

Husbandry Manual for The Shingleback Lizard



Tiliqua rugosa GRAY, 1825
Reptilia:Scincidae

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A Husbandry Manual template has been developed to standardise information on captive management needs in a concise, accessible and usable form. Currently there is no Husbandry Manual for the Shingleback Lizard. As these lizards are commonly kept in zoological and private collections in Australia and internationally, a Husbandry Manual could be widely used.

This Husbandry Manual is set out as per the husbandry manual template designed by Stephen Jackson and Graeme Phipps. The template is a document that was created to maintain husbandry manual uniformity and thus its effectiveness and ease of use. It is intended as a working document. It is designed to be used by any institution, as well as private collections, holding this species.

Although these lizards are easy to keep in captivity they do have some special requirements. The aim of the Husbandry Manual is to summarise and consolidate information regarding OHS, natural history, captive management and ethical husbandry techniques and conservation from a variety of sources. It should provide information on appropriate husbandry with scope for improved health and welfare and captive breeding if required.

The University of Western Sydney, Hawkesbury Campus, is planning on keeping Shingleback Lizards amongst other species in their reptile unit. This manual can be used by the University of Western Sydney staff and students in this facility.

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OCCUPATIONAL HEALTH AND SAFETY

The Occupation Health and Safety Act, 2000 is in place to help provide a safe working environment and reducing injury and deaths in the workplace. This Act is enforced by Worksafe Australia. Staff should be familiar with Occupational Health and Safety (OHS) legislation and be aware of employer and employee responsibilities. For further information refer to www.legislation.gov.au (Legislation 2007).

The Shingleback Lizard is classed as innocuous, although the powerful jaw muscles can inflict a painful bite. If bitten do not try to pull away but sit the lizard down and tap its tail to make it let go (Ehmann 1992, Green 2001).

There have been incidences of Death Adders (*Acanthopis* spp.) being confused with Bluetongue and Shingleback Lizards. This might be more likely with the banded Shingleback Lizards which are found in the western parts of their range (Horan pers. comm., Phipps pers. comm.).

In the interest of OHS it is the employers responsibility to provide the employees with all necessary personal protective equipment (PPE) such as hat, safety glasses, gum boots, steel capped boots, lab coat, overalls, face mask, latex gloves and work gloves. The employee must use PPE as directed.

The employer should also develop Standard Operating Procedures (SOPs) for every task. SOPs should reflect the safest way to complete a task.

OHS hazards are divided into six categories. These categories are: Biological, Chemical, Ergonomic, Physical, Psychological and Radiation.

Biological: The main biological risk is zoonotic disease. Keepers may come into contact with these diseases from dirty bedding, waste products, food and water, bites or scratches, or directly from the animal. In the interest of avoiding disease a high standard of personal hygiene should be maintained including regular washing of hand and the use of appropriate PPE such as gloves when handling animals, feed, water and waste.

The following is a list of organisms that can possibly be carried by Shingleback Lizards and may produce zoonotic diseases:

Bacteria:

Aeromonas spp.

Campylobacter spp.

Edwardsiella spp.

Escherichia coli

Klebsiella spp.

Mycobacterium spp.

Pasteurella spp.

Proteus spp.

Salmonella spp.
Proteus spp.
Staphylococcus spp.
Streptococcus spp.

Fungi:
Aspergillus spp.
Trichophyton spp.

Protozoa:
Cryptosporidium spp.
Coccidia spp.

(Brown 2003, Horan pers. comm., McCracken 1994, Shea pers. comm.)

Although many of the above are regarded as being potentially zoonotic only a few commonly cause clinical disease.

Chemical: Various chemicals used when working with reptiles are hazardous. The chemicals referred to in this manual are Betadine, F10SC, Fecasol, Formalin, Isoflurane, Ivomec, Ketamine, Lethobarb, Lignocaine, Metacam, Neomycin, Panacur, Repti-cal, Repti-hand, Repti-vite and Top Of Descent. Material Safety Data Sheets (MSDS) should be supplied for all chemicals and read before chemicals are used.

Ergonomic: The workplace and equipment used should be ergonomically designed, reducing incidences of RSI and other workplace injuries. Examples of areas for consideration include, cage design, work bench and shelving height and adjustable work consoles. Also staff should be adequately informed and trained in good workplace practices, for example good posture, appropriate exercises and adequate breaks.

Physical: Some of the physical hazards encountered fire, wet floors, manual handling, the lifting of heavy items (food, bedding etc). Staff should be taught and encouraged to follow correct lifting techniques. Staff should experience annual drills in evacuation procedures and fire safety, a chart should be displayed outlining the use of fire safety equipment, including extinguishers. Emergency phone numbers should be displayed by the telephone. There should be a first aid officer appointed and encouragement of first aid training for all staff. In the case of individuals it is always a good idea to have some basic first aid training. Signage showing correct lifting techniques should be displayed in areas where lifting occurs. Proper equipment should be provided for the safe disposal of spills. Physical hazards also include injuries inflicted by the animals ie. scratch and bite wounds. A first aid kit should be supplied.

Psychological: Psychological problems which may occur include reptile, rodent or insect phobias, dealing with injured animals, euthanasia of food items and lizard deaths, euthanasia and post mortems. Staff should be provided with appropriate education. Team

leaders need to encourage good communication, delegate duties accordingly, and where necessary provide qualified counseling.

Radiation: Sources of radiation hazards are Ultra Violet (UV) radiation from the sun or UV tubes. It is best to avoid UV tubes and to turn tubes off when dealing with animals. When outside wear appropriate PPE including UV protective glasses, sunscreen, hat, long sleeve clothing and avoid outdoors at high UV times.

1 Introduction

National Parks and Wildlife Service (NPWS) list Shingleback Lizards as Class 1 species (Species Code Number Z2583), indicating that they have been assessed as a species that is readily maintained in captivity by keepers with a basic knowledge of reptile care. As at 31/3/2005 220 people held 591 Shingleback Lizards, as pets or permanent care animals, under the National Parks and Wildlife Act in NSW (NPWS 2006).

Shingleback Lizards are a member of the Blue-tongue Lizard complex. They are endemic to Australia with four recognised subspecies (Hitz et al 2003). The most commonly kept subspecies is *T. r. asper*. The husbandry techniques are the same for all subspecies (Green 2001).

There has been a long history of scientific interest in lizards from the Bluetongue complex (refer figure 1.1). There has also been a long history of keeping these lizards in captivity throughout the world. By the second half of the 19th century Shingleback Lizards were being exhibited in zoos in Australia and Europe. Early attempts to keep them outside Australia were often unsuccessful. Shingleback Lizards do not adapt well to humid conditions, such as on the east coast of Australia. In such conditions they will die, usually from a respiratory disorder, unless appropriate housing is arranged. Since the improvement of husbandry techniques, better results and captive breeding have been reported (Griffiths 2006, Hitz et al 2004).

The Exhibited Animals protection Act (EAPA) may be used as a minimum standard for keeping Shingleback Lizards. This is a legal requirement if the animals are held under an EAPA license. The EAPA is concerned with animal welfare with regard to ethical issues, physical wellbeing and behavioural enrichment. (DPI 2004, Flesch pers. comm., Phipps pers. comm.).

All reptiles are protected in Australia. In NSW Reptiles may be kept by private keepers under the National Parks and Wildlife Act, for exhibit under the Exhibited Animals Protection Act or for research under The Animal Research Act. Shingleback Lizard exportation is restricted by the Environmental Protection and Biodiversity Conservation Act. Refer to local jurisdiction when obtaining Shingleback Lizards (Phipps pers. comm.).

The National Parks and Wildlife Act 1974 (NPWA) regulates the keeping of native animals as pets and the rescue and rehabilitation of native animals. This Act is enforced by National Parks and Wildlife Service (NPWS), for further information refer to www.nationalparks.nsw.gov.au (NPWS 2006).

The Exhibited Animals Protection Act 1986 (EAPA) regulates the keeping of animals for display by zoos, wildlife parks, mobile zoos, aquariums and bio parks. This Act is enforced by The Department of Primary Industries (DPI), for further information refer to www.agric.nsw.gov.au (Department of Agriculture 2007).

The Animal Research Act 1985 regulates the keeping of animals for research purposes. This Act is enforced by The Animal Care and Ethics Committee (ACEC), for further information refer to www.austlii.edu.au (Austlii 2007).

Environmental Protection and Biodiversity Conservation Act 1999 (EPBC) regulates the exportation of native animals. This Act is enforced by The Federal Department of Environment and Heritage (DEH), for further information refer to www.deh.gov.au (Department of Environment and Heritage 2007).

Prevention Of Cruelty To Animals Act 1979 (POCTA) should also be met to prevent cruelty and promote their care and protection. RSPCA believes that consideration of an animal's welfare must include its physical, physiological and mental state. This should be considered in terms of The Five Freedoms:

- 1 Freedom from hunger and thirst
- 2 Freedom from discomfort
- 3 Freedom from pain, injury or disease
- 4 Freedom to express normal behaviour
- 5 Freedom from fear and distress

For further information refer to www.rspca.org.au (RSPCA 2006).

A Shingleback Lizard was the first Australian Lizard recorded by Europeans. The first sighting was 6th August 1699 by William Dampier in Shark Bay, WA. "And a Sort of Guano's, of the same Shape and Size with other Guano's describ'd but differing from them in 3 remarkable Particulars: For these had a larger and uglier Head, and had no Tail: And at the Rump, instead of the Tail there, they had a Stump of a tail, which appear'd like another Head; but not really such, being without Mouth or Eyes: Yet this Creature seem'd by this Means to have a Head at each End; and, which may be reckon'd a fourth Difference, the Legs also seem'd all 4 of them to be Fore-legs, being all alike in Shape and Length, and seeming by the Joints and Bending to be made as if they were to go indifferently either Head or Tail foremost. They were speckled black and yellow like Toads, and had Scales or Knobs on their Backs like those of Crocodiles, plated on to the Skin, or stuck into it, as part of the Skin. They are very slow in Motion; and when a Man comes nigh them they will stand still and hiss, not endeavouring to get away. Their Livers are also spotted black and yellow: And the Body when opened hath a very unsavory Smell. I did never see such ugly Creatures any where but here. The Guano's I have observ'd to be very good Meat: And I have often eaten of them with Pleasure; but tho' I have eaten of Snakes, Crocodiles and Allegators, and many Creatures that look frightfully enough, and there are but few I should have been afraid to eat of; if prest by Hunger, yet I think my Stomach would scarce have serv'd to venture upon these N. Holland Guano's, both the Looks and the Smell of them being so offensive." (Stanbury & Phipps 1980).

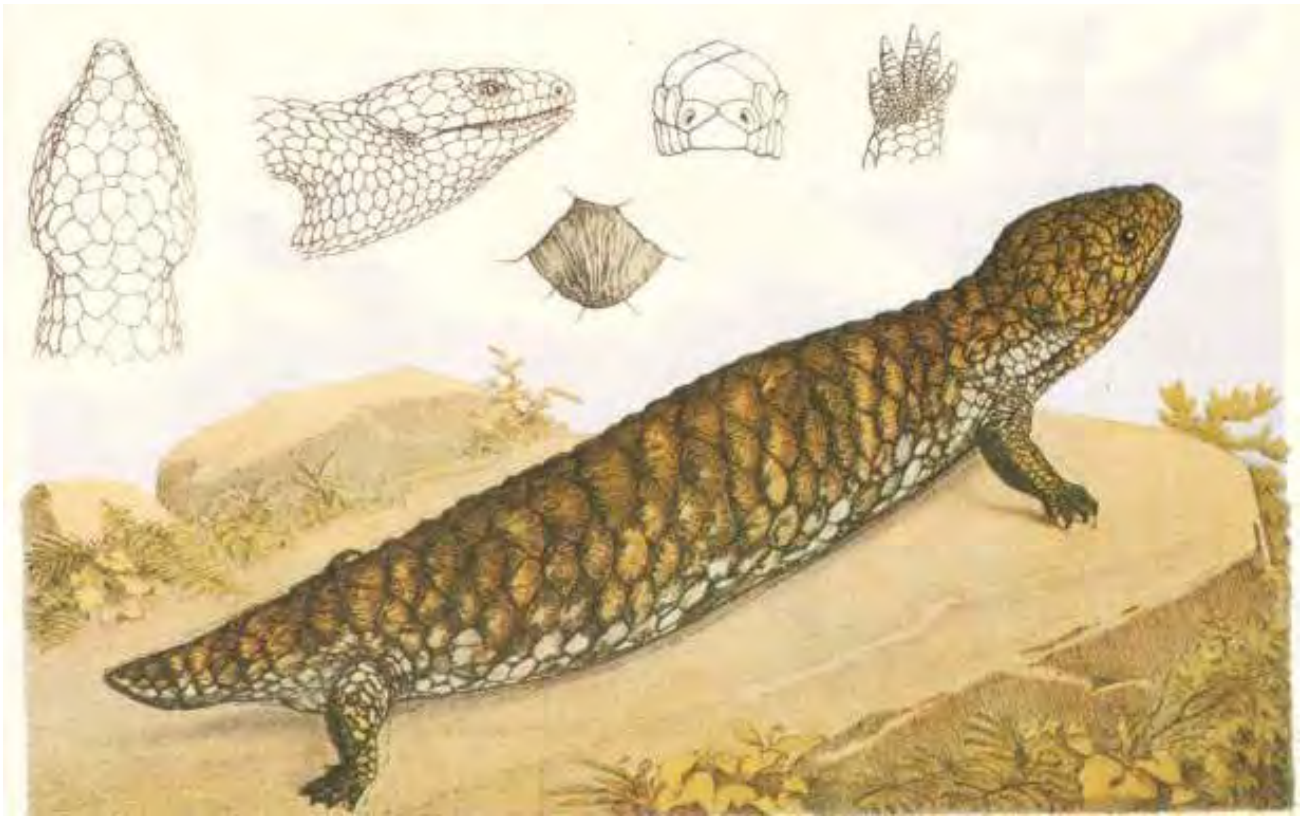


Figure 1.1 An illustration from a Victorian era scientific journal
(Stanbury & Phipps 1980)

The first scientific description of a Shingleback Lizard was 1827 by J. E. Gray in Georges Sound, WA. “The body nearly uniform, chestnut brown; the head depressed with the scales convex, and more nearly of an equal size than usual: those round the eyes and mouth large; the three anterior scales on the edge of the lower jaw larger than those which cover the lower surface of the head, body, and tail, which are uniform, distinct, large and membranaceous: the scales of the back are nearly of equal size with those covering the commencement of the tail; they are furnished with a prominent midrib, and end in a point. The legs very short, compressed covered with nearly smooth, rather thin scales. The toes very short; claws rather thick, and short. The tail about half the length of the body. Head three inches long. Body, seven inches. Tail, four inches. Only one specimen of this exceedingly interesting animal was brought home by Captain King, but the spirits in which it had been preserved had unfortunately evaporated, so that it was considerably injured...The above specimen found at King George the Third’s Sound, and is preserved in the Museum [the British Museum].” (Stanbury & Phipps 1980).

Within Australia Bluetongues are well known to the Aborigines and feature in their legends, art, diet and traditional medicine.

“Why the Blue-tongued Skink has a blue tongue (Aboriginal tale). An old man was very sick and asked his friend, the lizard, to run to the ocean and urgently bring back ink from the squid which was required to cure him from his bad illness. When the lizard arrived at the ocean, he called the squid and asked him for a little bit of ink for his sick friend. The squid was in a charitable mood and offered the lizard to help himself from his full bladder of ink. But in all his hurry the lizard had forgotten to bring a vessel for the ink so the only way to transport the ink was in his mouth. Then he ran back so fast that he nearly ground off his legs. But eventually he arrived just in time to save his friend from certain death. Since then these skinks have blue tongues and very, very short legs...” (refer figure 1.2) (Hitz et al 2004).



Figure 1.2 Squid lets the skink have his ink for the sick man (Hitz et al 2004)

2 Taxonomy

It has been established that there is a Blue-tongue Lizard complex. This complex includes *Tiliqua*, true Blue-tongues (Bluetongue and Shingleback Lizards) and *Cyclodomorphus* (Sheoak and Pinktongue Skinks). *Egernia* is also connected with this complex (Houston pers. comm., Shea 1998, Wallis 1996, Wilson & Swan 2003). *Tiliqua* and *Cyclodomorphus* are members of the Family Scincidae and the Subfamily Lygosominae, which is divided into three groups Sphenomorphus, Mabuya and Eugongylus with the Bluetongue Lizard complex being in the Mabuya group (Greer 1989).

Among the characteristics features of this lineage is the presence of enlarged teeth towards the back of the tooth row in both the maxilla and mandibles (refer figures 2.1, 2.2, 2.3 & 2.4). In comparison all other skinks have teeth that are nearly even in size. Fossils dating back 15 million years (Cenozoic Era, Tertiary Period) from deposits at Riversleigh, described as *Tiliqua pusilla*, have typical Bluetongue Lizard dentition indicating that the lineage is even older (Shea 1999).

Skinks, and other Squamates, have modified diapsid skulls. There has been a reduction of bones fusing the two temporal openings on each side of the skull behind the orbits of the eyes (Harris 1992). The typical Skink skull is broad and flattened with a reduced upper temporal opening and a relatively long snout but there is considerable variation (refer figures 2.1, 2.2, 2.3 & 2.4) (Glasby et al 1993, Houston pers. comm.).

Most skinks have blunt peg-like teeth. However *Tiliqua* have a few enlarged bluntly rounded 'molars' to crush food. The number of premaxillary teeth, which is more or less constant throughout life, as apposed to the number of maxillary teeth which usually increase with size, is a very useful taxonomic characteristic in skinks (Greer 1989). Shingleback Lizard teeth are rootless and are continually being replaced. They can be missing up to one third of their teeth at any given time (refer figures 2.1, 2.2, 2.3 & 2.4) (Shea pers. comm.).



Figure 2.1 Ventral view of Shingleback Lizard skull (Titmuss 2007)



Figure 2.2 Dorsal view of Shingleback Lizard skull (Titmuss 2007)



Figure 2.3 Lateral view of a Shingleback Lizard skull (Titmuss 2007)



Figure 2.4 Shingle back Lizard mandible (Titmuss 2007)

The meaning of the scientific names is as follows:

Tiliqua - meaningless, as was common with reptile Genera named by Gray.

rugosa - wrinkled.

aspera - rough.

konowi - named for the collector Gunther Konow, a Perth resident.

palarra - local aboriginal name for this animal.

(Shea pers. comm.)

2.1 Nomenclature

Class	Reptilia
Order	Squamata
Sub Order	Sauria
Family	Scincidae
Sub Family	Lygosominae
Genus	<i>Tiliqua</i>
Species	<i>rugosa</i>

(Hitz et al 2003)

2.2 Subspecies

T. r. rugosa (GRAY, 1825) Common Bobtail or Shingleback

T. r. aspera (GRAY, 1845) Shingleback or Sleepy Lizard

T. r. konowi (MERTENS, 1958) Rottnest Island Bobtail

T. r. palarra SHEA, 2000 Shark Bay Bobtail

(refer figure 2.5) (Hitz et al 2003)

- 1 Tail very short, wide, 14.5-30% of SVL; 11-16 subcaudals; 19-25 scale rows at midbody; conspicuously large scales on body; max. SVL 341mm.....*T. r. aspera* (refer figure 2.9)
 - Tail relatively long, 20.6-37% of SVL; number of subcaudals normally >16.....2
 - 2 Median occipital usually present; first supraciliary and frontal separated; dorsal colour pattern normally consisting of pale, colourful bands; 22-30 scale rows at midbody; max. SVL 303mm.....*T. r. rugosa* (refer figure 2.8)
 - Median occipital usually absent; first supraciliary and frontal in contact at least on one side; dorsum with diffuse pattern on dark ground colour, or narrow pale streaks and spots on a brown ground.....3
 - 3 Nasals separate; dorsum with diffuse pattern (fine, pale vermiculation) on dark gray ground colour; venter with diffuse, grayish green clouding; 24-30 scale rows at midbody; max. SVL 260mm.....*T. r. konowi* (refer figure 2.10)
 - Nasals normally in contact; brown ground colour with yellow streaks and spots; 26-35 scale rows at midbody; max. SVL 300mm.....*T. r. palarra* (refer figure 2.11)
- (refer figures 2.6 & 2.7 and table 2.1)

Figure 2.5 Identification key to the subspecies of *T. rugosa* (Hitz et al 2003)

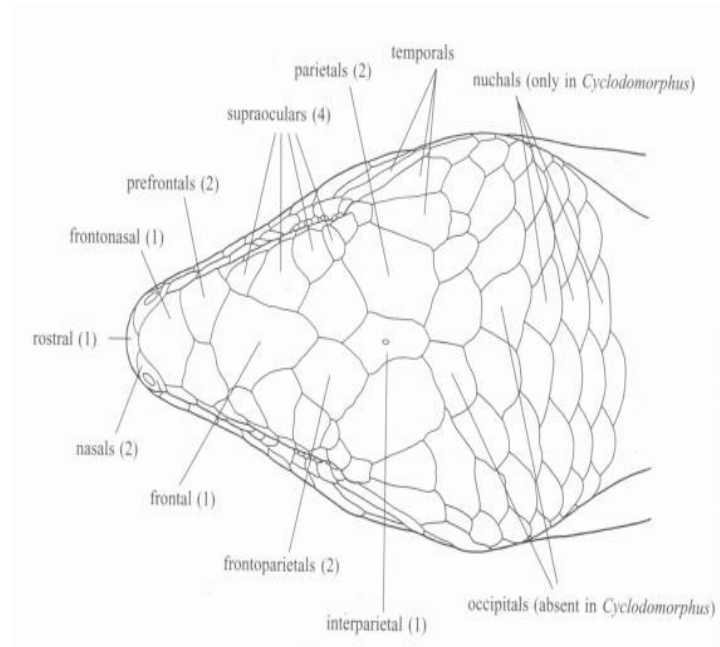
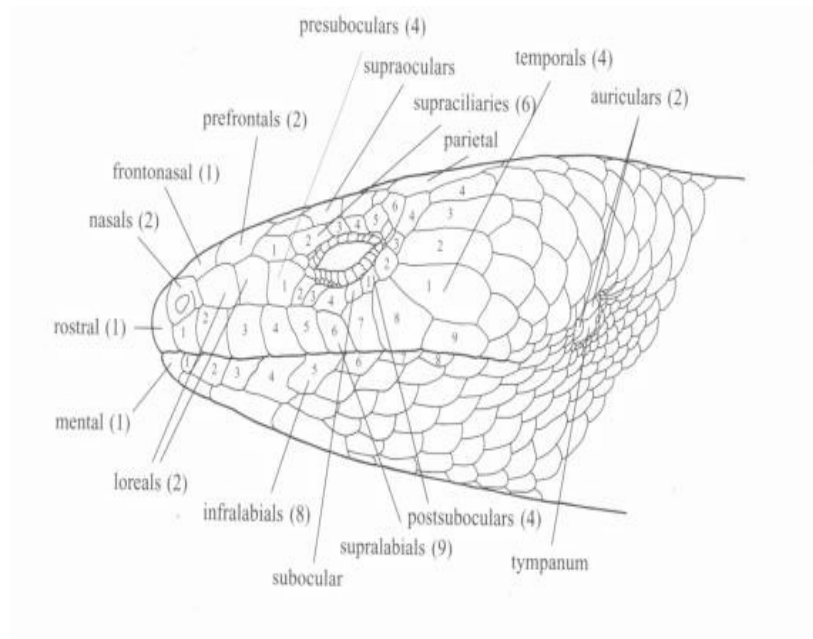


Figure 2.6 Head scales of a Blue-tongued skink (Hitz et al 2003)

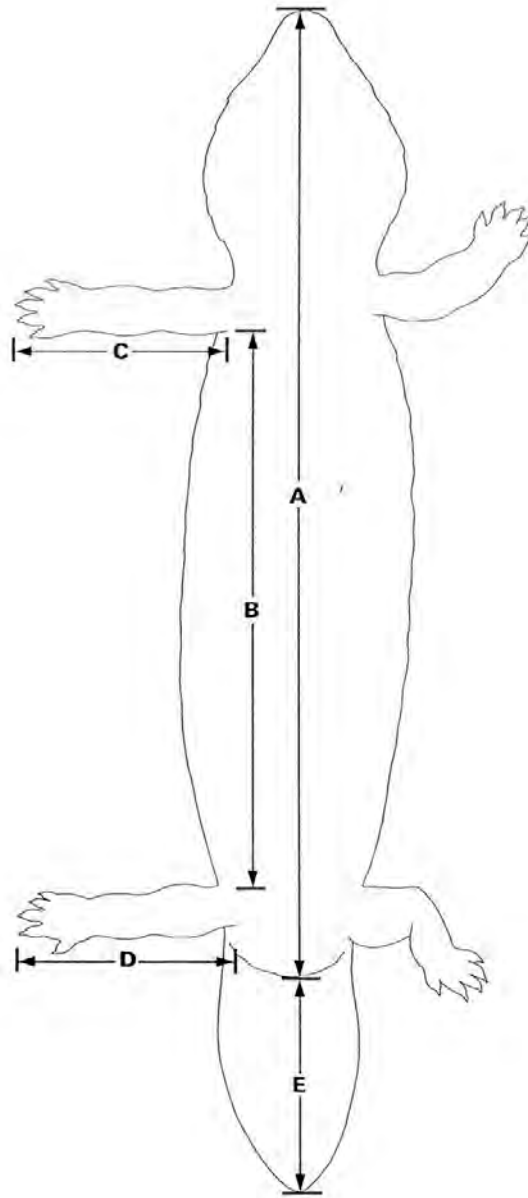


Figure 2.7 Sketch of ventral surface of a typical *Tiliqua*, indicating limits of certain morphometric characters:

A = snout-vent length (SVL)

B = axilla-groin length

C = forelimb length

D = hindlimb length

E = tail length

A + E = total length (TL)

(Shea 1992)

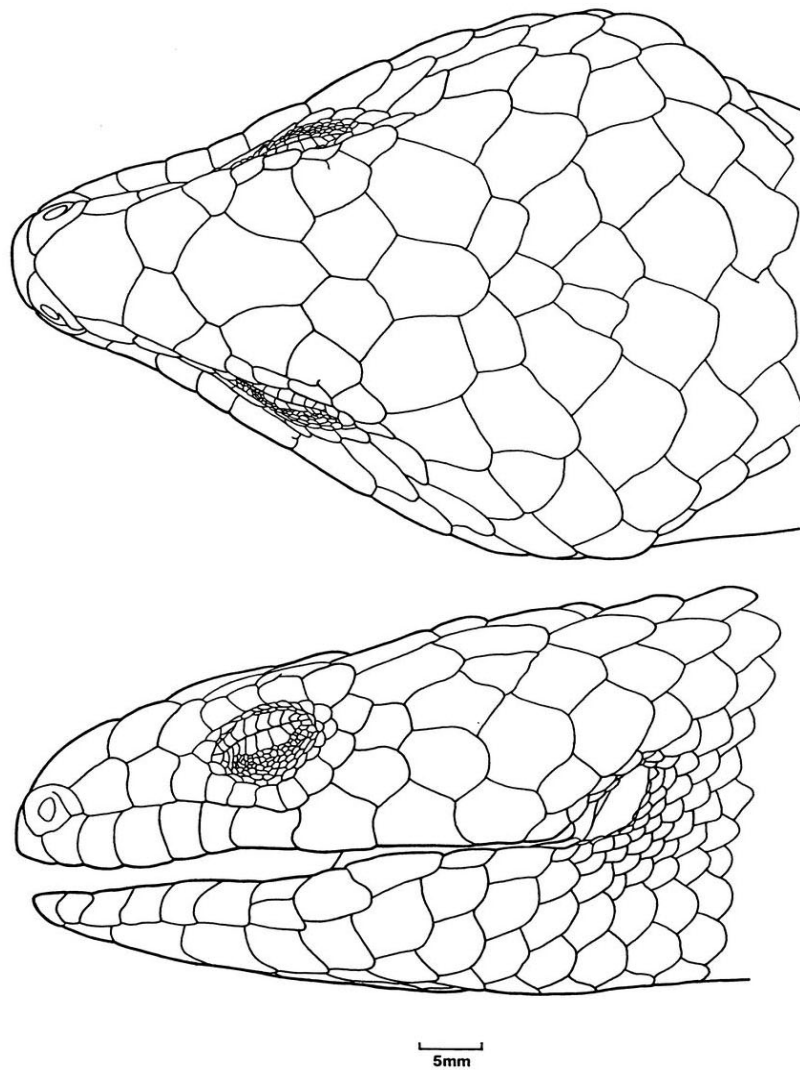


Figure 2.8 Head shield configuration of *T. r. rugosa* (Shea 1992)

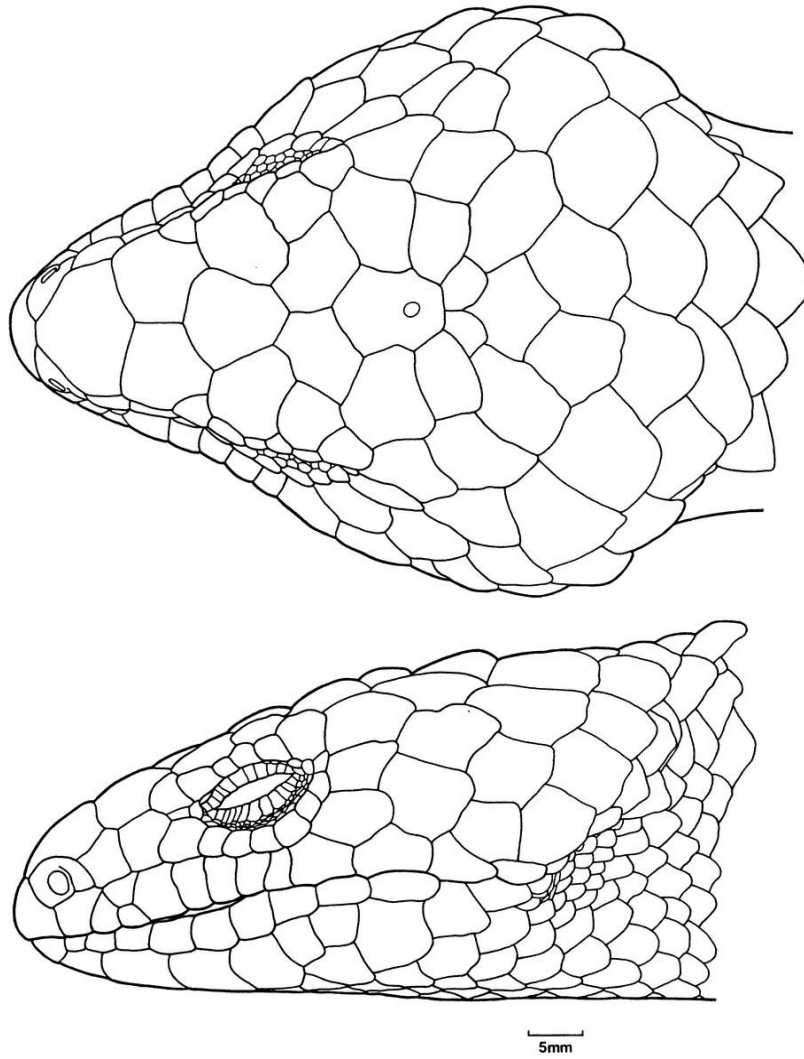


Figure 2.9 Head shield configuration of *T. r. aspera* (Shea 1992)

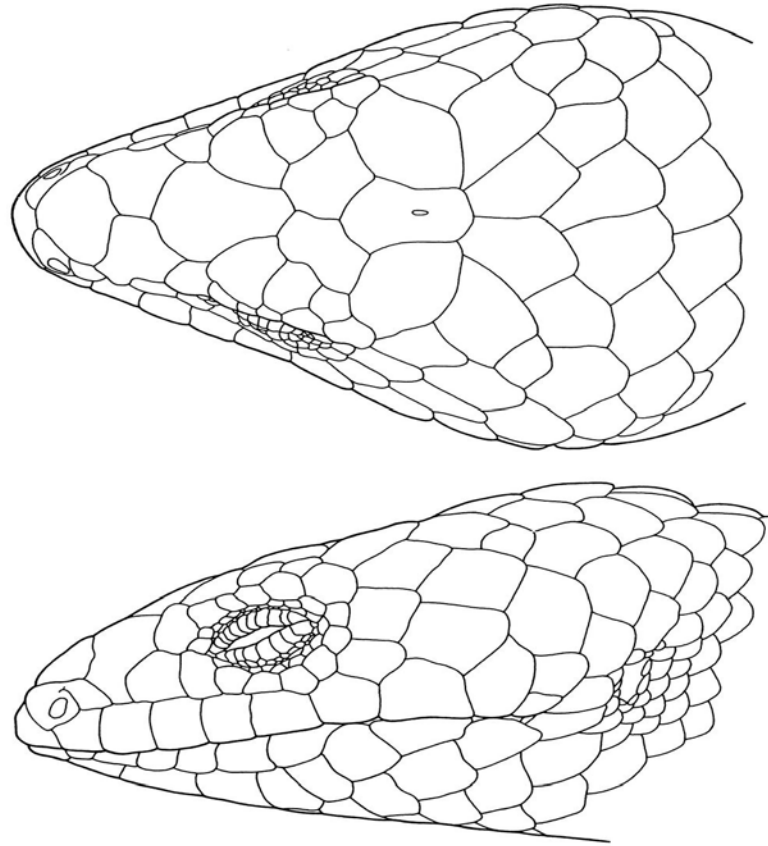


Figure 2.10 Head shield configuration of *T. r. konowi* (Shea 1992)

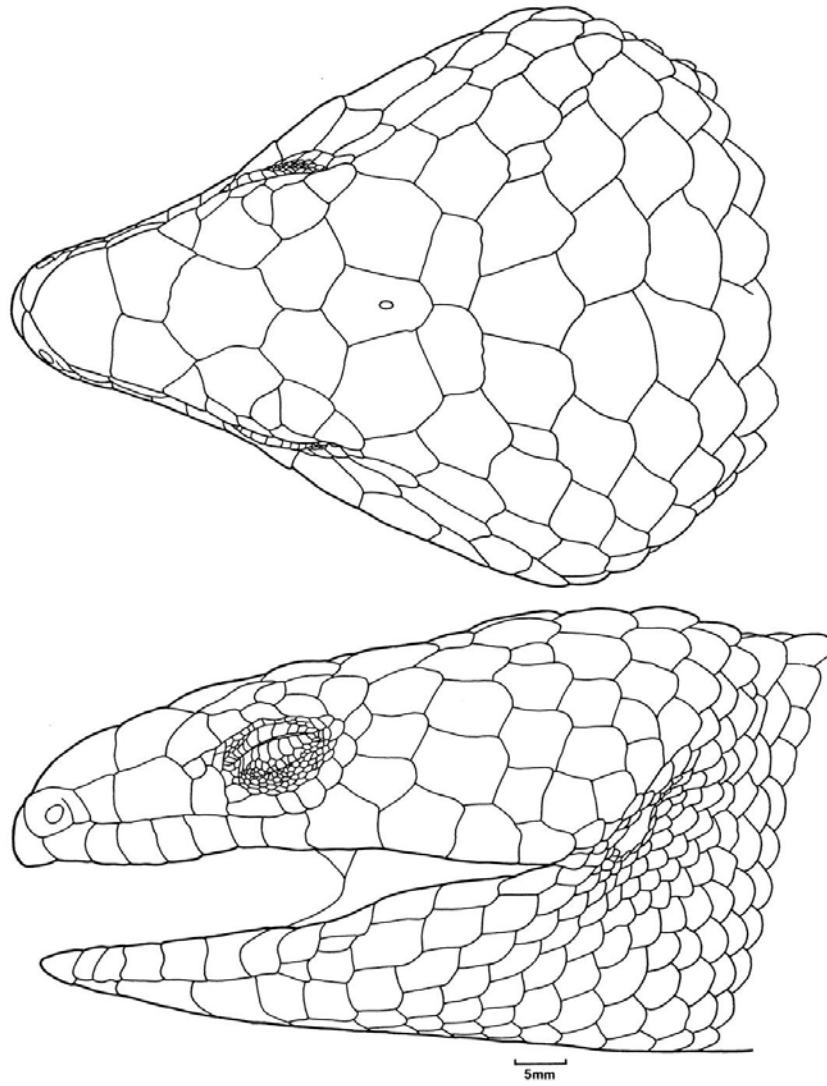


Figure 2.11 Head shield configuration of *T. r. palarra* (Shea 1992)

Table 2.1 Summary of diagnostic characters of the four subspecies of *T. rugosa*

(Hitz et al 2004)

	<i>T. r. rugosa</i>	<i>T. r. aspera</i>	<i>T. r. konowi</i>	<i>T. r. palarra</i>
Head	Narrow when compared to the other sspp.	Wide, triangular in outline	Narrow	Relatively narrow; ear opening small; very dark in colour
Nape	Without particular traits	Without particular traits	Without particular traits	A narrow, brown streak along the vertebral line flanked by light streaks
Dorsal scales	Much smoother than those of <i>T. r. aspera</i>	Large and rough	Back and flanks with fine scales	Much smoother than those of <i>T. r. aspera</i>
Dorsal pattern	Light to dark brown or black ground colour; narrow to wide, irregular shaped cross bands on back and tail in white, gray, yellow, or orange to red colour	Ground colour uniform gray, brown, black or multicoloured; no cross bands	Gray to olive green ground colour; fine pale vermiculated pattern	Ground colour olive green to brown; dorsum flanks with irregularly shaped, white and yellow streaks (5-6 scales in length) or spots
Tail	Relatively long, up to 37.2% of SVL	Very short, wide, at maximum 30% of SVL; its shape resembles the head	Relatively long and slim, up to 37% of SVL; weak banded pattern	Up to 31.0% of SVL

	<i>T. r. rugosa</i>	<i>T. r. asper</i>	<i>T. r. konowi</i>	<i>T. r. palarra</i>
Throat	Spotted with dark, occasionally streaked	With light spotting	In ground colour	With a moderate to high content of brown
Venter	Yellow to bluish gray	Cream coloured to yellow, usually with brown bars in longitudinal and cross direction	In ground colour	Yellow with a distinct brown pattern
Limbs	Yellow to bluish gray, sometimes streaked with dark	Yellowish to dark brown; black in melanistic specimens	In ground colour	Front and hind legs predominantly brown on the outer surfaces, predominantly yellow on the inner sides; thighs of the hind legs with a white streak (two scales in width)
SVL	Maximum 303mm	Maximum 341mm	Maximum 260mm	Maximum 300mm
TL	Maximum 415mm	Maximum 443mm	Maximum 356mm	Maximum 393mm

2.3 Recent Synonyms

Tiliqua Gray, 1825

Trachydosaurus Gray, 1825

Trachysaurus Gray, 1827

Tachydosaurus Gray, 1838

Tiliqua rugosa rugosa (Gray, 1825)

Trachydosaurus rugosus Gray, 1825

Scincus peronii Wagler, 1830

Trachysaurus peronii Wagler, 1833

Brachydactylus typicus Smith, 1835

Tiliqua rugosa aspera (Gray, 1845)

Trachydosaurus asper Gray, 1845

Lacerta ecaudata Cunningham, 1925

Tiliqua rugosa konowi (Mertens, 1958)

Trachydosaurus rugosus konowi Mertens, 1958

Tiliqua rugosa palarra Shea, 2000

Scincus tropisurus Peron, 1807

Scincus pachyurus Gray, 1831

Tiliqua rugosa palarra Shea, 2000

(Hitz et al 2003)

2.4 Other Common Names

Bobbies

Bog-eye*

Bogghi*

Boggi*

Boggies

Bogi*

Bob-tail Lizard

Bobbi

Garbarli*

Kalta*

Pinecone Skink

Stumpy

Stumpy-tail Lizard

Sleepy Lizard

Sleepies

Two Headed Lizard

*indigenous names

3 Natural History

Shingleback Lizards are slow moving and might be the ecological equivalent (with regard to form, diet and habitat) to terrestrial tortoises of other continents (Wilson & Knowles 1988).

Shingleback Lizards are viviparous and give birth to between 1 and four large young (Wilson & Knowles 1988). They have xeric adaptations such as the livebearing of small litters of large young and the ability to store large amounts of fat in the tail (Bustard 1970, Griffiths 2006, Houston pers. comm.). During extended periods of low food supply Shingleback Lizards in poor physical condition can be commonly seen. These animals have relatively thin flat tails and often have a high external parasite load (pers. obs.). Other xeric adaptations are the exudative salt gland located in the nose, the ability to cope with a decrease in hydration level during winter and unusually high tolerances to plasma electrolytes or salt in the blood (Greer 1989, Heatwole & Taylor 1987). Many lizards convert ammonia to uric acid, which is insoluble in water and is excreted directly without water loss (Morris 2006).

When water is available after rain Shingleback Lizards appear in increased numbers and drink avidly from puddles. Shedding may also be put off until after rain (Greer 1989). Shingleback Lizards are able to pant when overheated. The mouth is open during inhalation and closed during exhalation (Heatwole & Taylor 1987).

Shingle back Lizards can leave characteristic spoors. Wide bodied lizards, such as the Bluetongues, leave a wide body scrape, with a narrower furrow made by the tail (refer figure 3.1) (Hitz et al 2004, Triggs 1996).



Figure 3.1 Shingleback Lizard tracks (Hitz et al 2004)

3.1 Morphometrics

3.1.1 Mass And Basic Body Measurements

Maximum SVL is from 260mm to 341mm and maximum TL is from 356mm to 443mm depending on the subspecies (refer table 3.1) (Shea 1998).

Weights are rarely measured for bluetongues in the literature but average weight is around 600g to 700g (Shea pers. comm., Torr 1999).

The maximum weight of a Shingleback recorded is 1103g for *T. r. aspera*, which is the largest, most robust subspecies (Hitz et al 2004).

Table 3.1 Maximum SVL and TL of the four subspecies of *T. rugosa* (Hitz et al 2004)

	<i>T. r. rugosa</i>	<i>T. r. aspera</i>	<i>T. r. konowi</i>	<i>T. r. palarra</i>
Max SVL mm	303	341	260	300
Max TL mm	415	443	356	393

3.1.2 Sexual Dimorphism

Shingleback Lizards are almost sexually monomorphic although various dimorphic traits have been reported. These traits are variable between subspecies and populations (Hitz et al 2004).

Methods used to sex Shingleback Lizards:

1. External morphology:

The tails are more slender and slightly longer in males. In some populations the head is large and wide in males and long, narrow in females. Females are usually a little heavier than males (Cogger 2000, Green 2001, Torr 1999).

2. External (secondary) genital organs (hemipenes / hemiclitores):

These are paired organs that are able to be everted. Rise from the cloaca and are retracted into the base of the tail. The hemiclitores is only half as long, more slender and less voluminous than the hemipenes and is difficult to examine in a live animal. The hemipenes are best everted when the lizard is at its active temperature. This is done by exerting pressure on the ventral side of the base of the tail (Hitz et al 2004). Considerable pressure must be applied and the pelvic girdle must be supported to avoid damaging the lizard's spine (Houston pers. comm.).

A blunt probe may be carefully inserted through the cloaca into the retracted copulatory organ. The depth of penetration indicates the length of the respective organ. The probe penetrates about twice the distance in hemipenes than in hemiclitores (Hitz et al 2004).

3. Internal (primary) genital organs (testes / ovaries):

A genital endoscopy can be performed by a veterinarian (Hitz et al 2004).

4. Observation of various biological aspects:

Shingleback Lizards show behaviour such as signs of dominance in males especially in the breeding season. Males may fight in the breeding season. Males follow females in the breeding season (Shea pers. comm.).

Physical signs may be observed and include the presence of hemipenis exuviae in males and excretion of unfertilised yolk masses may be observed in females (Hitz et al 2004).

5. Laboratory methods:

Shingleback Lizards possess diploid sets of chromosomes with $2n=32$ chromosomes. It is usually the case with reptiles that the males are homomorphous (ZZ) and the females are heteromorphous (ZW) for sex chromosomes. No heteromorphous sex chromosomes have been found in Shingleback Lizards so DNA testing will not work (Hitz et al 2004).

In sex determination both genetics and the environment of incubation play a role, and either can dominate over the other. Some viviparous skinks have been shown to have temperature dependent sex determination even though sex chromosomes may be present. So many embryologists these days don't make a simple distinction between genetic sex determination and temperature dependent sex determination, but talk about environmental sex determination, in which genetics and temperature both play a part. Mammals, because of their constant body temperature, seem to have taken the role of temperature out of the system, but reptiles may still have many influences on sex determination (Shea pers. comm.).

Even though sex chromosomes may not be able to be recognised by differences in the morphology of the chromosomes, that does not mean that differences don't exist; it just means that the Z and W chromosomes are not obviously different from each other (Shea pers. comm.).

Plasma or serum samples may be evaluated for testosterone or faecal samples can be examined for the quantitative presence of sexual steroid hormones and their metabolites (Hitz et al 2004).

3.1.3 Distinguishing Features

The Shingleback Lizard is large and very robust and possesses four short pentadactyle limbs of approximately equal length. Their tail is shorter than their body with scales ranging from smooth to rugose. Their head is broad and triangular, and distinct from the neck. They have a tongue that is blue, broad and fleshy (Cogger 2000, Wilson et al 1988, Wilson & Swan 2003).

Colour varies through shades of brown or black, with flecks of cream or yellow spots or blotches. Colour varies considerably throughout their range and between subspecies. In western populations the markings tend to form irregular crossbands (Cogger 2000, Green 2001).

The species and subspecies of *Tiliqua* (other than *T. rugosa*) are:

T. adelaidensis (Adelaide Pygmy Bluetongue)
T. gigas gigas (Northern New Guinea Bluetongue)*
T. gigas evanescens (Southern New Guinea Bluetongue)*
T. gigas keyensis (Kei Islands Bluetongue)*
T. multifasciata (Centralian Bluetongue)
T. nigrolutea (Southern or Blotched Bluetongue)
T. occipitalis (Western Bluetongue)
T. scincoides scincoides (Eastern Bluetongue)
T. scincoides chimaerea (Sunda Islands Bluetongue)*
T. scincoides intermedia (Northern Bluetongue)

*Exotic
(Hitz et al 2004)

T. rugosa occurs in sympatry broadly with *T. occipitalis* and *T. scincoides* and to a lesser extent with *T. nigrolutea*. *T. rugosa* is allopatric to all other *Tiliqua* spp. (Shea 1992).

T. rugosa is the most distinctive and readily identifiable of the *Tiliqua* species and there should be no problems identifying a Shingleback Lizard as no other species closely resembles them (Griffiths 2006, Shea 1992, pers. obs.). Shingleback Lizards can be distinguished from other *Tiliqua* spp. as:

- Having a broad short tail with a blunt tip.
- Tail 14.5 – 37 % SVL.
- Maximum 25 subcaudals.
- Subdigital lamellae divided, at least basally.
- Dorsal scales grossly enlarged, strongly rugose.
- Head shields broken up, only vaguely symmetrical

(refer table 3.2 and figures 3.2 and 3.3) (Cogger 2000, Hitz et al 2004).

Table 3.2 Characteristics separating *Tiliqua rugosa* from other *Tiliqua* spp. (Cogger 2000, Hitz et al 2004, Shea 1992)

	<i>Tiliqua rugosa</i>	Other <i>Tiliqua</i> spp.
Tail	Short, depressed, blunt (refer figure 9)	Moderate to long, tapering (refer figure 12)
Dorsal scales	Grossly enlarged, strongly rugose, often irregular	Moderate, smooth
Head shields	Broken up, only vaguely symmetrical (refer figure 10)	Smooth, entire, symmetrical (refer figure 13)
Subdigital lamellae	Divided, at least basally (refer figure 11)	Undivided (refer figure 14)
Subcaudals	Maximum 25	Minimum 26

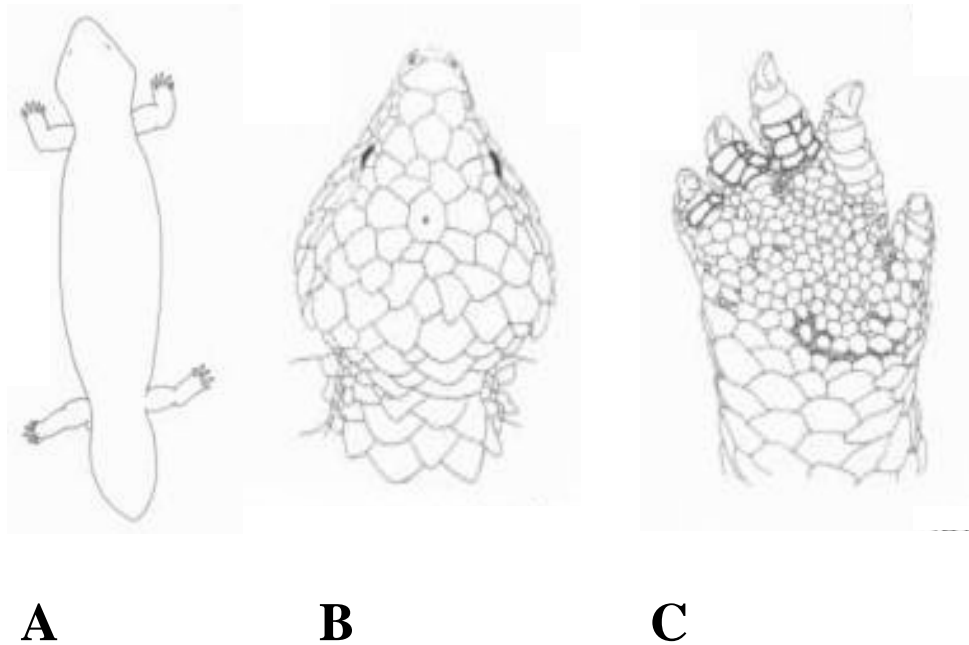


Figure 3.5 Key distinguishing characteristics for *Tiliqua rugosa* (Cogger 2000)

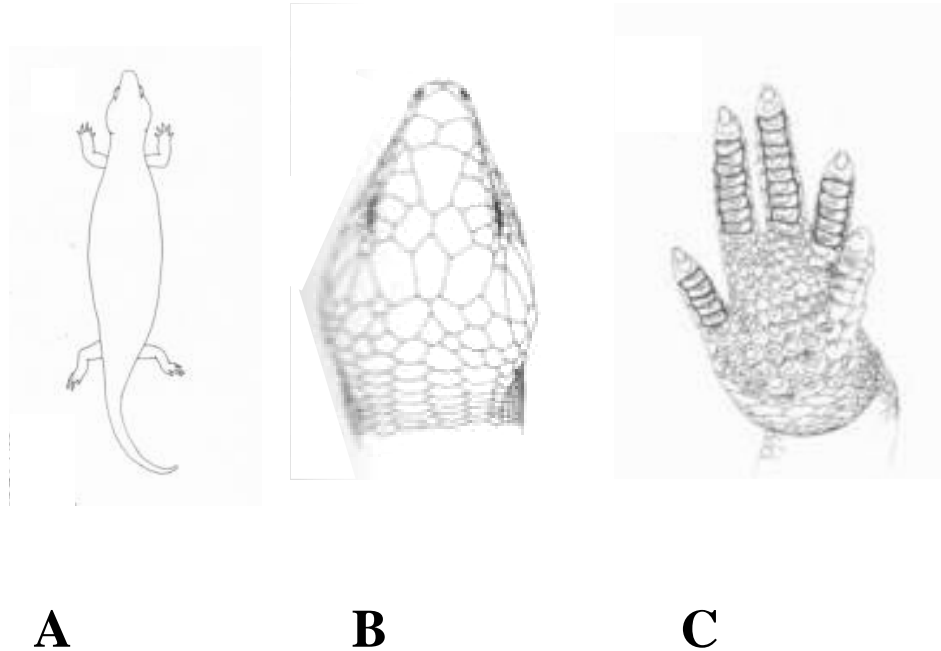


Figure 3.6 Key distinguishing characteristics for other *Tiliqua* spp. (Cogger 2000)

3.2 Distribution and Habitat

Shingleback Lizards are distributed in Australia from southern Queensland, New South Wales, South Australia, Victoria and Western Australia, including Rottnest Island. In NSW they do not occur naturally east of the Great Dividing Range (escapees have been reported). Their distribution area is more than one million square kilometers (refer figure 3.4) (Ehmann 1992, Griffiths 2006, Shea pers. comm.).

Shingleback Lizards are found in dry to arid open areas. Their varying habitats include mallee, deserts (sandy, stony, chenopod, saltbush), coastal heath, Grasslands (kangaroo grass and wallaby grass, spinifex grass or porcupine grass), dry sclerophyll forest, woodlands, shrublands and coastal dunes (Green 2001, Wilson et al 2003).

They live in areas with an essentially hot, dry summer (with an average maximum 21 to 27°C) and a cold winter (with an average minimum 9 to 15°C), where rainfall is low at 200-500mm annually (refer figures 3.5 and 3.6) (Bureau of Meteorology 2007). Their habitat may also receive winter frosts and snow (refer figures 3.7 and 3.8) (Ehmann 1992, Watharow 2003, pers. obs.).



Figure 3.7 Geographical distribution of *T. rugosa* and its subspecies (Hitz et al 2004)

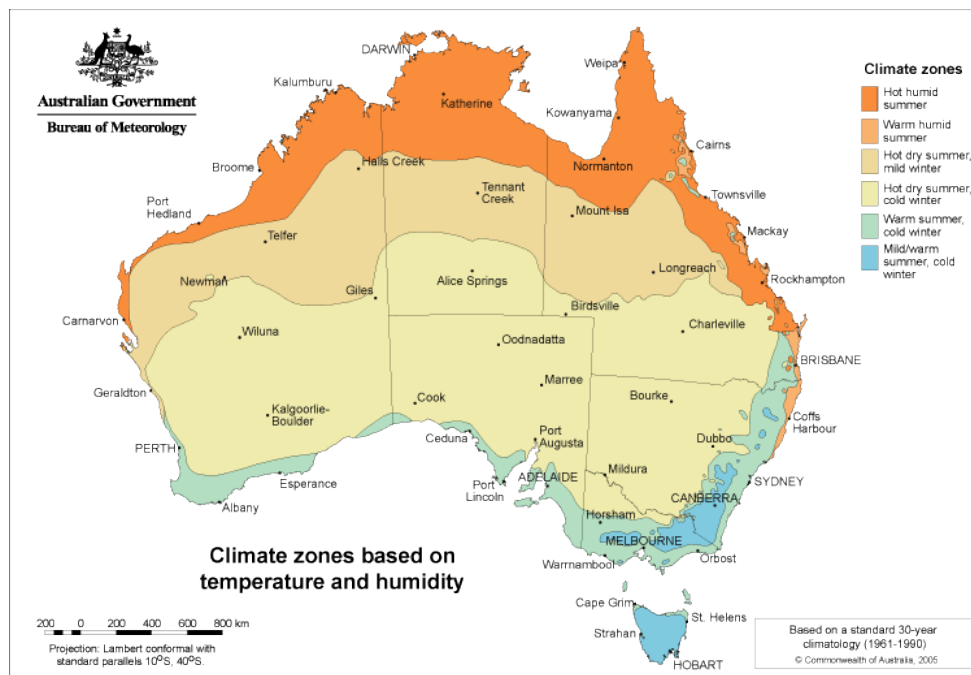


Figure 3.8 Australian climatic zones
 (Bureau of Meteorology 2007)

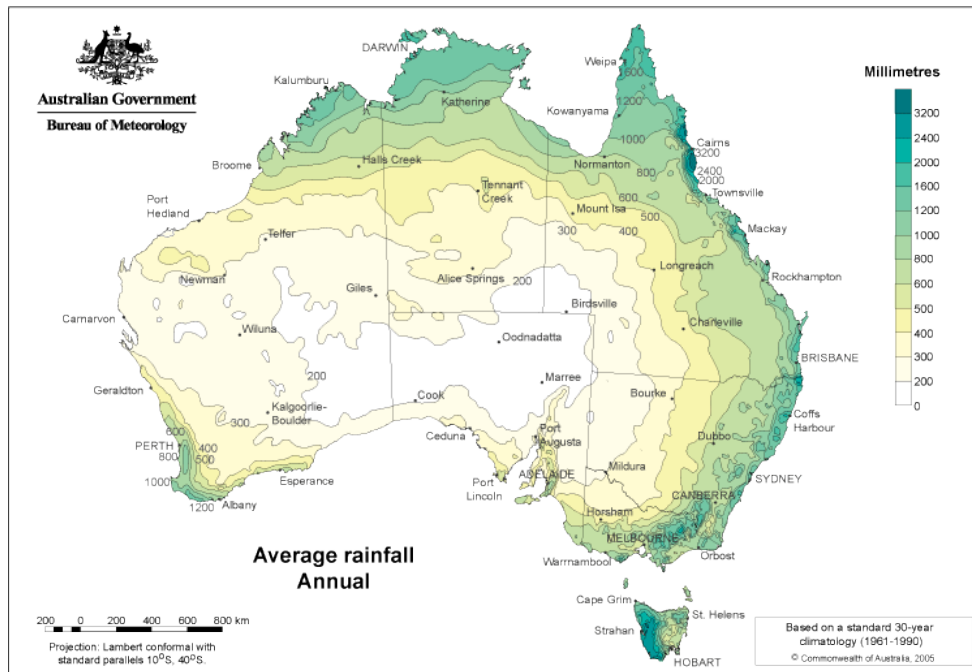


Figure 3.9 Australian average rainfall, annual
(Bureau of Meteorology 2007)

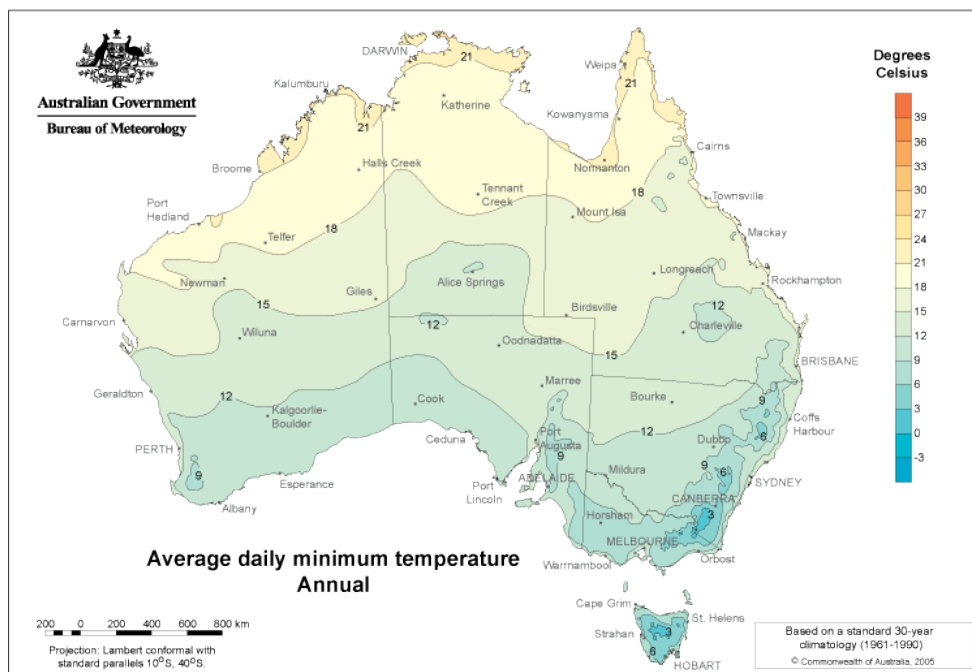


Figure 3.10 Australian average daily minimum temperature, annual
(Bureau of Meteorology 2007)

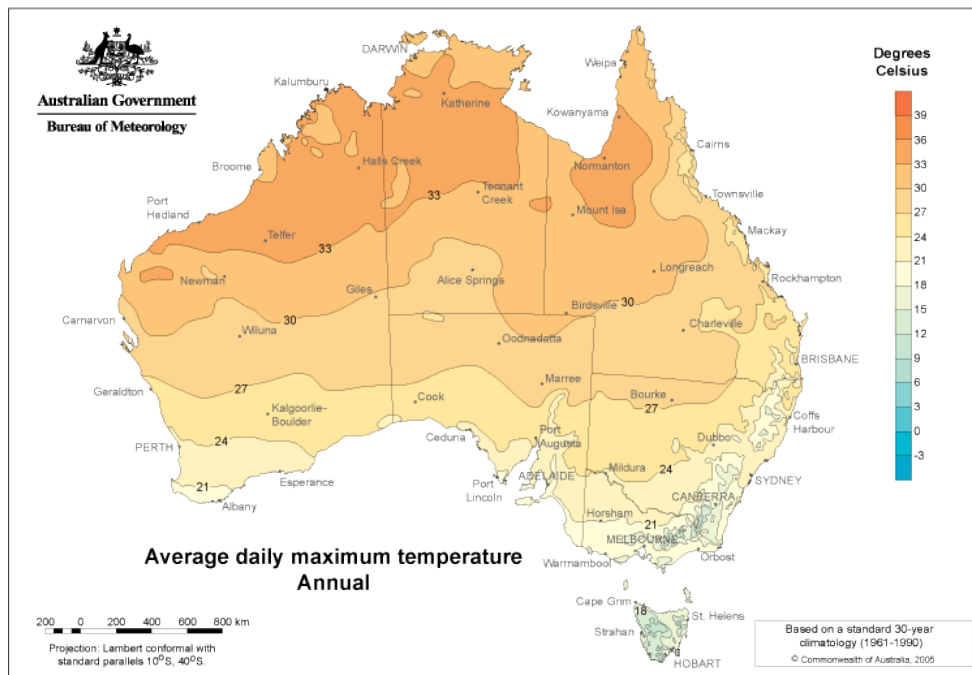


Figure 3.11 Australian average daily maximum temperature, annual
(Bureau of Meteorology 2007)

3.3 Conservation Status

Shingleback Lizards are common to abundant (Ehmann 1992). They are not listed in The International Union for the Conservation of Nature and Natural Resources (IUCN) Red List and have no conservation concern, indicating the status in all states is secure (IUCN 2006, Wilson & Swan 2003). All reptiles are protected in Australia (NPWS 2006).

Shingleback Lizards are listed in the ARAZPA (Australian Regional Association of Zoological Parks and Aquaria) Australian Species Management Program Regional Census & Plan (as at 1st January 2006) as ASPM Reptile and TAG; No Regional Program; Management Level 3. This indicates that ASMP Reptile and TAG (Taxon Advisory Group) have no recommendations for this species or group. Management Level 3 indicates Annual census only. The census of current and planned holdings for the region is published in the body of the annual Regional Census and Plan document. ARAZPA members numbers are: Current male 18, female 24 and unknown 64 - total 106, Planned male 17, female 15 and unknown 73 - total 105 (refer table 3.3) (Johnson and Lees 2006).

Table 3.3 ARAZPA ASMP Shingleback Lizard current and planned holdings (Johnson and Lees 2006)

Shingleback	<i>Trachydosaurus rugosus</i>						
ADELAIDE	0.	0.	3	0.	0.	3	MAINTAIN
AUCKLAND	0.	0.	0	0.	0.	2	ACQUIRE FOR EDUCATIONAL DISPLAY
BALLARAT	0.	0.	4	0.	0.	5	MAINTAIN
BEERWAH	0.	0.	8	0.	0.	8	MAINTAIN
COOMERA	4.	1.	2	4.	1.	2	MAINTAIN
CUDLEE PK	0.	10.	0	0.	0.	10	MAINTAIN
CURRUMBIN	3.	0.	0	3.	0.	0	MAINTAIN
DUBBO	2.	0.	0	0.	0.	2	MAINTAIN
GOSFORD	0.	0.	14	0.	0.	8	DELETE EXCESS
HEALESVIL	1.	3.	4	2.	3.	0	DELETE EXCESS
HELLINSBU	0.	0.	3	0.	0.	3	MAINTAIN
LP KOALA	1.	1.	1	1.	1.	1	MAINTAIN
MELBOURNE	1.	2.	2	1.	2	2	MAINTAIN (EDUCATION ONLY)
MONARTO	0.	0.	2	0.	0.	2	MAINTAIN
MUS VICT	1.	0.	0	1.	0.	0	MAINTAIN
ORANA	0.	0.	2	0.	0.	2	DISPLAY ONLY
PEARCEDAL	2.	4.	0	2.	4.	0	MAINTAIN
PERTH	0.	0.	5	0.	0.	5	MAINTAIN IN 2006
SUMMERTOW	1.	1.	5	1.	1.	5	MAINTAIN
SYDNEY	0.	0.	6	0.	0.	8	MAINTAIN
SYDNEY AQ	0.	0.	0	0.	0.	2	
WELLINGTN	1.	1.	0	1.	1.	0	BREED TO REQUIREMENTS IN 2006
WERRIBEE	0.	0.	3	0.	0.	3	MAINTAIN FOR EDUCATION ONLY
YARRALUML	1.	1.	0	1.	2.	0	ACQUIRE
Totals	18.	24.	64	17.	15.	73	

ASMP Reptile and TAG; No Regional Program; Management Level 3

3.4 Diet in the Wild

Shingleback Lizards are omnivorous and in the wild they eat berries, fruits, herbaceous vegetation, flowers (including Patersons curse and dandelion flowers), fungi, carrion, insects and other arthropods, snails, and baby birds (Cogger 2000, Ehmann 1992, Torr 1999). As most live food is too fast for them 95% of their diet is herbivorous (Torr 1999). Shingleback Lizards can eat up to 30% of their body weight in one day (Watharow 2003).

3.5 Longevity

3.5.1 In the Wild

In one study in South Australia it was found that only 16% of young reach their first birthday. The annual survival rate for adults was found to be 80 – 90%. This gives an average age in the wild of 9 to 10 years. A maximum age of 15 years has been recorded (Torr 1999, Walls 1996).

Shingleback Lizard predators include Wedge-tailed Eagles, Brown Falcons, large Goannas, large venomous snakes, Black-headed Pythons as well as introduced cats, dogs

and foxes. Additionally, in modern times, road traffic, lawn mowers and snail baits add to mortality (Hitz et al 2004, Shea 1998, Torr 1999).

3.5.2 In Captivity

Shingleback Lizards have an average life span is 12 to 15 years with a maximum of up to 35 years (Green 2001, Torr 1999, Walls 1996).

3.5.3 Techniques Used to Determine Age in Adults

There is no method available to age Shingleback Lizards. Like other reptiles they grow at a rate that varies with the amount of food they are provided with, the temperature they are kept at and their size (larger animals grow more slowly than smaller animals) so size cannot be used to age them (Shea pers. comm.).

4 Housing Requirements

Housing is the single most important aspect of reptile captive management and the appropriate effort should be made (Houston pers. comm.). Shingleback Lizards do not adapt well to humid conditions, such as the conditions that occur on the east coast of Australia. In these conditions they will die, usually from a respiratory disorder or septicemia associated with skin infections, often secondary to sloughing problems, unless appropriate housing is arranged. The enclosure should have a relative humidity of less than 40% (Bellamy pers. comm., Houston pers. comm.).

The micro climate of indoor and outdoor enclosures can be controlled. The enclosure can be designed to reduce relative humidity. Considerations need to be made with surface area of water bowl, ventilation, no fleshy live plants and the use of dry absorbent substrate (Green 2001, Houston pers. comm., pers. obs.).

East of the Great Dividing Range Shingleback Lizards should be kept indoors due to high relative humidity although they may be kept outdoors during dry periods (Houston pers. comm.).

Shingle back Lizards have a high UV requirement. This can be supplied by giving the lizards UV light 3 times per week for 4 hours (refer figure 4.1) or by giving them access to sunlight (Houston pers. comm.).

During the active months they should have a light cycle of 14 light : 10 dark, with temperatures from 24 to 34⁰C.

During torpor they should have a light cycle of 10 light : 14 dark, with temperatures from 9 to 17⁰C.



- Ideal for all desert dwelling reptiles
- Ultra High UVB output
- Effective up to 50 cm (20")
- Provides necessary UVB rays for optimal calcium metabolism
- Recommended for use with screened terrariums; terrariums with dense screen covers (screens can filter out UVB rays)
- Recommended in combination with Repti Glo 2.0 for a higher visual light output

The Exo Terra Repti Glo 10.0 has a very high UVB output similar to that associated with desert environments. Desert locations receive more direct sunlight than any other because of fewer clouds, less air humidity and no plants or trees to provide shade. Therefore desert reptiles are more exposed to UV radiation than any other type of reptile. This bulb can also be used on screened terrariums or terrariums with dense screen covers to ensure UVB penetration. Dense screens can filter out up to 50% of the UVB rays.

The most important feature of a fluorescent bulb is the ability to emit sufficient UVB light (ultraviolet B), a component of sunlight, whereas an incandescent lamp only emits very little amounts of UVA light. It is impossible to accommodate a high visible light emission with a high ultraviolet (UV) output. The more visible light emitted, the less UV-radiation and vice versa.

Other factors to consider: not all reptiles or terrarium animals need the same amount of UVB-radiation: nocturnal versus daylight activity, geographical and climatological conditions (ex: rainforests versus deserts). The distance from the bulb to the animal is equally important.

Exo Terra's fluorescent bulbs are classified according to their percentage of UVB output. For tropical and sub-tropical reptiles, 5% bulbs (Repti Glo 5.0) are perfectly adequate, provided they are correctly sited, changed regularly, and the number of hours of exposure is sufficient. 10-12 hours daily has proven a satisfactory exposure level for most species. Animals living in deserts, which are areas with high UVB levels, should be exposed to 10% UVB bulbs (Repti Glo 10.0). We also recommend the Repti Glo 10.0 when the distance from the bulb to the animal exceeds 30 cm (12") or when the bulbs are placed above a dense ventilation screen. The Repti Glo 2.0 emits very little UVB light (2%), in most cases not sufficient for vitamin D3 synthesis. The higher the UV output, the less visual light is emitted. The light also gets a bluer appearance.

It is recommended to combine a high UVB output (Repti Glo 5.0 and 10.0) with a very high visual light output (Repti Glo 2.0) for optimal results. Fluorescent bulbs do not provide sufficient heat. A separate heat source is required in addition (ex: incandescent basking lamp).

Figure 4.1 Repti Glo UV Compact Bulb (Exo Terra 2007)

4.1 Exhibit/Enclosure Design

Enclosures can be designed for either indoors or outdoors (refer figures 4.2, 4.3, 4.4 & 4.5). Terrariums made from glass and sealed timber are often used indoors whilst outdoor enclosure materials may consist of tin, cement, brick, wire mesh, and wire netting.

Adequate drainage must be provided for outdoor enclosures (DPI 2004). Agricultural pipe and/or materials such as crushed sandstone can provide very good drainage.

Outdoor enclosures are encouraged for species from a climatic region similar to that of the exhibit location, thus providing a natural regime of climatic and seasonal conditions (DPI 2004).

Security should be considered when designing an enclosure. Make sure that the enclosure is escape proof to keep the lizards in. People, vermin (rats, mice, cockroaches, birds etc.) and predators (dogs, cats, foxes, birds etc.) should be kept out. The enclosure should be lockable. The walls of outdoor enclosures must be constructed of smooth non-climbable barriers and must continue into the ground not less than 50cm and shrubs must be placed away from the enclosure walls to prevent escape. Enclosures must be constructed so as to prevent unsupervised touching of the animals contained within (DPI 2004, Titmuss 2005).

With regard to temperature and light cycle natural daily variations should be provided for indoor housing. Seasonal variations may be provided (Shea pers. comm.). The light cycle can be controlled by a timer and the photoperiod should run in tandem with the temperature (Green 2001). Ventilation should be adequate so as to reduce humidity and consequently pathogens, appropriate ventilation may incur additional heat loss and you need to be aware of this when providing heat for the animals. UV light, either natural or artificial must be provided (for absorption and synthesis of certain vitamins and minerals) (DPI 2004).

Shingleback Lizards brumate in the cooler months and their enclosure must be kept dry and out of draughts. Allow regular checks and keep handling to a minimum (DPI 2004).

Cage walls, floor and fittings must be made of impervious materials that can be effectively cleaned and disinfected. Have all doors and lids fitted with latches, hooks or clasps (DPI 2004). In outdoor enclosures protection from predators should be incorporated into the design (Green 2001).



Figure 4.2 Indoor exhibit at Wildlife World (Titmuss 2007)



Figure 4.3 Indoor exhibit at Featherdale Wildlife Park (Titmuss 2007)



Figure 4.4 Indoor exhibit Education Centre Taronga Park Zoo (Scannell 2007)



Figure 4.5 Outdoor enclosure (Green 2001)

4.2 Holding Area Design

Holding areas can be used for quarantine and isolation, they are temporary arrangements. The enclosure must be large enough to at least allow the lizards to lay fully stretched out and to turn around. As with other housing create a thermal gradient in holding cages. Holding cage should be fitted with a thermometer to monitor the temperature range. If the lizards are being held under the EAPA, holding cages are temporary and do not have to meet EAPA exhibit standards if the lizards are to be held for less than 3 months (refer figure 4.6) (DPI 2004).



Figure 4.6 olding cages Wildlife World (Titmuss 2007)

4.3 Spatial Requirements

In the wild, Shingleback Lizards occupy areas with a mean size ranging from 18m² to 2075m² (Heatwole & Taylor 1987). Ranges of up to 4000m² have been recorded (Hitz et al 2004). The size of the range is dependant on food and refuge availability (Shea pers. comm.).

In captivity the minimum floor area required for one or two specimen is 2.5L x 2.5L (L = total length of longest specimen). A maximum TL of 443mm has been recorded which means that the enclosure should have a minimum floor area of 1227cm². The minimum floor space allowable for any enclosure must be increased in area by 20% (245cm²) for each additional specimen (DPI 2004, Hitz et al 2004).

The minimum height is the larger of either 2 x head body length (SVL) or 40cm. A maximum SVL of 341mm has been recorded which means that enclosures should have a minimum height of 682mm (DPI 2004, Hitz et al 2004).

If the enclosure is built with the potentially largest size of the lizards in mind animals will not need to be moved to larger enclosures as they grow.

4.4 Position of Enclosures

Reptiles should not be kept in areas excessive noise or vibration, or which are subject to excessive temperature fluctuations (DPI 2004). Outdoor enclosures must be North North/East facing to provide morning sun and heat all year round (DPI 2004).

4.5 Weather Protection

Outdoor enclosures must provide adequate shade at all times of the day and provide areas that are permanently covered and dry (DPI 2004). This can be achieved by using hide boxes, vegetation and partial enclosure cover (pers. obs.).

4.6 Temperature Requirements

The Shingleback lizards preferred body temperature (PBT) is 33⁰C, and critical thermal temperature is around 45⁰C (Watharow 2003). A thermal gradient must be provided (24 to 34⁰C). This can be achieved by putting the heat source to one end of the enclosure in indoor enclosures. Outdoor enclosures must be sunny but a shaded area must also be provided.

Methods of heating include the use of hot rocks, heat mats and basking lights. At night, blue or red globes may be used for heating (Green 2001, Watharow 2003). Over heating

the enclosure may become an issue. Enclosures can be cooled down with extra ventilation, an exhaust fan or an air conditioned room (Green 2001). Panting as a means of temperature regulation has been recorded in Shingle back Lizards (Heatwole & Taylor 1987).

In outdoor enclosures plants can be used to filter sunlight and provide dappled sun. Outdoor enclosures provide natural daily and seasonal variations. These can be artificially provided for indoor enclosures. The temperature should be monitored using a min/max thermometer to ensure that temperature extremes are avoided (DPI 2004). Slate or tiles placed under the heat source are good for conducting absorption and radiation of heat (Watharow 2003).

4.7 *Substrate*

Substrates that are often used include gravel, sand, peat, bark, leaf litter, newspaper and recycled paper pellets. Ideally a good substrate will reduce humidity (DPI 2004, Watharow 2003). Choose a substrate that is easily kept dry, reduces odour and clumps faeces so that it can be easily removed.

4.8 *Nestboxes and/or Bedding Material*

In the wild Shingleback Lizards shelter beneath bushes, procumbent vegetation, grass tussocks, fallen timber, leaf litter and bark, in hollow logs, rabbit (or other animal) burrows and a variety of man made materials such as corrugated iron and railway sleepers (Ehmann 1992, Hitz et al 2004).

4.9 *Enclosure Furnishings*

Include furnishings that encourage their natural behaviour. A basking site should be provided (DPI 2004). Multiple basking sites are required in group situations (Shea pers. comm.). At least one visual barrier must be provided, such as crevices, hollow logs, dry vegetation or shelter box (DPI 2004).

Whilst endeavoring to create a natural environment remember not to overcrowd the enclosure with furnishings (DPI 2004). Some suggestions for consideration are a stable and secure rock under heat source to radiate heat at night (help in sloughing), branches to climb over, insulated hide boxes, leaf litter (Green 2001, Watharow 2003).

In keeping with their natural habitat plants (such as clumps of native grass) are an excellent source of shade and refuge. Take care to avoid plants that will increase humidity or plants that are toxic (Green 2001).

5 General Husbandry

5.1 Hygiene and Cleaning

During the lizards active time of the year regular cleaning is required:

- Faecal, urine wastes and uneaten food must be removed daily (spot checking).
- The substrate should be replaced weekly. It is a good idea to leave a small amount of faeces each time the cage is cleaned, as the pheromones released mark the cage with the animal's own scent.
- When the substrate is changed the caging should be cleaned with a veterinary grade disinfectant such as F10SC (refer figure 5.1).
- Hard surfaces of enclosures and hide boxes must be cleaned with the same disinfectant fortnightly to prevent the accumulation of faecal matter and urine.
- Food and water bowls must be cleaned and disinfected after every use.
- Wash hands thoroughly or use a skin sanitizing gel such as Repti-hand between animals and after handling animals to prevent the spread of disease (refer figure 5.2).



- F10SC is a total spectrum disinfectant that, unlike other strong disinfectants on the market, has no adverse side effects on people, animals, or on equipment and surfaces. It is ecologically friendly and biodegradable, and carries a wide range of registrations and approvals from around the world. In Australia, F10SC is registered by the APVMA for use in animal production and housing facilities, approved by AQIS for use in food export processing as a non-rinse disinfectant, and is also listed by the TGA as a Hospital Grade Disinfectant. The benefits of using F10SC include:

- Kills all types of pathogen – F10SC is bactericidal, virucidal, fungicidal, sporicidal
- Minimal chance of microbial resistance due to F10SC's unique benzalkonium chloride and polyhexamethylene biguanide combination of actives and mode of action
- *Rapid kill times – less than 30 secs for gram positive bacteria, 60 secs for gram negative bacteria, Canine Parvovirus 20 mins
- Successfully tested against avian influenza (bird flu) viruses at a concentration of 1:500 in 10 mins
- Non-corrosive, non-toxic, non-tainting, non-irritating, aldehyde-free
- Highly cost effective
- Biodegradable & ecologically friendly
- *Tried, tested, independently verified and documented, and approved around the world

Figure 5.1 F10SC (Chemical essentials 2007)

STOP DISEASE SPREADING
Protect yourself from
Germ and Bacteria with

Repti-Hand

Repti-Hand is designed for just that purpose. It is important that you and your staff use the product. But it is also important that you pass on the same safety information to your customers and sell Repti-Hand with every reptile sold.

Repti-Hand not only protects people from animal diseases, it also has the critical function of protecting the pets from human diseases and from the disease spread by their human handlers. The use of Aristopet Repti-Hand in the shop protects both people and pets and shows you really care about your staff, customers and pets.

Repti-Hand is an instant skin sanitizing and cleaning gel, which kills up to 99.9% of germs and bacteria on contact, including salmonella. Repti-Hand is also pH balanced to be gentle on your hands.

DIRECTIONS: Simply squeeze a small amount of Repti-Hand directly onto hands and spread evenly over hands or skin surface to be sanitised in a washing motion. Do not use on broken skin. Discontinue use if irritation occurs.

Available in:
RE22 250mL
RE23 1L

FOR USE WHEN HANDLING ALL ANIMALS

- DOGS
- CATS
- REPTILES
- SMALL ANIMALS



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Figure 5.2 Repti-hand (Aristopet 2007)

5.2 Record Keeping

Records should be kept in a book, such as a diary or account book. Records should be maintained for each animal providing at least the following information:

- Animal identification.
- Species, sex, mating behaviour, acquisition and disposal of animals.
- Feeding date as well as quantities and type of food both offered and eaten.
- The dates of acquisition and disposal, with details of circumstances and addresses.
- The date or estimated date of birth.
- Breeding and details of any offspring.
- The date of occurrence of skin shedding and any problems encountered.
- Clinical data, including results of any physical examinations by a qualified veterinarian and details of, and date when, any form of treatment was given.
- Opportunistic measurements of body weight and snout vent length (SVL).
- The date of death and results of necropsy (where performed).
- Movements between or within institutions.

(DPI 2004, Titmuss 2005)

5.3 Methods of Identification

Cages should be labeled with a written cage card or use of a computerized bar code system identifying each animal. The usual method of identifying individuals is the recording of individual markings and characteristics by description or photograph. Less commonly, notching or counting ventral scales may also be used (Shea pers. comm.).

5.4 Routine Data Collection

Lizard lengths (SVL and TL) and weights should be monitored and recorded (refer figure 2.3).

6 Feeding Requirements

The Shingleback Lizards feeding requirements change with temperature. Below 20 – 22°C brumation begins, the thyroid gland, being the central controlling gland for the metabolism, reduces its activity, thus the reptiles digestive tract becomes inactive. Blood flow is reduced from organs no longer being used extensively. During this time the exterior morphology remains significantly unaffected. Internally the size and position of the organs is changed, this is known as high plasticity. The simple sac-like lungs of *Tiliqua* lizards are able to vary their volume to allow other organs to expand (refer figure 6.1) (Hitz et al 2004).

6.1 Captive Diet

Shingleback Lizards are omnivorous. They are diurnal and should be fed during the day (Walls 1996). Wild Shingleback Lizards spend an average of 12 minutes per day ingesting food (Hitz et al 2004). To ensure animals are feeding suitably, records must be maintained. Offer an appropriate variety of wholesome foods in sufficient quantities to ensure normal growth and good health and help prevent deficiency based diseases (Hitz et al 2004). The feeding regime must be designed with a view to avoid obesity. Handling of reptiles soon after feeding should be avoided to prevent discomfort for the animal and maldigestion (DPI 2004).

The following is a suggestion of foods which may be included in the healthy diet of Shingleback Lizards:

Fruit and vegetables: Alfalfa, apple, banana, broccoli, cabbage, carrot, cauliflower, celery tops, chicory, corn, daffodils, figs, grapes, kiwi fruit, melon, peaches, pears, peas, pumpkin, spinach, squash, strawberries, sweet potato, tomato and zucchini. These foods can be supplemented with collected vegetables such as Carnations, Dandelions (flowers and leaves), Evening Primrose, Native Hibiscus flowers and Rose petals (Green 2001, Hitz et al 2004, Walls 1996, Watharow 2003, pers. obs.).

Animal protein: Dog or cat food (canned, non fish variety), earthworms, eggs (raw or cooked, with the shells crushed), mealworms, mice, slugs and snails (Green 2001, Hitz et al 2004, Walls 1996, Watharow 2003).

If snails or slugs are given they must be collected from an area without baits or poisonous plants (Weigel 1988) or kept for a few days before feeding out (Houston pers. comm.).

Food should be cut into pieces that the lizards are able to swallow; don't cut the food too small as this increases the surface area to volume ratio and the food will dry out faster (Phipps pers. comm.).

As fruit is generally very high in sugar the diet should consist of more vegetables and less fruit (Houston pers. comm.). A sample diet, from Wildlife World, shows a healthy variety (refer figure 6.2).

Individual lizards have definite likes and dislikes (Walls 1996, pers. obs.).

The adult diet should consist of 90% vegetable matter. Juveniles can be fed 80% vegetable matter and 20% lean meat (Hitz et al 2004, Houston pers. comm.).

Shingleback Lizards do not need water ad lib. They can be offered water every one to two weeks (Weigel 1988). Offer only fresh, clean drinking water (DPI 2004).

After feeding do not let the environmental temperature drop below 12⁰C. The lizard's body temperature should not drop below 22⁰C. If this occurs the food will rot rather than digest properly (Green 2001). Shingleback Lizards should not be fed during brumation.

Adults can be fed every three to five days and juveniles every two to three days although it is better to feed small meals more often (Houston pers. comm., Watharow 2003).

Shingleback Lizards will generally eat from October to April. The cost of feeding one or two lizards is about \$5 per week. This equates to \$160 per year.

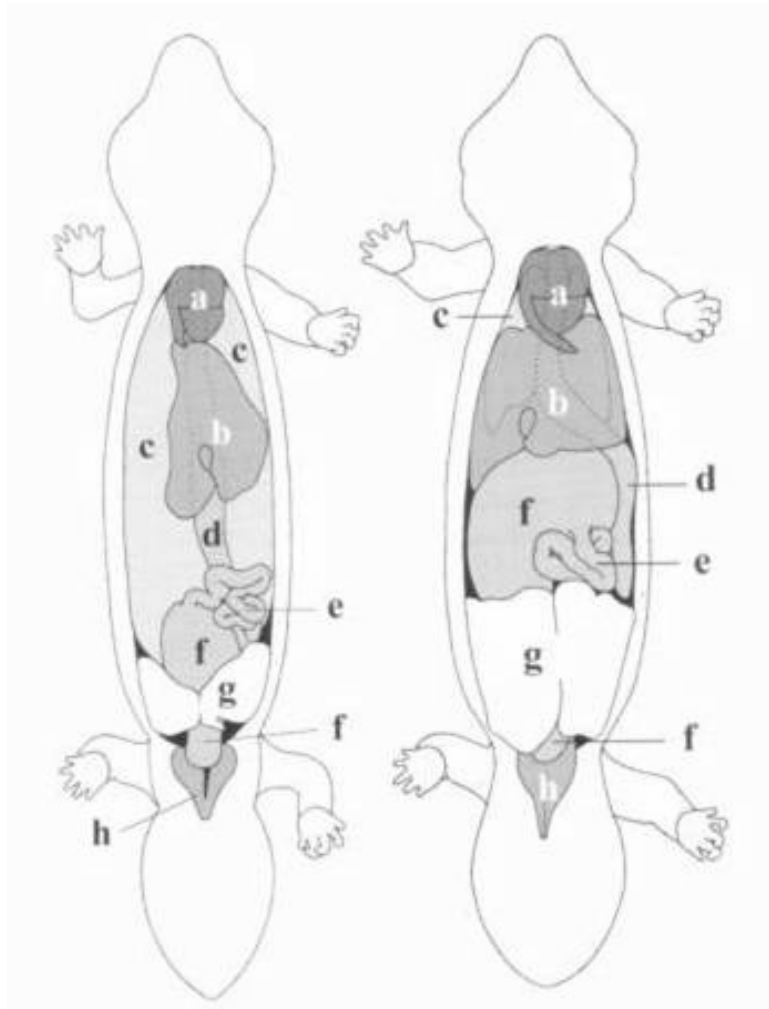


Figure 6.1 Example of the organ topography of *T. rugosa* ventral view

A in a specimen with an inactive intestinal tract, small liver and small fat bodies.
Condition of this lizard is relatively poor

B in a specimen with an active intestinal tract, large liver and well developed fat bodies.
Condition of this lizard is relatively good

The position of the esophagus, situated behind the liver and heart is indicated by a dotted line (Hitz et al 2004)

- | | |
|-------------|--------------|
| a – heart | e - midgut |
| b – liver | f - hindgut |
| c – lung | g – fat body |
| d – stomach | h – kidneys |

MONDAY:

- * 1 bunch Kale or Red cabbage
 - * 1 bunch Escarole or Endive
 - * 1 bunch Parsley
 - * 400g Carrot (grated)
 - * 400g Rockmelon
 - * 400g Beans
 - * 400g Tomato
 - * 400g Apple
 - * 1 punnet Mung sprouts
 - * 1 punnet Alfalfa sprouts
- Sprinkle with Repcal and Herpvite supplements every Monday

WEDNESDAY:

- * 1 bunch Kale
- * 1 bunch Escarole or endive
- * 1 bunch Parsley
- * 400g Sweet Potato
- * 400g Tomato
- * 300g Pawpaw
- * 400g Peas
- * ½ bunch Spinach
- * 1 punnet Mung sprouts
- * 1 punnet Alfalfa sprouts
- * 1 x 2kg bag frozen corn kernels

FRIDAY:

- * 1 bunch Kale or Red cabbage
- * 1 bunch Escarole or equivalent Bok Choy or Choy Sum
- * 1 bunch Parsley
- * 400g Carrot (grated)
- * 400g Apple
- * 400g Beans
- * 400g Broccoli
- * 400g Grapes or Kiwi fruit
- * 600g Pawpaw
- * 1 punnet Mung sprouts
- * 1 punnet Alfalfa sprout

This quantity makes HEAPS (the zoo's whole collection) so you will need to cut down on quantity. However it all needs to be finely chopped, mixed through and ends up looking like more greens with colour than anything else.

For the omnivorous species, (Blue tongue etc) a small amount of Whiskas Jellymeat is added to lightly coat the mix. This alternates with soaked Eucanuba cubes mixed through it.

Figure 6.2 Lizard diet used at Wildlife World (Mostyn 2006)

6.2 Supplements

If a balanced diet is given, supplements are not necessary for adults. As an assurance, however, food can be vitamin and calcium phosphate enriched, monthly. Juveniles need their diet supplemented with vitamins and calcium (Walls 1996, Watharow 2003). Care must be taken to avoid vitamin/mineral overdosing and to ensure correct dietary calcium : phosphorus ratios (DPI 2004). Commercially prepared mineral supplements, such as Repti-cal (refer figure 6.3) and multi vitamins designed for reptiles, such as Repti-vite (refer figure 6.4) can be sprinkled over food. Following the product directions will ensure adequate nutrition without overdose.

6.3 Presentation of Food

Shingleback Lizards should be fed in bowls. Several feeding stations spread throughout the enclosure should be provided where reptiles are kept in groups to prevent intragroup aggression occurring. Always make a point of observing specific animal behaviours, particularly during feeding to ensure that undue dominance is avoided. Only offer food when the animals are maintained at the temperature required to digest the food (DPI 2004).

Food presentation can be used as a form of environmental enrichment. Use diet variation, an opportunistic rather than regular feeding schedule, hide food and create food scent trails (pers. obs.).

REPTI-CAL

Natural Phosphorus Free, Calcium & Vitamin D3 Supplement
FOR ALL REPTILES & AMPHIBIANS

Calcium deficiency is a major dietary problem with captive reptiles and amphibians. Maintaining a correct calcium:phosphorous (Ca:P) ratio in the diet of 1:1 to 1.5:1 is equally important nutritionally as adequate calcium intake. Commonly used food sources such as Crickets, Meal Worms and Mice contain high levels of Phosphorous and low levels of calcium.

ReptiCal assists in balancing the Ca:P ratio by providing a natural phosphorous free calcium source together with vitamin D3 to assist in absorption from the intestinal tract.

ReptiCal is manufactured from natural oyster shell ground to a ultrafine powder with added vitamin D3.

Active Constituents:

350mg/g Calcium (as Calcium Carbonate)

70iu/g Cholecalciferol (Vitamin D3)

Directions For Use:

Mix with vegetables, fruits and pastes at approximately 1/2 Tablespoon (9g) per 500g of food. Before feeding insects: Place Repti-Cal in a plastic bag, add insects and shake slowly until insects are completely coated.

Storage:

Store below 30°C (Room Temperature) in a cool dry place.

NOTE: Product settles in container after manufacture.

RE04 220g



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Figure 6.3 Repti-cal (Aristopet 2007)

REPTI-VITE

Concentrated Multi-Vitamin, Mineral, Amino Acid Supplement
FOR ALL REPTILES & AMPHIBIANS

Directions for Use:

Mix with vegetables, fruits and pastes at approximately
1 level teaspoon of Repti-Vite (4g) per 500g of food.

Before feeding insects:

Place Repti-Vite in a plastic bag, add insects and shake
slowly until insects are completely coated.

Storage:

Store below 30°C (Room Temperature) in a cool
place, protect from light. Keep container tightly closed.

Disposal:

Clean empty container can be recycled.

Each 1kg Contains:	
Vitamin A	200,000iu
Cholecalciferol (Vit D3)	20,000iu
Calciferol (Vitamin D)	1,000iu
Ascorbic Acid (Vit C)	4,000mg
Folic Acid	40mg
Thiamine Hydrochloride (Vit B1)	200mg
Riboflavin (Vit B2)	400mg
Nicotinic Hydrochloride (Vit B3)	200mg
Pantoic Acid (Vit B5)	1,000mg
Calcium Hydroxide (Vit B6)	200mg
Cyanocobalamin (Vit B12)	2mg
Biotin (Vit H)	2mg
Inositol (Vit B7)	400mg
Choline Bitartrate	4,000mg
Alanine	2g
Arginine	0.75g
Aspartic Acid	2.1g
Cysteine	2.1g
Glutamic Acid	2.1g
Glycine	2.1g
Histidine	2.1g
Isoleucine	2.1g
Leucine	2.1g
Lysine	2.1g
Methionine	2.1g
Phenylalanine	2.1g
Proline	2.1g
Serine	2.1g
Threonine	2.1g
Tryptophan	2.1g
Valine	2.1g
Zinc (as Zinc Oxide)	400mg
Magnesium (as Magnesium Oxide)	1,000mg
Iron (as Ferrous Sulphate)	2.1g
Potassium (as Potassium Chloride)	4.1g
Sodium Chloride	3.1g
Calcium Calcium Carbonate and Calcium	1.50g
Monophosphoric Hydrogen Phosphate	40g

RE02 200g



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Figure 6.4 Repti-vite (Aristopet 2007)

7 Handling and Transport

It is recommended that all reptiles are transported in crush-resistant containers. Within the box the animal may also be contained via the use of a cotton or calico bag. Transport containers must provide suitable barriers between animals where there is a risk of an animal injuring another. Reptiles must be transported under conditions which protect them from extremes of temperature. Transport containers must not be placed in direct sunlight, water or draughts. Reptiles must not be transported unless they have been maintained for a sufficient time prior to departure at a temperature that will ensure complete digestion of any ingested food. Reptiles must not be fed during transport. Reptiles must have direct access to water prior to transport to prevent dehydration. This may involve placing the animals in shallow tepid water for an appropriate time prior to departure. This is particularly important for juveniles. Enclose the reptile within a strong, durable, porous linen bag that should, in turn, be enclosed by a sufficiently ventilated, escape proof, rigid container. Any empty space must be padded to prevent excessive movement within the container. Attach labels that ensure the box is handled and transported appropriately. Write the name and address of the consignee and consignor on a label fixed to the container. Place a copy of the consignment note inside the container. Do not place specimens of different species, or specimens of greatly differing size of the same species within the same bag for transportation (DPI 2004).

7.1 Timing of Capture and Handling

Shingleback Lizards can be captured at any time of the day. It is always best to avoid restraining in the hottest part of the day (Phipps pers. comm.).

7.2 Catching Bags

Shingleback Lizards can be picked up and placed in a cotton bag with the top closed with an elastic band. The hem should be on the outside of the bag (the bag may need to be turned inside out) to stop the toes from becoming tangled in the hem of the bag. Before use, the bag should be checked for holes or loose stitching (Houston pers. comm.).

7.3 Capture and Restraint Techniques

Shingleback Lizards are usually quiet and are easily handled. They should be handled gently and confidently. Do not hesitate when handling. They are most comfortable when the front and back legs are supported and the lizard is horizontal (refer figure 7.1) (Green 2001, pers. obs.).

If a restraint is required the lizard can be held by pressing the legs against the body (refer figure 7.2) (Green 2001, pers. obs.).



Figure 7.1 Handling a tame Shingleback Lizard (Mostyn 2007)



Figure 7.2 Restraining a Shingle back Lizard (Mostyn 2007)

7.4 Weighing and Examination

The lizard can be weighed in a bag on hanging scales and can be restrained for examination. In the interest of monitoring animal health, record weights (DPI 2004).

7.5 Release

The lizard can be released in the enclosure near refugia.

7.6 Transport Requirements

‘The Live Animal Regulations (LAR) is applicable to IATA members and to airlines that are parties to the IATA Multilateral Interline Traffic Agreement for Cargo. All persons who ship, accept or load animals must be familiar with the specific handling requirements for the individual species to ensure that the animals always travel in safe, healthy and humane conditions’ (IATA 2000).

The animals must be examined prior to shipment and be healthy enough to travel. This means that they must be free of any apparent injury and readily recognizable disease, and that they are also free of ectoparasitic infestations. Mixing of different species is not permitted in a single inner container (IATA 2000).

Take care to avoid extreme cold (<7C) or heat (>29C). The preferred temperature range is 15-25C. Heat packs may be used (providing that they do not contain substances classified as dangerous goods) but must not come into direct contact with the animal. Insulation such as bubble wrap or foam rubber can be used. Cold packs should not be used (Shea pers. comm.). The location of containers during transport needs to be free of drafts, out of direct sunlight and should be sheltered as much as possible from physical vibration and noise.

Correctly label and mark the container with the consignee’s name, address and telephone number. The label must also contain the shipper’s name, address and telephone number and the scientific name and number of animals in the primary container must be recorded on the outside of the primary and secondary containers. Labels must not block ventilation holes. The container must have “LIVE ANIMAL - REPTILE” and “THIS WAY UP” labels affixed to all four sides, minimum dimensions for label: 10 X 15 cm, for lettering 2.5 cm high (IATA 2000).

7.6.1 Box Design

The International Air Traffic Authority has provided standards for transporting animals by air. Shingleback Lizards require IATA standard box number 41 (refer figures 7.3, 7.4, 7.5 & 7.6) (IATA 2000).

The transport box should be designed with a primary (outer) and secondary (inner) container. There should be adequate ventilation in box containers and the containers must be constructed of materials strong enough to avoid incidental damage by freight. They must be made of non toxic materials.

Transportation containers need to be made so as the animals are protected from unauthorized access and secure from accidental opening (from outside or inside). At the same time to comply with CITES regulations the containers must be able to be opened and closed readily for inspection. Containers must have smooth or rounded inside surfaces with no sharp projections. They need to be clean and leak proof. Reusable containers must be cleaned and disinfected after each use. To keep the animals comfortable and reduce risk of disease, absorbent bedding must be provided. Ideally the outer transport container will have handles to facilitate handling and prevent ventilation becoming blocked. Spacer bars on bottom of the outer box will help avoid contact with hot/cold/wet floors. A clearance of at least 3cm between inner and outer containers will allow air flow and avoid stacking in.

If the primary enclosure is constructed of wood it must be at least 0.6mm thick (fiberboard or reinforced corrugated cardboard may be used). Polystyrene boxes may be used as the inner box. If polystyrene boxes are used inside cardboard boxes the thickness of the polystyrene must be at least 2cm. The inner container may also be a simple 'breathable' bag of natural materials (e.g hessian, cotton). Metal must not be used in the construction of the inner or outer container. Any partitions in multi boxes must be securely attached. Meshed openings on the outer container will provide adequate and safe ventilation (securely attached on the inside) (IATA 2000).

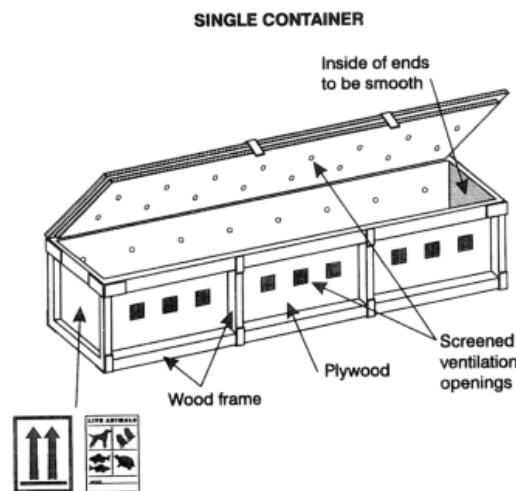


Figure 7.3 Example of a single transport container for IATA container requirement 41 (IATA 2000)

Figure 7.4 Example of a multiple transport container for IATA container requirement 41 (IATA 2000)

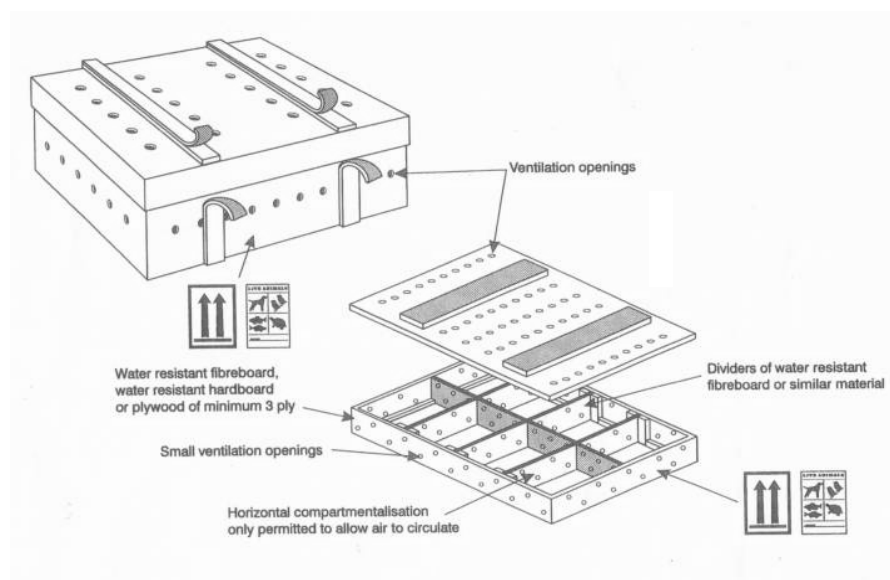


Figure 7.5 Example of a multiple transport container for IATA container requirement 41 (IATA 2000)

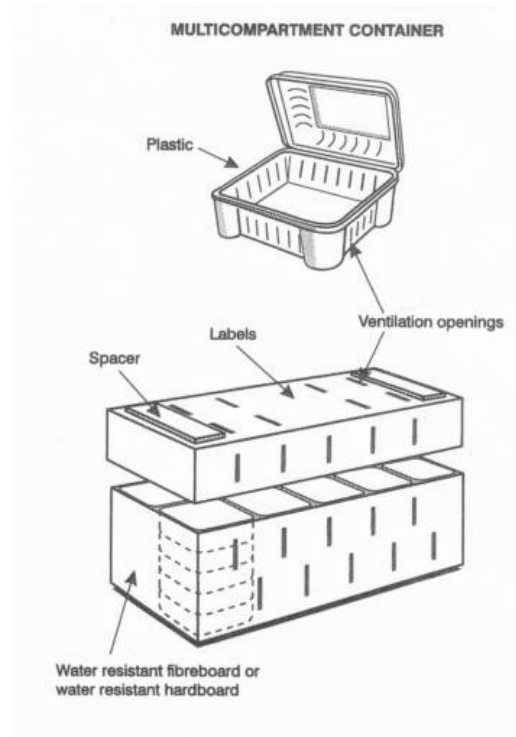


Figure 7.6 Example of a multiple transport container for IATA container requirement 41 (IATA 2000)

7.6.2 Furnishings

Shingleback Lizards do not require any furnishings during transportation.

7.6.3 Water and Food

Shingleback Lizards do not require food or water during transportation (IATA 2000).

7.6.4 Animals per Box

Shingleback Lizards should be packed one per bag or inner container (refer figure 7.7 & table 7.1) (IATA 2000).

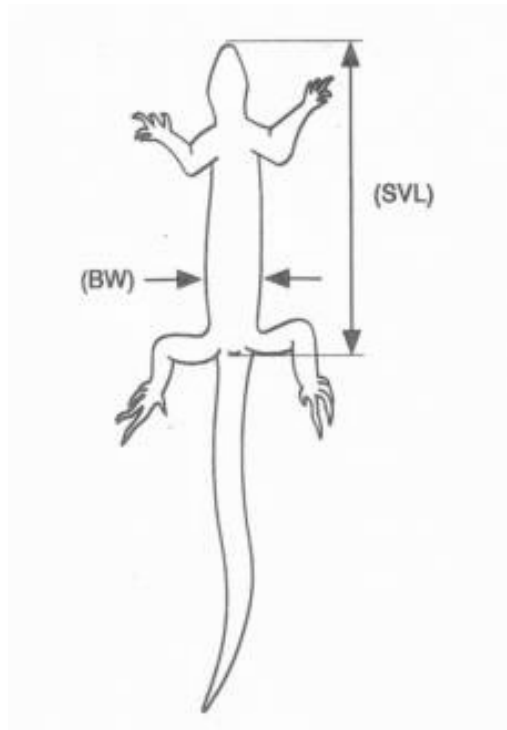


Figure 7.7 Lizards should be measured by SVL and BW (IATA 2000)

Snouth-vent-length (SVL)	Body-width (BW)	Maximum no. of animals per bag	Minimum bag size
≥ 20 cm (8 in)	≥ 5 cm (2 in)	1	Depending on the size of the animal
≥ 15 < 20 cm (6 < 8 in)	≥ 2.5 < 5 cm (1 < 2 in)	15	45 × 60 cm (18 × 24 in)
		10	30 × 45 cm (12 × 18 in)
≥ 10 < 15 cm (4 < 6 in)	< 2.5 cm (1 in)	30	45 × 60 cm (18 × 24 in)
		20	30 × 45 cm (12 × 18 in)
< 10 cm (4 in)	< 2.5 cm (1 in)	30	30 × 45 cm (12 × 18 in)

Table 7.1 Packing density for lizards (IATA 2000)

7.6.5 Timing of Transportation

Transporting of Shingleback Lizards during temperature extremes should be avoided.

7.6.6 Release from Box

The lizard can be released in the enclosure near refugia.

8 Health Requirements

8.1 Daily Health Checks

The condition of Shingleback Lizards is assessed by looking for fat deposits in the tail. Emaciated lizards will have protruding hips but bear in mind that there is considerable seasonal variation (refer Figure 6.1) (Hitz et al 2004).

During health examinations keep in mind that “abnormalities” may be due to something other than ill health (e.g. pregnancy, mating season, change in diet, change in environment, introduction of new animals) which may be temporary.

In order to effectively examine an animal, you need to know what is “normal” for the species and individual being kept. If things become “abnormal” this may be a sign of ill health or disease.

Distant Examination (DE):

This type of examination is done simply by looking at the animal. It should be done every time you see the animal. By making a conscious effort of it at first it will become automatic in no time.

Signs of ill health include:

- Abnormal smells
- Diarrhoea
- Haemorrhage
- Regurgitated food
- Lameness or stiffness
- Dehydration
- Swelling
- Deformities
- Injury or sores
- Discharges (oral, nasal, ocular, aural or cloacal)
- Change in behaviour
- Not eating or drinking
- Excessive eating or drinking
- Not sloughing properly (dysecdysis)
- Change in animal condition – weight loss / gain

* If you see anything abnormal in the distant examination, perform a physical examination.

(Titmuss 2005)

8.2 Detailed Physical Examination

8.2.1 Chemical Restraint

Sometimes it is necessary to chemically restrain animals for invasive procedures. Ketamine can be used to sedate or lightly anesthetise, at a dose rate of 30 to 40 mg/kg, delivered by intramuscular injection (IM) for moderately invasive procedures. Recovery from Ketamine may be prolonged. It can be supplemented with a gaseous anesthetic delivered through an endotracheal tube or induction chamber. Intubation is easy in lizards as the glottis is easily accessible at the base of the tongue. Small diameter tubes are required. A local anesthetic can be injected at the operating site for invasive or surgical procedures. Preferred gaseous anesthetics include halothane, at 3% during induction and 1 to 2% for maintenance and isoflurane, at 5% during induction and 1 to 2% for maintenance. Preferred local anesthetics include lignocaine (Barnard 1996, Partington & Ball 1999, Shea pers. comm., Vogelnest 1999).

Pre anaesthetic fasting for 48 hours is recommended (Vogelnest 1999).

Reptiles may hold breath while being put under anaesthesia. They can appear to be fully anaesthetised one second and the next be almost fully conscious. Recovery may take hours (Reiss 1999).

In the Shingleback Lizard anaesthetic depth is assessed by the evaluation of reflexes and muscle tone. The pinch withdrawal reflex of tail or foot, cloacal stimulation, palpebral reflex, corneal reflex and the loss of righting reflex are indicative of surgical plane. Heart rate can be observed by observing the lateral axillary area. Loss of motor function progresses cranially to caudally during induction and returns in the opposite direction during recovery (McCracken 1994, Reiss 1999).

Do not cool the lizard as a method of allowing easier handling (Reiss 1999).

Little is known about pain and pain perception in reptiles. However reptiles do have the anatomy and physiology for nociception. Pain can cause stress, lower immune function and delay healing. Pain may be difficult to detect in reptiles, inactivity may be the most common response to pain. The endogenous opioid system in reptiles is well developed and analgesia may be provided with opioids (Reiss 1999). Metacam (Meloxicem) at 0.04mL/kg may be used (Bellamy pers. comm.).

8.2.2 Physical Examination

It is important to monitor your animal's health regularly so that any sign of ill health can be picked up early and animals successfully treated and quarantined. The procedure for diagnosing ill health is as follows:

- Identify the animal
- Keep written records of animal's history
- Perform a distant examination
- Perform a physical examination
- Perform further clinical tests
- Making a provisional diagnosis
- Confirming a diagnosis

A diagnosis can only be made by a veterinarian.

This type of examination should be carried out periodically (e.g. once a month). It involves actually picking the animal up, and having a closer look and feeling and palpating for abnormalities.

A physical examination is hands on. Signs of ill health to look for during a physical examination include everything in a DE and some additional observations:

- Teeth abnormalities
- Examine eyes carefully
- Poor scale condition, look and feel for lumps, parasites, ulcers, blisters and foreign bodies
- Any abnormal odours coming from the animal
- Swollen joints
- Any areas of swelling, discolouration or discharge (sign of infection)
- Abnormal respiratory sounds
- Loss of weight

(Titmuss 2005)

Any information gathered on the health of animals needs to be recorded and must be maintained (Refer 5.2 Record Keeping) (DPI 2004).

On occasion it will be necessary to collect biological samples from animals. Faeces and urate samples can be collected in a specimen pot or faeces can be collected directly into a Fecalyzer (refer figure 8.2) and onto a slide for immediate wet preparation examination for motile protozoa (Bellamy pers. comm.).

The preferred collection site for blood is the ventral coccygeal vein (refer figure 8.1). Up to 0.9% of body weight of blood can be collected. The needle must be fine enough to accurately puncture the delicate coccygeal vein but also strong enough to penetrate the skin. A 25 gauge needle is suitable for blood collection. The needle must go under the scale, not through it. The site needs to be disinfected with Betadine pre and post venipuncture. A microhaematocrit tube can be used to collect very small amounts of blood for centrifugation. A syringe should be used to collect the blood. It can then be transferred to the appropriate container. To fill a tube up you should hold it horizontally and the blood will run up the tube by capillary action. Plain or anticoagulant Vacutainers

or collection pots may be used (colour coded), depending on the type of test required (refer table 8.1) (Bellamy pers. comm., Horan pers. comm.).

Means and ranges for haematological values for reptilian classes can be compared (refer table 8.2). Reference *T. scincoides* and *T. rugosa* haematology and chemistry values to compare haematology results (refer table 8.3).

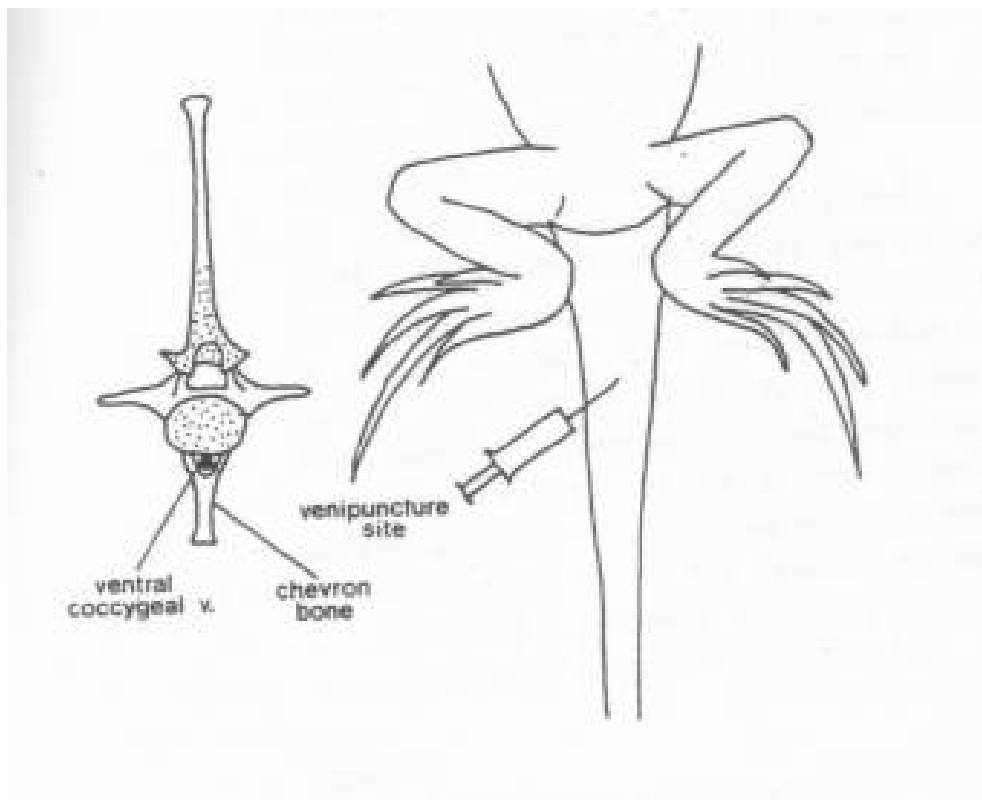


Figure 8.1 Venipuncture site for lizards (McCracken 1994)

Table 8.1 Vacutainer and universal tube colour codes, their anticoagulants and applications (Lane & Cooper 2003)

Vacutainers	Collecting pots	Anticoagulant	Type of sample	Application
Red	White	None	Clotted blood/serum	Biochemistry, serology
Green or green and orange	Orange	Heparin	Whole blood and plasma	Biochemistry, lead, electrolytes
Lavender	Pink	EDTA	Whole blood	Haematology
Grey	Yellow	Oxalate Fluoride	Whole blood	Glucose
Light blue		Sodium citrate	Whole blood and plasma	Coagulation tests
Dark blue	Brown	None (Serum gel)	Clotted blood/serum Serum	Trace elements Serology

Table 8.2 Means and ranges for haematological values for reptilian classes (McCracken 1994)

Value		Chelonians	Lizards	Snakes	Crocodilians
PCV	%	20 - 35	26 - 35	20 - 40	20 - 35
Hb	g/dL	5.0 - 11.0	6.0 - 11.0	6.5 - 11.0	7.0 - 9.0
Tpp	g/dL	4.0 - 6.5	4.0 - 7.0	3.5 - 6.5	5.0 - 6.5

Table extracted from Cooper et al. (1985)

Value		Chelonians	Lizards	Snakes	Crocodilians
Glucose	mmol/L	3.6	6.8	3.3	4.9 *
Uric acid	umol/L	184.1	267.3	237.6	178.2 *
Urea	mmol/L	19.3	1.0	1.5	-
Na	mmol/L	136.0	160.0	159.0	145.0 *
K	mmol/L	4.2	4.5	4.0	5.9 *
Ca	mmol/L	3.0	2.8	3.5	3.0 *
P	mmol/L	1.8	2.4 *	2.0	-

Table extracted from Frye (1981). All figures expressed are means of data collected from many species within each class, and are provided as a rough guide only.

Footnote

*Sample number too small to be considered statistically significant.

Table 8.3 Reference *T. scincoides* and *T. rugosa* haematology and chemistry values (McCracken 1994)

Values		Bluetongue Lizard (<i>Tilgna scincoides</i>) (n = 3)	Shingleback Lizard (<i>Tilgna rugosa</i>) (n = 6)
PCV	%	16 - 30	18 - 34
TPP	g/dL	4.6 - 10.0	4.3 - 5.6
RBC	$\times 10^{12}/L$	0.6 - 1.1	0.7 - 1.3
Hb	g/dL	4.6 - 12.4	5.2 - 8.7
Thrombocytes	$\times 10^9/L$	12.8 - 18.0	13.2 - 29.0
WBC	$\times 10^9/L$	2.1 - 6.6	1.8 - 5.5
Heterophils*	%	26 - 60	30 - 74
Eosinophils*	%	6 - 16	0 - 6
Basophils*	%	0 - 3	0 - 10
Lymphocytes	%	3 - 12	2 - 14
Monocytes/ Azurophils*	%	25 - 46	16 - 46
Unidentified	%	-	-

Footnotes

1. Ranges given are between observed max. and min. values

A necropsy can be performed as soon as possible post mortem. The necropsy is extremely useful for diagnosing the cause of an animal's death or illness and is often an endpoint in research.

- Be familiar with normal Shingleback Lizard anatomy (refer figure 6.1).
- Wear PPE.
- Examine external body and orifices, thoroughly. Examine the animal systematically beginning cranially and working toward the caudal end. Check for lumps or deformities, abnormal colouration, make note of and sample any external parasites. Parasites can be removed and preserved in formalin.
- The lizard should be placed on the dissection board in dorsal recumbency.
- With a scalpel, open body cavity with a cranial to caudal, midline, ventral incision and examine the organs in situ. Note abdominal size/colour/texture. Note size of fat bodies. Note any hemorrhage or fluid in cavity and possible site of origin.
- All organs may be removed, in their entirety, for further examination. All solid organs should be incised and examined. Check for colour, consistency and exudates. Organs may be measured and weighed. The lungs and heart should be opened and examined.
- Samples for culture, histopathology, and or other tests should be taken prior to opening the gut. Take small samples of organs, include any abnormalities.
- Incise the entire gastrointestinal system. Record stomach contents. Check for parasites within the cavities as well as the texture, colour and thickness of the wall of the gut. Samples can be taken for parasitology, culture, toxicology or histopathology.
- Any musculoskeletal abnormality should be incised and examined.
- The cranial cavity can be opened by removal of the skin over the skull, then the bones of the dorsal surface of the brain, or can be longitudinally sectioned with a fine scalpel to open the cranial cavity and both hemispheres can be removed for examination.
- For suspected viruses use sterile swabs to swab appropriate organs, including the oral cavity or trachea and place in media-containing cuvettes. For suspected bacteria swab abscesses or other places of possible infection, use media-containing cuvette, or preferably steak agar plates immediately. Keep all samples cool (not frozen). Samples should arrive at testing facility within 24 hours of collection.

- Place histology sections directly into 10% buffered formalin with 10 times as much formalin solution as tissue. Samples need to be fixed in solution for at least 24 hours prior to mounting and sectioning. Special fixatives are required for certain tests, check with the histology laboratory if requiring specific types of tests.
- A complete history and description of all observations from the gross pathological exam should be included with all specimens shipped to the testing laboratory. Inclusion of a differential diagnosis is helpful as often laboratories will be unfamiliar with Shingleback Lizard disease.

(Bellamy pers. comm., Titmuss D pers. comm.)

“Veterinary Pathology Diagnostic Services – The university of Sydney

The Veterinary Pathology Diagnostic Services (VPDS) unit provides a comprehensive laboratory service to the University Veterinary Centre at the Sydney campus. This service is also available to other parts of the University as well as outside veterinary practices and research organisations.

The VPDS is staffed by specialist veterinarians and multiskilled experienced technicians. The service encompasses clinical biochemistry, haematology, cytology, microbiology, necropsy and histopathology, and parasitology. Clinical biochemistry includes serum and other fluid biochemistry, urinalysis and faecal analysis. Haematology includes routine blood counts, bone marrow examination, cross matching and feline blood typing. Cytology includes fluid analysis from all sites and examination of fine needle cell aspirates. Microbiology includes bacteriological, mycological and virological testing.

The histological section of VPDS has expertise in processing a wide variety of normal and diseased tissues for routine and special staining. Parasitology includes detection of eggs, oocysts or larvae in faeces, blood or other biological fluids. Other tests are provided by VPDS which are available on request.

VPDS has particular expertise in investigating companion animal disease but also has a special interest in the investigation of health problems of laboratory animals. VPDS does provide a comprehensive and competitive service to private and government research organisations particularly in the area of histological investigation.

For further information on the lab contact

David Griffin

Laboratory Manager

Phone: +61 2 9351 3099

Fax: +61 2 9351 7421

Email: d.griffin@vetp.usyd.edu.au”

(The University of Sydney 2007)

8.3 Routine Treatments

With the exception of parasitic infections diseases should be diagnosed and treated by a veterinarian. Most intestinal parasitic infections can be diagnosed by collecting fresh fecal matter (refer fig 8.2) and performing a fecal float test (refer fig 8.3). However, if internal parasites are suspected it is often easier to treat the animals without testing. With all medications read the instruction provided.

A rule to work out amount of a medication required is:
 $\text{weight of animal (kg)} \times \text{dose rate} / \text{concentration of dose in solution}$ (Horan pers. comm., Phipps pers. comm.).

Endoparasites can be treated with a deworming product such as Panacur (Fenbendazole) at a dose rate of 50-100mg/kg orally or Ivomec (Ivermectin) at a dose rate of 0.2mg/kg SC injection or orally, with dose repeated in two weeks (always follow the directions on packaging). Ectoparasites can be treated with Ivermectin or Top of Descent spray topically with treatment repeated in one week, as per instructions (refer figure 8.4). With the treatment of parasites clean and disinfect housing, equipment and bowls and dispose of cage furnishing to help avoid reinfestation (Barnard 1996).

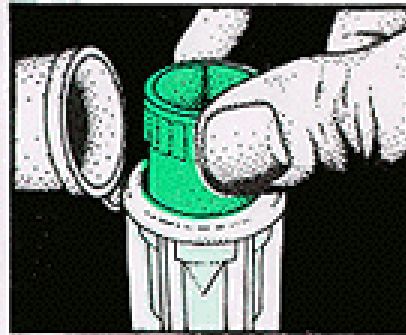
Wild animals can carry large loads of parasites that have no resistance at all to antiparasitic drugs and small doses are very effective on a huge range of parasites (Flesch pers. comm.).

Wounds can be cleaned with antiseptics such as Betadine. Antibiotic treatment such as Neomycin may be required (Partington and Ball 1999).

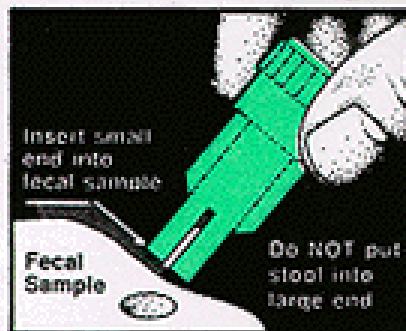
Euthanasia of sick or injured animals is sometimes necessary. Do not freeze reptiles as the formation of crystals cause pain and distress. Freezing also causes cells to rupture, making histological information for necropsy impossible. Barbiturates such as Lethobarb can be injected IV at a dose rate of 150mg/kg. IC or IP injection may be used but causes cell damage, making pathological interpretation impossible (Barnard 1996, Bellamy pers. comm., McCracken 1994). If you do not have the means of euthanasia contact a veterinarian.

Instructions

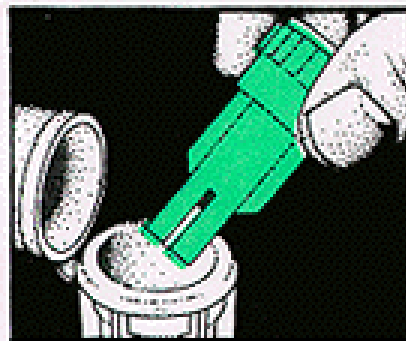
How to collect a stool sample with your Fecalyzer®



1. Lift cap and remove green insert.



2. Push small end of green insert into stool sample. (If stool sample is loose, scoop into small end of green insert.)



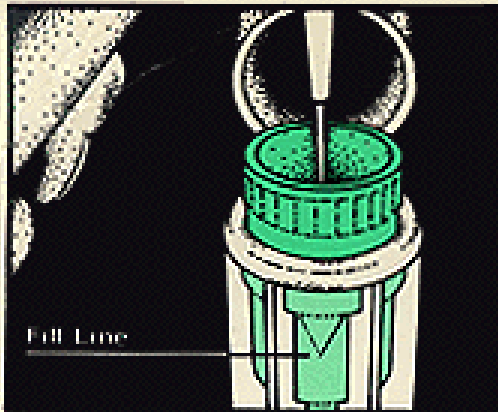
3. Replace green insert and close cap. Return to your veterinarian.

EVSCO PHARMACEUTICALS
Affiliate of IGI, Inc. Buena, NJ (USA) 08310

3

Figure 8.2 Faecal collection instructions (Vetoquinolusa 2007)

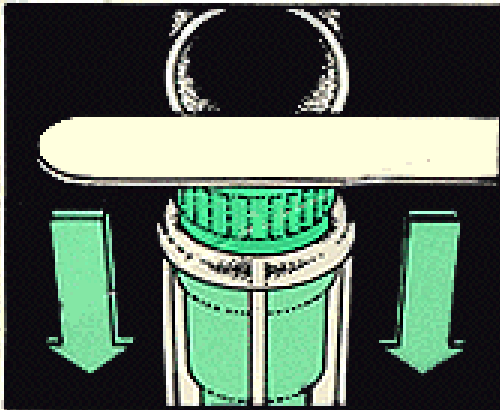
Laboratory Instructions



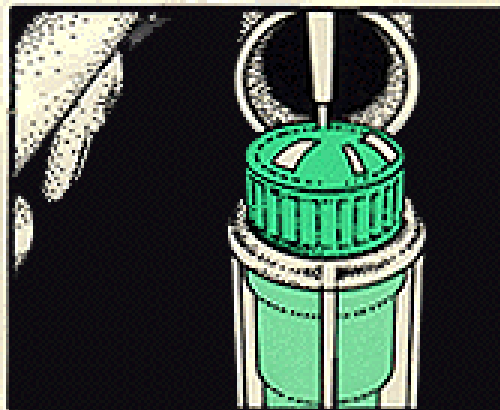
1. Lift cap but do not remove green insert. Fill green vial with FECASOL® Flotation Medium to the tip of the arrow embossed on side of vial.



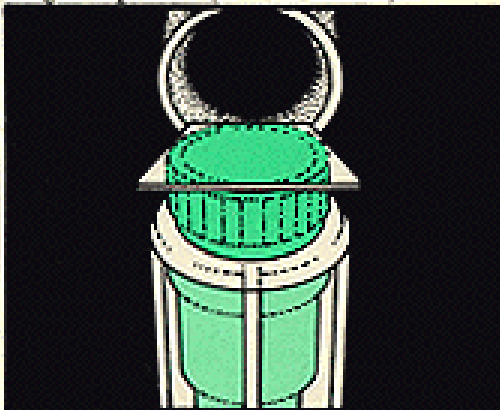
2. Rotate green insert vial back and forth to separate ova from fecal sample. Mix thoroughly.



3. Seat green insert vial firmly in place with tongue depressor (or with thumbs).

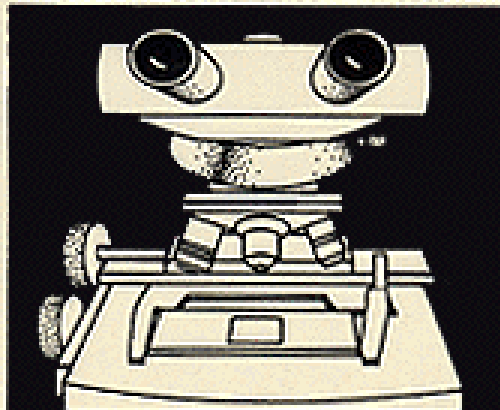


4. Fill holder completely to form a meniscus with additional FECASOL Flotation Medium.



5. Float 22mm cover slip on meniscus for 15-20 minutes.

7. Close cap and dispose of FECALYZER® to prevent cross-contamination.



6. Transfer cover slip to slide for microscopic examination at 100X magnification.

Figure 8.3 Faecal examination instructions (Vetoquinolusa 2007)

TOP OF DESCENT

DESCRIPTION

Top of Descent is an aerosol insecticide for use inside the cabin of aircraft at top of descent, prior to disembarkation.

The purpose of Top of Descent (and aircraft disinsection procedures in general) is to help prevent the spread of insects and the bacteria or viruses which they carry, which can cause disease in humans, plants or animals.

Top of Descent is a 100 gram aerosol can containing World Health Organisation recommended and approved insecticides together with a non-flammable, non-CFC propellant approved for use in aircraft.

Top of Descent spraying is mandatory for all flights into many countries of the world including Australia and New Zealand.

APPROVALS

Top of Descent complies with the World Health Organisation specifications for insecticides. Top of Descent is approved by the National Registration Authority, Australian Quarantine & Inspection Services and the New Zealand Ministry of Agriculture & Fisheries. The propellants have been tested and approved by the PAFT Committee. Top of Descent is a patented product.

Callington Haven is an ISO 9002 quality accredited company with a National Association of Testing Authorities, Australia accredited laboratory for aerospace chemical testing.

APPLICATION

Top of Descent spraying is to be carried out inside the cabin areas prior to the opening of doors prior to disembarkation.

Spraying of cabins shall be carried out at a standard spray rate of 1g per second and on the basis of a required coverage of 10g per 1,000 ft³ in aircraft cabins. This generally equates to one step or one row per second.

Figure 8.4 Top of descent (Callington Haven 2007)

PROCEDURE

The following procedure must be followed:-

B747 The spraying is to be applied as near as possible to the ceiling by two members of the cabin crew, one walking along each aisle holding 2 x 100g cans at arms length and at a slow walking pace of not more than one step or one row per second starting at the rear of the aircraft. The upper deck can be disinsected by one of the two crew members with the remaining crew member completing disinsection of the main cabin at the front of the aircraft.

A total of 4 x 100g cans should be fully used for the above procedure.

B747-SP Only one can to be used by each of two personnel walking slowly from the rear of the aircraft cabin holding can/s at arms length. (N.B. A total of 2 x 100g cans should be fully used for this procedure.)

747 COMBI Only one can to be used by each of two personnel walking slowly from the rear of the aircraft cabin holding can/s at arm length. (N.B. A total of 2 x 100g cans should be fully used for this procedure.)

B767/DC10 Only one can to be used by each of the two cabin crew walking at a slow pace holding can/s at arms length of not more than one step or one row per second starting at the rear of the aircraft cabin. (N.B. A total of 2 x 100g cans should be fully used for this procedure.)

VERIFICATION

All empty or partly used Top of Descent cans (along with cans used for the pre-embarkation, pre-spraying and cans used for the hold spraying) must be kept for inspection and removal by the Quarantine Officer boarding the aircraft at the first port of entry into Australia and New Zealand, when other quarantine formalities will be undertaken.

PACKAGING

12 x 100 gram cans per carton.

8.4 Known Health Problems

Infectious diseases:

In captivity Shinglback Lizards are particularly prone to endemic diseases or parasites (Worrell 1963). Many of the diseases can be carried at non pathogenic levels and become pathogenic. Infections may occur when predisposing factors occur such as when an animal's resistance to illness is lowered due to stress or inadequate nutrition, as a result of environmental stress, or when there is a disruption of normal tissue integrity. Re-infection is more likely in a small confined environment and measures need to be taken to avoid this.

Bacterial: Bacteria are a major cause of disease in reptiles. They can be a primary or secondary mode of infection. Diseases caused by bacteria include:

Abscesses/granulomas, Necrotic Stomatitis, Necrotic Gastroenteritis, Cloacitis, Ocular Infections (Conjunctivitis and Panophthalmitis), Dermatitis (Necrotic Dermatitis, Dermatophilosis and Blister Disease), Periodontal Disease, Osteomyelitis, Septicaemia, Salmonellosis and Mycobacterial Infections. Most common are Gram-negative bacteria, which often occur in the animals normal gut flora. Anaerobes are also common. Common bacterial agents include *Dermatophilus congolensis*, *Escherichia coli*, *Pseudomonas*, *Aeromonas*, *Bacteroides*, *Fusobacterium*, *Clostridium*, *Peptostreptococcus*, *Pasteurella*, *Klebsiella*, *Salmonella*, *Arizona*, *Campylobacter*, *Edwardsiella*, *Proteus*, *Staphylococcus*, *Streptococcus* and *Mycobacterium* spp. Bacterial infections can occur along with fungal.

Viral: Numerous viral infections occur in lizards and some of them are severe. Many of these pathogens have not been studied (Bellamy pers. com., Shea pers. comm.).

Fungal: Fungal infections are usually of the respiratory and integumentary systems. The aetiology include *Aspergillus*, *Geotrichium*, *Penicillium*, *Candida*, *Mucor*, *Basidiobolus*, *Geotrichium*, *Paecilomyces*, and *Trichophyton* spp.

Protozoal: Protozoa can infect reptiles and whilst they often occur at non pathogenic levels they may also cause disease. Pathogenic diseases infect the gastro intestinal tract and can cause enteritis, ulcerative haemorrhagic colitis, luminal occlusion, severe local peritonitis, diarrhea, regurgitation, anorexia, weight loss and hypertrophic gastritis. Agents include Flagellates (*Trichomonas* spp.), Amoebiasis (*Entamoeba invadens*), Sporozoans (*Cryptosporidium* spp.), Ciliates (*Balantidium* spp.), Coccidia (*Eimeria* and *Isopora* spp.)

Endoparasites: Reptiles can be definitive (a host in which sexual maturation of a parasite occurs), intermediate (an organism that harbors the asexual or intermediate phases of a parasite) or paratenic (a host in which a parasite survives without undergoing further development; a transport host) hosts for many endoparasites. Depending on severity of infestation and species of endoparasite involved infestation can be non pathogenic or may cause anorexia, weight loss, regurgitation, diarrhea, dyspnoea, listlessness, breathing distress or death. Aetiology include Trematodes (flukes), Cestodes

(tapeworms), Nematodes (*Strongyloides* spp.), Hookworms (*Entomelas*, *Kalichephalus* and *Oswaldocruzia* spp.), Pinworms (Oxyurids), Roundworms (Ascarids), Lungworms (*Rhabdias* spp.), Filaroid worms, Pentastomids and Threadworms (*Capillaria* spp.).

Ectoparasites: Heavy infestations of ectoparasites can cause anaemia and/or death. Ectoparasites can also be vectors for a variety of other pathogens. Ectoparasites include Mites (*Ophionyssus natricis*), Ticks (*Amblyomma*, *Aponomma*, *Ixodes* and *Ornithodoros* spp.) and Dipterans (Sand Flies, Horse Flies, Midges and Mosquitoes). *Amblyomma albolimbatum* is known as the Stumptailed Lizard Tick (refer figures 8.5 and 8.6).

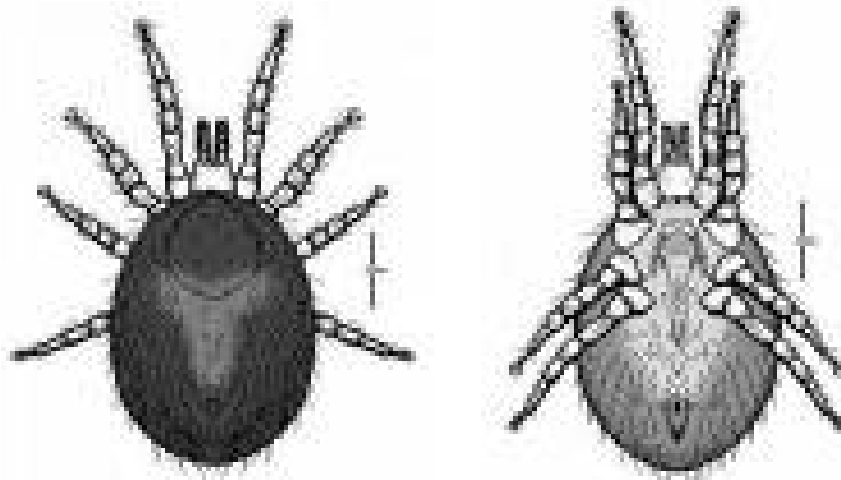


Figure 8.5 Dorsal and ventral views of The Snake Mite *Ophionyssus natricis* (Vida Preciosa International Inc. 2007)

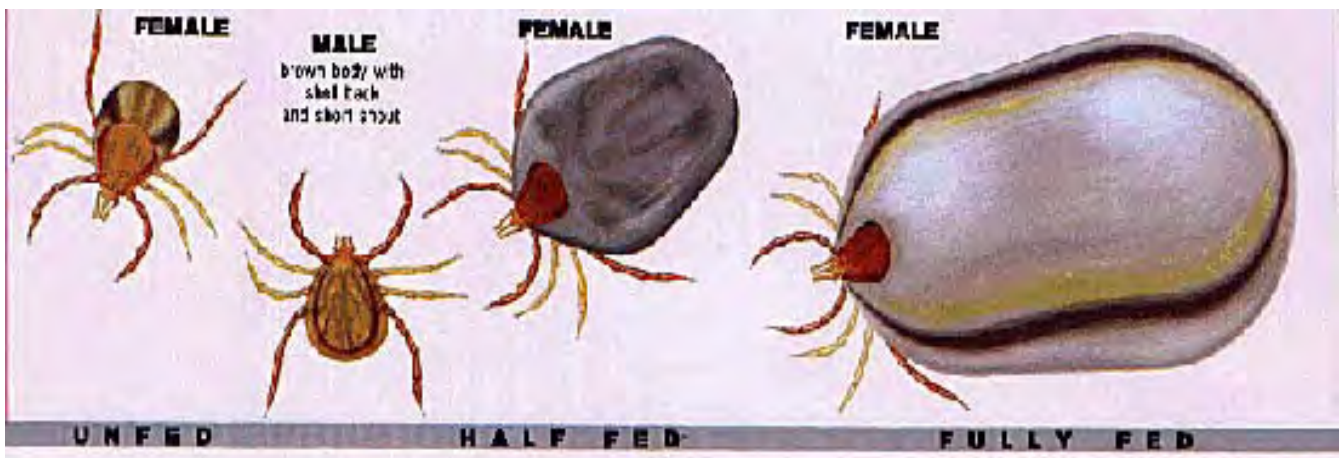


Figure 8.6 Paralysis tick *Ixodes holocyclus* (Ulladulla Veterinary Hospital 2007)

Non infectious diseases:

Environmental Diseases: Poor environment is often reflected in the condition of animals. Maladaptation syndrome (non specific physical deterioration) and rostral abrasions (snout rubbing) can occur in wild caught, overcrowded or improperly housed Shingleback Lizards. Dysecdysis (incomplete sloughing of skin) can occur from incorrect humidity, lack of abrasive substance, scar tissue or ectoparasites. Hyperthermia and hypothermia can occur due to poor temperature control of housing.

Traumatic conditions: Numerous soft tissue injuries and limb fractures can occur. Amongst other things, they occur due to bites from cage mates (territorial, sexual or feeding competition), other animal attacks (dog and cat) and mishandling.

Nutritional disease: The failure to provide an adequate, balanced diet can be the cause of numerous diseases including poor condition, obesity, gout, vitamin deficiency, hypervitaminosis and mineral deficiency (osteodystrophy is caused by inadequate access to UV light, diets low in calcium or vitamin D or incorrect calcium to phosphorus ratio, which should be 1.2-1.5 : 1.0).

Reproductive disorders: Dystocia can be caused by embryonic death and subsequent maternal toxicity, abnormal size or shape of foetus, malnutrition, calcium deficiency or environmental influences such as incorrect temperature. Prolapsed oviduct/hemipene can be caused by a cloacal infection, which in turn can be caused by careless sexing or dystocia.

Neoplastic diseases: Tumors have been recorded, with no specific predilections, in all reptile groups.

(Bellamy pers. comm., Brown 2003, CSIRO 2007, Hitz et al 2004, Horan pers. comm., McCracken 1994).

8.5 Quarantine Requirements

Quarantine is the isolation of an animal to control the potential to spread or the spread of disease. Quarantine facilities must be provided for the isolation of specimen for at least 30 days after their initial arrival. This period may vary depending on the individual reptiles, their source and any potential associated disease risks. Quarantine facilities must be spatially separated from the main reptile collection and include the capacity for individual isolation. All cages must be isolated individually and be accessible for disinfection (DPI 2004).

As well as newly acquired animals, any sick or suspect animals must be quarantined. New, sick or suspect animals can threaten the health of the existing colony. Sick animals should be removed from the main housing system and treated in quarantine. Three months is a good quarantine time for potentially infectious animals. If no signs of ill health are apparent in that time they can be transferred to the general collection. Quarantine reduces the risk of spreading disease from your sick animals to potentially healthy, newly acquired or suspect animals. Animals should be individually isolated in quarantine to minimise the risk of disease spread within the room. Hygiene standards need to be maintained i.e. wash your hands and wear and change gloves between cages. It is best to wash your hand between handling animals from different cages in your general collection too.

During the quarantine period animals should be health assessed often. Perform distant examinations daily or more often as the need arises. Do physical examinations weekly or more often as required. Faecal and blood samples may also be taken.

When attending your animals always attend quarantine area last. Never go into the collection room after being in quarantine room. Never mix feeding, watering or other equipment between quarantine and collection or between individual cages in quarantine. Avoid mixing equipment in general collection.

If an animal dies in quarantine or in a general collection, a necropsy is recommended.

(Titmuss 2005)

9 Behaviour

9.1 Activity

Shingleback Lizards are diurnal and terrestrial. They exhibit basking behaviour to maintain body temperature. They sun bake to raise body temperature and retreat into the shade if it becomes too hot (Green 2001, Torr 1999, pers. obs.).

Shingleback Lizards have been observed to begin morning basking by exposing only the head from the retreat. After some initial warming the lizard will emerge, turn its body at a right angle and arc its body towards the sun (Greer 1989). During spring they are most active, feeding and breeding while conditions are favorable (Torr 1999).

As the photoperiod shortens and the temperature drops to below 12⁰C, Shingleback Lizards enter a state of winter dormancy called brumation. Signs that a lizard is ready to brumate include reduced activity, little or no basking and loss of appetite. During brumation, the lizards have reduced activity and will not eat (refer figure 6.1). Lizards should not be exposed to sub zero temperatures, insulated shelters must be provided. Dry hay can be used for insulation (Green 2001).

Shingleback Lizards have been observed to push over and walk along the stalks of long stemmed flowers to reach the inflorescences and may have a preference for yellow flowers (Greer 1989).

9.2 Social Behaviour

Shingleback Lizards are solitary. They are relatively sedentary but wander in spring (Walls 1996). They will use same home range year after year (Torr 1999). When it is not breeding season Shingleback Lizards tend to ignore each other (Shea pers. comm.).

9.3 Reproductive Behaviour

Shingleback Lizards are spring breeders. They are found alone at winters end and as spring progresses pairs start to form and can be found curled up together in retreats, basking side by side or feeding together (Torr 1999). The males follow the females. When ready to mate the male grasps the females head, neck or shoulders in his mouth and holds her in position to align their cloacas and insert one hemipene. Male combat has been observed during the breeding season (Green 2001, Greer 1989, pers. obs.).

Long term mate fidelity has been observed (Shea 1998). Pairs appear to mate for life, meeting each spring (Wilson & Swan 2003). Mating is usually observed four to eight

weeks after brumation (Hitz et al 2004). In captivity new arrivals settle in and will mate (Green 2001). They can be housed together all year round.

9.4 Bathing

Shingleback Lizards are a desert species and seldom see free water, they are not likely to bathe (Walls 1996).

9.5 Behavioural Problems

Reptiles do not show stereotypic displays caused by boredom. Inadequate housing can be a cause of snout rubbing although this does not seem to occur in Shingleback Lizards (Houston pers. comm.).

9.6 Signs of Stress

When harassed they perform the characteristic *Tiliqua* defense display, which is to inflate the body and throw it into an arc facing the intruder, hiss and gape, protruding a flat blue tongue against the pink mouth interior (Greer 1989, Wilson et al 1988, Wilson & Swan 2003). This display is not all bluff and if harassed Shingleback Lizards will bite and hang on tenaciously (Torr 1999). Their powerful jaw muscles can produce a painful bite (Ehmann 1992, Green 2001).

9.7 Behavioural Enrichment

Enrichment contributes to the wellbeing of captive animals. Use a flexible approach with an understanding of how the basic needs of heat, light, food, water, substrate and furniture can be manipulated to provide a more stimulating environment. You need to have a basic understanding of reptile behaviour. Observe behaviours and identify problems or areas that could be enriched. Monitor the effectiveness of the enrichment provided by positive behavioural changes. Environmental enrichment can be divided into five categories: dietary, cognitive, physical, sensory and social.

At this stage cognitive forms of enrichment have not been developed for reptiles.

Diet variation can be used. They are naturally opportunistic feeders, use an opportunistic schedule rather than regular schedule. You may hide food and create food scent trails.

Physical enrichment should reflect their natural environment and include adequate housing size and shape, seasonally and daily appropriate environment variation (temp, humidity, photoperiod and temp gradient). Basking sites and retreats should be provided.

Sensory enrichment can include placing leaves and branches in the enclosure. Sensory enrichment can also include other animals scent; Shingleback Lizard, other species (including other reptiles, mammals and birds), male, female, predator or prey, from bedding or sloughs (Hawkins & Willemsen 2004, pers. obs.). Other forms of sensory enrichment could also include visual or auditory stimuli.

Social enrichment can include intraspecific and interspecific housing.

Reptiles do not like their enclosure being changed around. They are generally happy to spend their days basking, resting and eating. Shingleback Lizards do well in captivity without constant sensory or social enrichment and an excess of these types of enrichment can lead to stressed animals. Avoid thinking in terms of mammals needs and do not supply an excess of enrichment as this is counter productive (Houston pers. comm., Shea pers. comm., pers. obs.).

9.8 Introductions and Removals

When introducing new animals it is a good idea to reassess the enclosure and only change it around as needed adding some extra refugia. This will help to avoid fight injuries (Shea pers. comm.).

9.9 Intraspecific Compatibility

Shingleback Lizards can be kept communally (pers. obs.). It is best to introduce new males to a group after the breeding season. Dominance can occur, usually with sexually mature males. A dominant animal should be removed or extra basking sites can be provided to prevent hogging (Green 2001, Walls 1996, Watharow 2003). Most of the time conspecifics tend to ignore each other, although it may appear that they are interacting with behaviours such as thermoregulation and refuging (Shea pers. comm.).

9.10 Interspecific Compatibility

The enclosures at wildlife parks often contain mixed species and genre. Featherdale Wildlife Park have a Shingleback Lizard and a Black-headed python (*Aspidites melanocephalus*) housed together (refer figure 4.3). Care should be taken when housing lizards with potential predators. Wildlife World have Shingleback Lizards, Centralian Bluetongues (*T. multifasciata*) and Western Bluetongues (*T. occipitalis*) housed together (refer figure 4.2). Care should be taken when mixing with other *Tiliqua* species as hybridization can occur. Shingleback Lizards may be housed with aboreal species such as *Pogona* spp.

9.11 Suitability to Captivity

Captive Shingleback Lizards become calm and docile and are amiable to handling. They are long lived and have 'personalities'. They have a bizarre and interesting appearance with a hearty appetite and are easy to feed. These traits make them ideal to keep as pets. The lizards from the Bluetongue complex are among the most popular and sought after terrarium lizards in the world (Green 2001, Hitz et al 2004, Shea pers. comm., Watharow 2003).

New arrivals may be slightly agitated or become defensive (Green 2001). As with some other tame reptiles Shingleback Lizards that have been kept indoors can be a little more feisty when taken outdoors and show threat displays when approached (pers. obs.).

10 Breeding

Malformed or stillborn neonates are an occasional occurrence. In some cases veterinary care, including Cæsarian section, may be required. Possible causes include incorrect temperature (high or low), food shortages, poisons, medication (inappropriately applied), radiation, spontaneous mutations or captivity related stress (Hitz et al 2004).

Inbreeding causes a high occurrence of paired recessive genes which may provide the phenotype of a disease or a predisposition to a disease, which can mean generally less healthy animals. Inbreeding has other consequences such as smaller, less fecund individuals. It is thought that inbreeding does not cause major problems until the F2 generation but inbreeding should be avoided as much as possible (Houston pers. comm.).

10.1 Mating System

Unplanned breeding is unethical should never occur (Phipps pers. comm.). Use climatic controls to control lizard breeding cycle. Cool the enclosure and reduce the hours of light to imitate winter conditions. Shingleback Lizards have a very developed pineal eye. This means that they are sensitive to light cycles (Worrell 1963). As you begin to warm the environment animals will pair. Winter cooling is used to synchronize male and female cycles and is essential if breeding is desired (refer table 10.1) (Hitz et al 2004). During spring it common to see Shingleback Lizards in pairs (Griffiths, 2006).

Maintain breeding records which note possible successful mating times and the date or estimated date of mating and birth and details of any offspring (DPI 2004).

10.2 Ease of Breeding

A successful propagation of Shingleback Lizards is well possible in captivity if the basic requirements of the animals are met (Hitz et al 2004, Watharow 2003, pers. obs.).

One technique that has been successfully used with Shingleback Lizards is the introduction of an intruder male into the enclosure of a breeding pair. The male is only left in for a short time, under supervision to avoid injuries, and after his removal the remaining male will take a greater interest in his female (Hitz et al 2004). It may be possible to get the same results using only faeces or sloughed skin (Houston pers. comm.).

10.3 Reproductive Condition

10.3.1 Females

Only healthy animals should be used for breeding. The controlling factor for annual breeding may be condition. Wild Shingle back Lizards often don't breed annually (Hitz et al 2004). If females are to breed, good condition prior to hibernation is required (refer Figure 6.1). A good feeding regime throughout pregnancy is also required.

10.3.2 Males

As with females only healthy animals should be used for breeding. The male's condition is not important but winter cooling to synchronize male and female cycles is essential.

10.4 Techniques Used to Control Breeding

The only way to control breeding is to keep males and females separated.

10.5 Occurrence of Hybrids

Hybridization is relatively uncommon between species of *Tiliqua*. *T. scincoides* x *T. rugosa* captive and wild and *T. rugosa* x *T. nigrolutea* wild have been recorded (Greer 1989, Hitz et al 2004). Hybridisation between Bluetongue species appears to be a rare event and does not imply that the species are not genetically distinct (Hitz et al 2004).

With the exception of *T. r. konowi* (which is found on Rottnest Island), intergrades occur between subspecies ranges giving a gradient of genes with no clear borders of ranges (Shea pers. comm.). Intergrades occur in captivity and many keepers prefer to breed only from lizards of the same geographic locality type (Green 2001).

10.6 Timing of Breeding

Both male and female Shingleback Lizards require a simultaneous period of winter cooling or brumation of two to three months to synchronize breeding cycles (refer figure 10.1). During this time temperatures range should be 9°C NTL (night time low) to 17°C DTH (day time high), with a 3 week transitory period (Hitz et al 2004). The light cycle should also reflect the seasonal changes, being reduced from 14 hours light : 10 hours dark to 10 hours light : 14 hours dark (Houston pers. comm.).

The follicles of female Shingleback Lizards show a variation in size depending on the season. The diameter is smallest in summer, and many females are gravid during this time. The follicles grow during autumn and winter, with an accelerated growth in spring. From the end of October the mature follicles are ovulated with a subsequent gravidity, in non mated females the follicles regress (refer table 10.1). Females which have ovulated but have not been impregnated may discharge the unused yolk masses after the completion of the normal term of gravidity (Hitz et al 2004).

The testes of male Shingleback Lizards show variation in their size and turgor depending on the season. The changes in the testes corresponds with the concentration of testosterone and epitestosterone in the testicular tissue and blood plasma. During summer and early autumn the testes are small, flattened and limp but during mid winter and spring the testes increase in length and turgor. The male Shingleback Lizard will excrete fine hemipenis exuviae during the mating season (refer table 10.2) (Hitz et al 2004).

Table 10.1 Chronological course of the reproductive cycle of *T. rugosa*
(Hitz et al 2004)

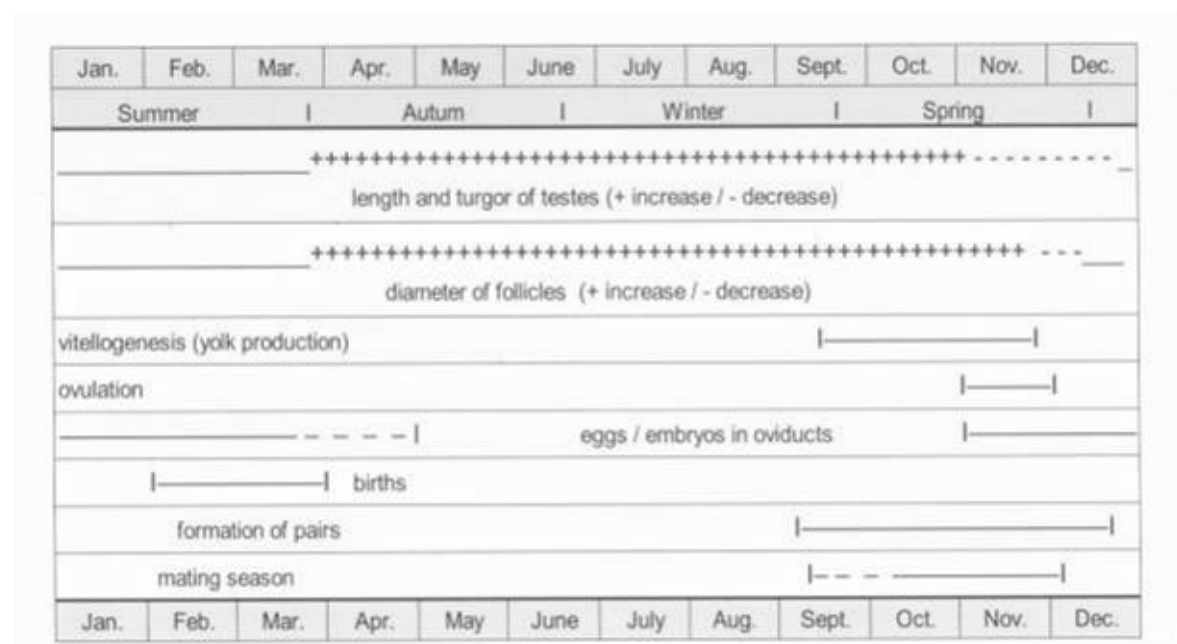
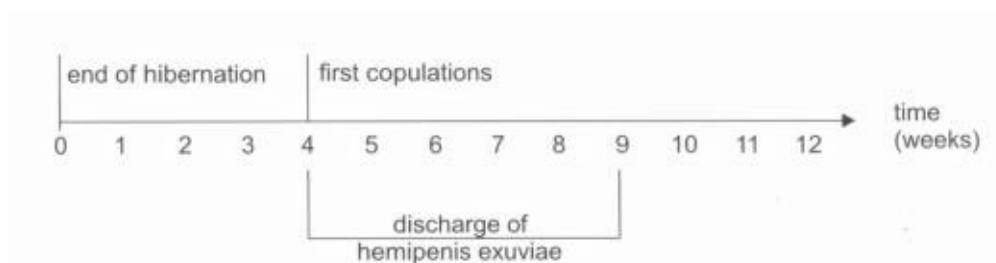


Table 10.2 Chronological sequence of events during the mating season
(Hitz et al 2004)



A SLEEPY YEAR



Late August to early September
With spring's warmer temperatures, sleepy lizards emerge from shelter.



Scent particles collected by the tongue are transferred to paired Jacobson's organs, which are lined with cells similar to those found in the nose.

March to April
During her period of inactivity, the female gives birth to 1-4 (usually two) live young.



Mid-December to August
After mating, the male leaves and takes shelter from the summer heat. The female spends some time feeding to add to her reserves before she too seeks shelter.

A sleepy lizard's year is a short one. It has only a few months to feed and mate before summer's heat kills the vegetation it eats and makes life in the open unbearable. Sleepies are the only lizards known to exhibit pair fidelity and during the short period of activity males must find their partner of the previous year and then mate with and defend her. The rest of the year is spent sheltering, often down an abandoned rabbit burrow.



Early to mid-September
The male sets about finding his partner, smelling the air to pick up her scent, seeking her scent trail on the ground and checking sites they both visited the previous year.



Late September to early October
When he finds his mate, the male spends much of his time with her, often feeding by her side and sheltering under the same bush.



November to December
Late in the breeding season some males must defend their mates from the advances of males who've already mated, which often leads to nasty scars on their heads.



Early October to December
Being so attentive eventually pays off and the male's advances are accepted. He won't be so lucky every year, however, as females usually reproduce only every second year.

Figure 10.1 A Shingleback Lizards yearly cycle (Torr 1999)

10.7 *Age at First Breeding and Last Breeding*

Shingleback lizards first breed at 30 months (Walls 1996), during their third to fourth season. It is the same in both the male and female (Greer 1989).

Sexual senescence has not been recorded in Shingleback Lizards.

10.8 *Ability to Breed Every Year*

Captive Shingleback Lizards are able to reproduce annually. It has been estimated that about 50% of wild Shingleback Lizards reproduce biannually. With an average litter size of two this translates to an average of one neonate per female per year. The controlling factor may be condition (Hitz et al 2004).

10.9 *Ability to Breed More than Once Per Year*

Shingleback Lizards do not breed more than once per year. There is no evidence that any *Tiliqua* species breeds more frequently than annually (Shea 1992).

10.10 *Nesting, Hollow or Other Requirements*

Refugia and hide boxes should be supplied.

10.11 *Breeding Diet*

The gravid female should be fed as normal (Green 2001).

10.12 *Incubation Period*

Gestation is around 150 days, dependent on temperature (Green 2001).

10.13 *Clutch Size*

They have a clutch size of one to four live young. The relative litter mass is about 35% of the maternal mass, more young means smaller young. The neonates SVL is 142mm-170mm and their weight is 52-130g (Green 2001, Shea 1998).

10.14 *Age at Weaning*

Shingleback Lizards are precocial and eat the same food as adults. Weaning does not occur (pers. obs.).

10.15 *Age of Removal from Parents*

Females are able to recognize their own young, at least for a short period after birth, but there is no evidence of any maternal behaviour (Shea 1998, Torr 1999). Young may stay with the mother for a short period before their dispersal (Watharow 2003).

10.16 *Growth and Development*

Growth of reptiles is dependant on food supply rather than age (Houston pers. comm.). Shingleback Lizards usually take about three years to reach full size (Torr 1999). Neonates have their first slough within hours of birth. The skin comes off in small pieces and is consumed by the lizard. Growing juveniles shed up to three times per year, adults only once (Hitz et al 2004, pers. obs.).

11 Artificial Rearing

11.1 Incubator Type

N/A

11.2 Incubation Temperature and Humidity

N/A

11.3 Desired % Egg Mass Loss

N/A

11.4 Hatching Temperature and Humidity

N/A

11.5 Normal Pip to Hatch Interval

N/A

11.6 Diet and Feeding Routine

Neonate Shingleback Lizards first meal may be placental material (Watharow 2003). They will feed on the same diet as adults (Weigel 1988) but they require higher protein and may have their diet fortified with calcium (Hitz et al 2004).

11.7 Specific Requirements

Housing should be maintained according to adult's requirements (Green 2001).

11.8 Data Recording

Information on neonate's cage card should include:

- Individual identification
- Date of birth
- Litter size
- Weight
- SVL
- Parentage
- Diet

11.9 Identification Methods

As with adults recording of individual markings and characteristics. Shingle back Lizards can be microchipped. Less commonly individual notching or counting of scales. Information is recorded on a cage card (Bellamy pers. comm., Shea pers. comm.).

11.10 Hygiene

As with adults, spot checking daily and remove old substrate, clean enclosure with F10SC and replace bedding fortnightly.

11.11 Behavioural Considerations

Juveniles may be shy and skittish. The animals will feel more comfortable with additional refugia. They will soon settle down especially if hand fed (pers. obs.).

11.12 Weaning

Neonate Shingleback Lizards may be removed from the parents (Walls 1996).

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15 Glossary

Aboreal: Dwelling, at least part of the time, in trees

Allopatric: From different areas

Brumation: A period of prolonged cool temperature without actual hibernation

Caudel: Pertaining to or toward the tail

Cloaca: The common chamber in reptiles into which the reproductive, digestive and urinary ducts open

Complex: A term for a group of related taxa, most commonly involving units in which the taxonomy is difficult or confusing

Cranial: Pertaining to or toward the head

Diagnostic characteristics: Characteristics that separate a taxon from other taxa

Diapsid: Reptile or other vertebrate with two temporal openings in the skull

Dimorphic: Two different shapes. Usually sexually ie. difference between shape in male and female

Distinguishing features: Features of a given taxon

Diurnal: Primarily active during the day

Dorsal: Pertaining to the back or upper surface of an animal

Ectoparasite: Symbiosis in which one organism (the parasite) lives at the expense of the other (host) externally

Ectothermic: Regulation of body temperature by means of external sources of heat

Endemic: Restricted to a particular region

Endoparasite: Symbiosis in which one organism (the parasite) lives at the expense of the other (host) internally

Exotic: Not native to Australia

Gestation: The period between copulation and birth

Hemipenis: One of the paired copulatory organs found in Squamates

Heteromorphous: Differing in shape

Homomorphous: Not differing in shape

Hybridize: Offspring produced from parents of different species

Innocuous: Harmless

Intergrade: Offspring produced from parents of different sub species. An animal found where distinctive geographical populations or sub species meet and where characteristics of each population occur or merge.

Interspecific: Occurring between different species

Intraspecific: Occurring between the same species

Mandible: The lower jaw

Maxilla: The upper jaw

Microhabitat: The space occupied by an animal within a given habitat

Monomorphic: No difference in shape. Usually sexually ie. no difference in shape between male and female

Neonate: Newborn

Nominate form: The sub species originally described; recognized by having the same specific and sub specific names. Eg. *Tiliqua rugosa rugosa*

Omnivorous: Meat and plant eater

Pentadactyle: Having five digits

Precocial: The young being at least partially self sufficient soon after birth
Range: Extent of distribution of a given taxon
Rugose: Of scales, bearing a wrinkled or uneven surface
Skink: Of the family Scincidae
Slough: The cast off skin of a reptile
Snout vent length (SVL): The distance between the tip of the snout and the cloaca
Species (sp., plural spp.): Groups of actually or potentially interbreeding natural populations, which are reproductively isolated from other such groups
Squamatid: Of the Order Squamata; snakes and lizards
Sub species (ssp., plural sspp.): A formal classification for part of a species, which in isolation has acquired some distinct characteristics of its own
Sympatry: In the same area
Synonym: A name proposed for a taxon described as new but later shown to be already named. The new name is invalid and becomes a synonym.
Taxon (plural taxa): A basic unit of classification in taxonomy
Taxonomy: The study of classification of living things
Terrestrial: Living on land
Torpor: State of inactivity due to low body temperature
Total length (TL): The distance between the tip of the snout and the tip of the tail
Vent: Cloaca
Ventral: Pertaining to the lower surface of an animal
Viviparous: Giving birth to live young
Xeric: Of or adapted to arid conditions
Zoonotic disease: A disease that occurs primarily in animals but can be transferred to humans

16 Appendix

16.1 MSDS

16.1.1 Betadine

BETADINE® SOLUTION MSDS

<p align="center"><u>MATERIAL SAFETY DATA SHEET</u></p> <p align="center"><i>PURDUE FREDERICK COMPANY</i></p> <p align="center">ONE STAMFORD FORUM 201 TRESSER BLVD. STAMFORD, CT 006901-3431</p> <p>EMERGENCY PHONE #: 1-888-726-7535 NON-EMERGENCY PHONE #: 1-203-853-0123 Date Prepared: October 2001</p>

S:

CHEMICAL NAME AND SYNONYMS: Povidone Iodine Solution USP, PVP-I

TRADE NAME: Betadine® Solution (10% Povidone Iodine)

CHEMICAL FAMILY: Polymer, complex of Polyvinylpyrrolidone w/ Iodine

FORMULA: (C₆H₉NO)_n x I

CAS REGISTRY #: 25655-41-8

SECTION II: HAZARD

NAME	CAS NO.'S	OSHA PEL/ACGIH	TOXICOLOGICAL DATA
POVIDONE IODINE, USP	25655-41-8	15 mg/m ³ – PEL 10 mg/m ³ - TLV	ORAL – MOUSE LD50 > 8100 mg/kg
INACTIVE INGREDIENTS	NL	NE	GENERALLY RECOGNIZED AS SAFE.

SECTION III: PHYSICAL DATA

Specific gravity: 1.03 (Water = 1)

pH: 5 - 6

APPEARANCE & ODOR: Reddish-Brown, clear liquid, faint odor.

16.1.1.1 SECTION IV: FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (method used): NA **FLAMMABLE LIMITS:** NA **LEL:** NA

EXTINGUISHING MEDIA: Use water, CO₂, dry chem or any suitable fire fighting agents for other primary cause of fire.

SPECIAL FIRE FIGHTING PROCEDURES: None regarding this product.

UNUSUAL FIRE AND EXPLOSION HAZARDS: NA

SECTION V: HEAL

THRESHOLD LIMIT VALUE (TLV): NE for Product – see Section II for ingredient TLV's.

EFFECTS OF OVEREXPOSURE: This product is generally recognized as safe when used as a topical antimicrobial

agent. Prolonged exposure to wet soln. may cause local irritation to the skin. Elevated concentrations of iodide in the

serum may occur if excessive amounts of iodine are adsorbed through broken skin, burns or deep wounds. Iodine

may also be absorbed through the lungs and gastrointestinal tract. High concentrations of iodide in serum may

produce alterations in thyroid function, renal disturbances, acidosis & electrolyte disturbances.

CONDITIONS AGGRAVATED BY EXPOSURE: NIF.

EMERGENCY AND FIRST AID MEASURES:

FOR EYES: Flush with copious amounts of water for 15 minutes. Seek medical attention.

FOR SKIN: Wash affected area thoroughly with water. Seek medical attention. NA = NOT APPLICABLE 1

FOR INGESTION: INDUCE VOMITING IMMEDIATELY - drink copious amounts of water – seek prompt medical

NE = NOT ESTABLISHED NL = NOT LISTED NIF = NO INFORMATION
FOUND BETADINE® SOLUTION MSDS

attention. Never give anything by mouth to an unconscious person.

FOR INHALATION: Inhalation is not likely to occur, however, in the event of exposure to vapors remove the victim from the affected area, restore breathing - if required and seek medical attention.

SECTION VI: REACTIVITY DATA

STABILITY: Stable at normal temperature and pressure.

STORAGE: Store and handle in accordance with good housekeeping practices. Store in tight container in a cool and dry location.

INCOMPATIBILITIES: Reducing agents, strong alkalies.

HAZARDOUS DECOMPOSITION: None.

POLYMERIZATION: Not known to occur.

CONDITIONS TO AVOID: Avoid contact with incompatible materials.

16.1.1.2 SECTION VII: ENVIRONMENTAL DATA

SPILL/RELEASE MEASURES: Wipe up spills with absorbent material. Sodium Thiosulfate is useful in decolorizing stains.

WASTE DISPOSAL: Dispose of in accordance with state, federal and local regulations.

HAZARDOUS SUBSTANCE UNDER SUPERFUND: NL **HAZARDOUS WASTE, 40CFR 261:** NL
HAZARDOUS WASTE NUMBER: NE

CONTAINER DISPOSAL: No special handling required. Consult local regulations regarding empty container disposal.

SECTION VIII: SPECIAL PROTECTION INFORMATION

16.1.1.2.1.1.1.1.1 **RESPIRATORY**

PROTECTION: Ordinarily not required.

VENTILATION: Ordinarily not required.

SKIN PROTECTION: Any impervious glove or apparel suitable to limit contact exposure.

EYE PROTECTION: Chemical splash goggles, face shield or any other suitable protective eyewear to limit exposure.

SECTION IX: SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN

IN HANDLING AND STORING: No special precautions are deemed necessary.

OTHER PRECAUTIONS: NA

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS:

H e e a a l t t h h - 1 1 F i r r e e - 0 0 R e e a a c c t t i i v v i i t t y y - 0 0 H - F R

The above information had been provided by the Purdue Frederick Company in good faith; but no warranty, expressed or implied is made with regard to the accuracy of such data or its suitability for a given application or purpose.

NA = NOT APPLICABLE 2 NE = NOT ESTABLISHED NL = NOT LISTED NIF = NO INFORMATION FOUND

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16.1.2 F10SC

HEALTH AND HYGIENE F10SC VETERINARY DISINFECTANT

Hazard Alert Code:
MODERATE

Chemwatch Material Safety Data Sheet
(REVIEW)

Revision No:
2

Chemwatch 4621-29

Issue Date: 29-Nov-2004

CD 2006/4

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: HEALTH AND HYGIENE F10SC VETERINARY
DISINFECTANT

PRODUCT USE

Multi-purpose disinfectant and sanitiser.

SUPPLIER

Company: Health and Hygiene Pty Ltd

Address:

PO Box 347

Sunninghill, 2157

ZAF

Telephone: +011 474 1668

Fax: +011 474 1670

HAZARD RATINGS

	Min	Max
Flammability:	0	
Toxicity:	0	
Body Contact:	2	Min/Nil=0 Low=1 Moderate=2 High=3 Extreme=4
Reactivity:	0	
Chronic:	2	

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code.

POISONS SCHEDULE

None

RISK	SAFETY
Irritating to eyes and skin.	Do not breathe gas/fumes/vapour/spray.
Toxic to aquatic organisms.	Avoid contact with skin.

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Possible respiratory and skin
sensitiser*.

Wear eye/face protection.

* (limited evidence).	To clean the floor and all objects contaminated by this material, use water.
	In case of contact with eyes, rinse with plenty of water and contact Doctor or Poisons Information Centre.
	If swallowed, IMMEDIATELY contact Doctor or Poisons Information Centre. (show this container or label).

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
quaternary ammonium compound		5.8
biguanidine compound		
surfactants		NotSpec
sequesterants		NotSpec
fragrance		0-1
dye		0-1
water	7732-18-5	>60

Section 4 - FIRST AID MEASURES

SWALLOWED

- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

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EYE

If this product comes in contact with the eyes:

- Wash out immediately with fresh running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- If pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

If skin contact occurs:

- Immediately remove all contaminated clothing, including footwear
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

- If fumes or combustion products are inhaled remove from contaminated area.
- Other measures are usually unnecessary.

NOTES TO PHYSICIAN

For exposures to quaternary ammonium compounds;

- For ingestion of concentrated solutions (10% or higher): Swallow promptly a large quantity of milk, egg whites / gelatin solution. If not readily available, a slurry of activated charcoal may be useful. Avoid alcohol. Because of probable mucosal damage omit gastric lavage and emetic drugs.
- For dilute solutions (2% or less): If little or no emesis appears spontaneously, administer syrup of Ipecac or perform gastric lavage.
- If hypotension becomes severe, institute measures against circulatory shock.
- If respiration laboured, administer oxygen and support breathing mechanically. Oropharyngeal airway may be inserted in absence of gag reflex. Epiglottic or laryngeal edema may necessitate a tracheotomy.
- Persistent convulsions may be controlled by cautious intravenous

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injection of diazepam or short-acting barbiturate drugs. [Gosselin et al,
Clinical Toxicology of Commercial Products]

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

The product contains a substantial proportion of water, therefore there are no restrictions on the type of extinguishing media which may be used. Choice of extinguishing media should take into account surrounding areas.

Though the material is non-combustible, evaporation of water from the mixture, caused by the heat of nearby fire, may produce floating layers of combustible substances.

In such an event consider:

- foam
- dry chemical powder
- carbon dioxide

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves for fire only.
- Prevent, by any means available, spillage from entering drains or water courses.
- Use fire fighting procedures suitable for surrounding area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

FIRE/EXPLOSION HAZARD

- Non combustible.
- Not considered to be a significant fire risk.
- Expansion or decomposition on heating may lead to violent rupture of containers.
- Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).
- May emit acrid smoke.

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Decomposition may produce toxic fumes of:
carbon dioxide (CO₂).
hydrogen chloride.
phosgene.
nitrogen oxides (NO_x).
other pyrolysis products typical of burning organic material.
May emit poisonous fumes.

FIRE INCOMPATIBILITY

None known.

HAZCHEM

None

Personal Protective Equipment

Gas tight chemical resistant suit.

Limit exposure duration to 1 BA set 30 mins.

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS

- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.
- Wipe up.
- Place in a suitable labelled container for waste disposal.

MAJOR SPILLS

Minor hazard.

- Clear area of personnel.
- Alert Fire Brigade and tell them location and nature of hazard.
- Control personal contact by using protective equipment as required.
- Prevent spillage from entering drains or water ways.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite and place in appropriate containers for disposal.
- Wash area and prevent runoff into drains or waterways.
- If contamination of drains or waterways occurs, advise emergency

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services.

EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)

The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour WITHOUT experiencing or developing

life-threatening health effects is:

water	500 mg/m ³
-------	-----------------------

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:

water	500 mg/m ³
-------	-----------------------

other than mild, transient adverse effects without perceiving a clearly defined odour is:

water	500 mg/m ³
-------	-----------------------

The threshold concentration below which most people. will experience no appreciable risk of health effects:

water	500 mg/m ³
-------	-----------------------

American Industrial Hygiene Association (AIHA)

Ingredients considered according exceed the following cutoffs

Very Toxic (T+)	>= 0.1%	Toxic (T)	>= 3.0%
R50	>= 0.25%	Toxic (T)	>= 3.0%
R51	>= 2.5%	Corrosive (C)	>= 5.0%
else	>= 10%		

where percentage is percentage of ingredient found in the mixture

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

+ X + X 0 +

X: Must not be stored together

O: May be stored together with specific preventions

+: May be stored together

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Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Limit all unnecessary personal contact.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

DO NOT allow clothing wet with material to stay in contact with skin.

SUITABLE CONTAINER

- Polyethylene or polypropylene container.
- Packing as recommended by manufacturer
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

None known.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

Store at 0-30 degC.

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records

- water: CAS:7732-18-5

MATERIAL DATA

Not available. Refer to individual constituents.

INGREDIENT DATA

WATER:

No exposure limits set by NOHSC or ACGIH.

PERSONAL PROTECTION

EYE

- Safety glasses with side shields; or as required,
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59]

HANDS/FEET

Wear chemical protective gloves, eg. PVC.

Wear safety footwear or safety gumboots, eg. Rubber.

NOTE: The material may produce skin sensitisation in predisposed individuals.

Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.

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- Skin cleansing cream.
- Eye wash unit.

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:

"Forsberg Clothing Performance Index".

The effect(s) of the following substance(s) are taken into account in the computer-generated selection: water

Protective Material CPI *.

BUTYL	A
NEOPRENE	A
VITON	A
PVA	C
NATURAL RUBBER	C

* CPI - Chemwatch Performance Index

A: Best Selection

B: Satisfactory; may degrade after 4 hours continuous immersion

C: Poor to Dangerous Choice for other than short term immersion

NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -

* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

For further information consult site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

General exhaust is adequate under normal operating conditions. If risk of overexposure exists, wear SAA approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, degreasing etc., evaporating from tank (in still air)	0.25-0.5 m/s (50-100 f/min)

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aerosols, fumes from pouring
operations, intermittent container
filling, low speed conveyer transfers,
welding, spray drift, plating acid fumes,
pickling (released at low velocity into
zone of active generation)

0.5-1 m/s (100-200 f/min.)

direct spray, spray painting in shallow
booths, drum filling, conveyer loading,
crusher dusts, gas discharge (active
generation into zone of rapid air
motion)

1-2.5 m/s (200-500 f/min)

grinding, abrasive blasting, tumbling,
high speed wheel generated dusts
(released at high initial velocity into
zone of very high rapid air motion).

2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range

Upper end of the range

1: Room air currents minimal or
favourable to capture

1: Disturbing room air currents

2: Contaminants of low toxicity or of
nuisance value only

2: Contaminants of high toxicity

3: Intermittent, low production.

3: High production, heavy use

4: Large hood or large air mass in
motion

4: Small hood - local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min.) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Colourless, green or blue liquid; mixes with water. May contain added fragrance.

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PHYSICAL PROPERTIES

Liquid.

Mixes with water.

Molecular Weight: Not Applicable	Boiling Range (°C): 110
Melting Range (°C): -20	Specific Gravity (water=1): 1.00
Solubility in water (g/L): Miscible	pH (as supplied): 7 approx.
pH (1% solution): Not Available	Vapour Pressure (kPa): Not Available
Volatile Component (%vol): Not Available	Evaporation Rate: as for water
Relative Vapour Density (air=1): Not Available	Flash Point (°C): Not Applicable
Lower Explosive Limit (%): Not Applicable	Upper Explosive Limit (%): Not Applicable
Autoignition Temp (°C): Not Available	Decomposition Temp (°C): Not Available
State: Liquid	Viscosity: Not Available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

The material has NOT been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (eg. liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.

EYE

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This material can cause eye irritation and damage in some persons.

SKIN

The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.

Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions.

Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

Not normally a hazard due to non-volatile nature of product.

The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models).

Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.

CHRONIC HEALTH EFFECTS

There is some evidence that inhaling this product is more likely to cause a sensitisation reaction in some persons compared to the general population.

There is limited evidence that, skin contact with this product is more likely to cause a sensitisation reaction in some persons compared to the general population.

TOXICITY AND IRRITATION

~TOXICITY FIGURE

Oral~Rat~LD50~>5000~mg/kg

Dermal~Rabbit~LD50~>5000~mg/kg

None~None~None~None~None

~OTHER

WATER:

No significant acute toxicological data identified in literature search.

Section 12 - ECOLOGICAL INFORMATION

DO NOT discharge into sewer or waterways.

Section 13 - DISPOSAL CONSIDERATIONS

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.

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- Dispose of by: Burial in a licenced land-fill or Incineration in a licenced apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
- Containers may still present a chemical hazard/ danger when empty.
- Return to supplier for reuse/ recycling if possible.

Otherwise:

- If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
- Where possible retain label warnings and MSDS and observe all notices pertaining to the product.

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM: None

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS:UN,
IATA,
IMDG

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE

None

REGULATIONS

water (CAS: 7732- 18- 5) is found on the following regulatory lists;

Australia Inventory of Chemical Substances (AICS)

OECD Representative List of High Production Volume (HPV) Chemicals

Section 16 - OTHER INFORMATION

REPRODUCTIVE HEALTH GUIDELINES

These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise. CR = Cancer Risk/10000; UF = Uncertainty factor: TLV believed to be adequate to protect reproductive health: LOD: Limit of detection Toxic endpoints have also been identified as: D = Developmental; R = Reproductive; TC = Transplacental

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carcinogen Jankovic J., Drake F.: A Screening Method for Occupational
Reproductive American Industrial Hygiene Association Journal 57: 641-649
(1996).

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CHEMWATCH. TEL (+61 3) 9572 4700.

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(Chemwatch 2006)

16.1.3 Fecasol

MATERIAL SAFETY DATA SHEET

FECASOL: A FECAL FLOTATION SOLUTION (30521-01848 OR 01849)

EVSCO PHARMACEUTICALS (800) 267-5707

DIVISION OF VÉTOQUINOL USA, INC.

101 LINCOLN AVE.

BUENA, N.J. 08310-0687

Date Prepared: 17 January 2003

Section I - Hazardous Ingredients/ Identity Information

Hazardous Components	OSHA PEL	ACGIH TLV
Sodium Nitrate (CAS 07631-99-4)		
There is 1.58kg of sodium nitrate in each gallon of purified water.		

Section II- Physical/Chemical Characteristics

Boiling Point	N/A	Specific Gravity H2O = 1	1.2 @ 25 C
Vapor Pressure	N/A	Melting Point	N/A
Vapor Density (air=1)	N/A	Evaporation Rate	N/A
Solubility in Water		Soluble	
Appearance and Odor: Clear, colorless liquid			

Section III- Fire and Explosion Hazard Data

Flash Point	Flammable Limits	LEL	UEL
Extinguishing Media: Use extinguishing media appropriate for surrounding fire conditions.			
Special Fire Fighting Procedures: Wear self-contained breathing apparatus.			
Unusual Fire & Explosion Hazards: **** Sodium nitrate powder is a strong oxidizer, however remaining in solution, it is considered non-regulated for DOT purposes. *****			

Section IV - Reactivity Data

Stability	Unstable	Conditions to Avoid: High temperatures		
	Stable	X		
Incompatibility (materials to avoid): Cyanides, strong reducing agents and acids				
Hazardous Decomposition or Byproducts				
Hazardous Polymerization	May Occur		Conditions to Avoid	
	Will Not Occur			
				X

MATERIAL SAFETY DATA SHEET

Product: FECASOL FECAL FLOTATION SOLUTION (03521-01848 OR 01849)

Date Prepared: 17 January 2003

Section V - Health Hazard Data

Routes of Entry:	Inhalation	Skin X	Oral X
Health Hazards (Acute & Chronic) May cause eye irritation. Ingestion may cause irritation to mouth and stomach. Ingestion of large amounts may cause dizziness, abdominal cramps, vomiting and headaches.			
Carcinogenicity: Some experimental data on animals indicate that sodium nitrate may be carcinogenic.	NTP?	ARC	OSHA
Signs and Symptoms of Exposure: As above.			
Medical Conditions Generally Aggravated by Exposure:			
Emergency & First Aid Procedures: EYES: Flush with plenty of water and contact a physician. In case of ingestion immediately induce vomiting if conscious and consult a physician.			

Section VI - Precautions for Safe Handling & Use

Steps to Be Taken In Case of Spill or Release: Wear complete protective equipment including NIOSH approved respiratory protection. Absorb on sand or vermiculite and place in a closed container for disposal.
Waste Disposal Method: Dispose IAW federal, state and local regulations.
Precautions To Be Taken in Handling & Storage: Keep container tightly closed and away from incompatible materials.
Other Precautions: Read and follow label instructions and instructions accompanying fecal analysis device before use.

Section VII - Control Measures:

Respiratory Protection (Specify Type) Not required for normal use.		
Ventilation	Local Exhaust adequate	Special adequate
	Mechanical(General) adequate	Other N/A
Protective Gloves Preferred		Eye Protection Not required for normal use.
Other Protective Clothing or Equipment Not required for normal use.		
Work/Hygienic Practices Not required for normal use.		

The information contained in this Material Safety Data Sheet (MSDS) has been compiled from information believed to be accurate and from our own experiences. While we

believe that the data presented is factual, Vétroquinol USA, Inc. and its divisions make no warranty or representation, nor assume any responsibility in conjunction with the use of this information.

(AccessButler 2007)

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16.1.4 Formalin

FIRST PRIORITY, INC. Page: - 1

Date: May 29, 2003

PRODUCT NAME: FORMALDEHYDE 10% (FORMALIN)

This Material Safety Data Sheet is being provided to your company, for the purpose of providing current health and safety information to your management and employees who work with this product. Please read the data provided and then provide it to those people at your company who have the responsibility to insure compliance with both FEDERAL and STATE Right to

Know regulations, and to those employees that request information on this product.

Federal Regulations: Parts 29 and 42 Code of Federal Regulations.

State of Illinois: Public Act 83-240

SECTION 1 - PRODUCT IDENTIFICATION

Manufacturer: First Priority, Inc.

1585 Todd Farm Drive

Elgin, IL 60123

Telephone Number: 800-650-4899

Emergency Number: Chemtrec

800-424-9300

Chemical Family: Mixture

Formula: N/A

Hazard Classification: Hazardous

HMIS Rating System: Health-3/Flammability-0/Reactivity-0

SECTION 2 - HAZARDOUS COMPONENTS

Ingredient CAS# PEL/TLV Percent

Formaldehyde 50-00-0 0.5 ppm 10.0%

Methanol 67-56-1 200 ppm 3.0%

The hazard communication standard requires that such mixtures be assumed to present the same health hazard as do components that constitute as least 1% of the mixture (0.1% for carcinogens) although OSHA has noted that the hazards of individual components may be altered by including them in a mixture. Some of the ingredients of this mixture are a trade secret. NE = not established.

SECTION 3 - PHYSICAL DATA

Boiling Point: 100°C **Specific Gravity:** 1.03

Vapor Pressure: 12 mm at R.T. **Percent Volatile:** 100%

Vapor Density: >1 **Evaporation Rate:** Similar to water

Solubility in Water: N/A **Appearance & Odor:** Clear liquid with pungent odor

FIRST PRIORITY, INC. Page: - 2

Date: May 29, 2003

PRODUCT NAME: FORMALDEHYDE 10% (FORMALIN)

SECTION 4 - FIRE & EXPLOSION DATA

Flash Point (Method): NE

Estimated Flammable Limits in Air: N/A

Extinguishing Media: Water spray, dry chemical, "alcohol foam" or CO2.

Special Fire Fighting Procedures: Must wear MSHA/NIOSH approved self-contained breathing apparatus and protective clothing. Cool fire-exposed containers with water spray.

Unusual Fire & Explosion Hazards: Containers exposed to intense heat should be cooled with water to prevent vapor pressure buildup which could result in container rupture.

SECTION 5 - HEALTH HAZARD DATA

Effects Of Overexposure

Eyes: Causes chemical burns.

Skin: Causes irritation. May be harmful if absorbed through skin.

Inhalation: Harmful if inhaled. Can cause irritation of nose, throat and lungs. Can cause central nervous system depression.

Ingestion: May be harmful if swallowed. If accidentally swallowed, burns or irritation to mucous membranes, esophagus or GI tract can result. Ingestion may cause blindness. Can cause central nervous system depression.

Emergency First Aid Procedures:

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes. Eyelids should be held apart during

irrigation to insure water contact with entire surface of eyes and lids. Get medical attention immediately.

Skin Contact: Thoroughly wash exposed area with soap and large quantities of water for at least 20 minutes. Contact a

physician if irritation persists. If there are chemical burns, cover the area with sterile, dry dressings and get medical attention immediately.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If

breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion: If accidentally swallowed, dilute by drinking large quantities of water. Immediately contact poison control

center or hospital emergency room for any other additional treatment directions.

SECTION 6 - REACTIVITY DATA

Stability: Normally stable, but may further react at high temperatures to form methanol, formic acid or methylals. At low temperatures will self-polymerize to form paraformaldehyde.

Conditions to avoid: Keep away from heat.

Incompatibility: Reacts with many compounds. Reaction with phenol, strong acids or alkalis may be violent.

Reaction with hydrochloric acid may form bis-chloromethyl ether, and OSHA regulated carcinogen.

Hazardous

Decomposition Byproducts: NE

Hazardous Polymerization: Will not occur.

SECTION 7 - SPILL OR LEAK PROCEDURES

Steps To Be Taken In Case Of Large Amount Of Material Is Released Or Spilled:

Always wear appropriate protective equipment. Eliminate all ignition sources and ventilate the area to reduce the potential for

exposure, fire and explosion. Recover and reuse as much liquid as possible. Large quantities: Enclose with diking material

to prevent seepage into sewer systems, surface/ground water or natural bodies of water. If possible, neutralize with dilute

(<5%) solutions of ammonium hydroxide, sodium hydroxide, sodium bisulfite or sodium sulfite. Small quantities: Soak up

with absorbent material (vermiculite, dry sand, earth) and remove to a chemical disposal area. Follow all emergency

notification and reporting regulations.

FIRST PRIORITY, INC. Page: - 3

Date: May 29, 2003

PRODUCT NAME: FORMALDEHYDE 10% (FORMALIN)

SECTION 7 - SPILL OR LEAK PROCEDURES (continued)

Waste Disposal Methods:

Recover free liquid. Absorb residue and dispose of according to all local, state/provincial and federal regulations. Empty

containers may contain explosive vapors. **Do not** cut, puncture or weld on or nearby.

SECTION 8 - SPECIAL PROTECTION

Respiratory Protection: Where air contaminants can exceed acceptable criteria, use NIOSH/MSHA approved

full face piece respiratory protection equipment.

Ventilation: If airborne contaminants are generated when the material is heated or handled, sufficient ventilation in volume and air flow patterns should be provided to keep air contaminant concentration levels below acceptable criteria.

Protective Gloves: Rubber solvent resistant.

Eye Protection: Wear chemical splash goggles or some other type of complete protection for the eye if contact is likely.

Other Protective Equipment: Emergency eye wash stations and showers should be available. Reusable protective clothing should be cleaned and ventilated after any formaldehyde contamination. Wash hands thoroughly after using product. Avoid breathing vapors.

SECTION 9 - SPECIAL PRECAUTIONS OR COMMENTS

Special precautions to be taken

in handling & storing: Storage temperature depends on methanol content and should be controlled to avoid precipitation or vaporization. Formaldehyde solutions will start to precipitate paraformaldehyde if stored below their recommended storage temperatures making the freezing point difficult to determine.

Other precautions: See Section 8.

Initial Date: May 29, 2003

Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof. First Priority, Inc. makes no representations as to the completeness or accuracy thereof. Information is provided upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will First Priority, Inc. be responsible for damages of any nature whatsoever resulting from use of or reliance upon said information presented herein. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

(AccessButler 2007)

16.1.5 Isoflurane

MATERIAL SAFETY DATA SHEET

IDENTITY: ISOFLURANE (1-CHLORO-2,2,2-TRIFLUOROETHYL
DIFLUOROMETHYL ETHER)

SECTION I: MANUFACTURER

HALOCARBON LABORATORIES Emergency Number: (803) 278-3504
(Div. of Halocarbon Products Corp.)
P.O. Box 661 Customer Service & Sales: (201) 262-8899
River Edge, N.J. 07661
Prepared by: Dr. Neville P. Pavri

SECTION II: CHEMICAL IDENTITY

CAS OSHA ACGIH Other
Components No. PEL TLV Internal Guide
1-Chloro-2,2,2-Trifluoroethyl 50 ppm
Difluoromethyl Ether 26675-46-7 None None (8 hour TWA)

OSHA HAZARD RATING:

This product contains the following toxic chemical(s) subject to Section
313 Title III reporting requirements (40 CFR Part 372).
None

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point : 48.5 C Vapor Pressure: 330mmHg @ 20 C
Melting Point : Not known Vapor Density(Air=1): >1
Specific Gravity(H₂O=1): 1.50 Solubility in Water : Negligible
Appearance and Odor: Clear, colorless liquid with slight pungent odor

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point/Method: None Autoignition Temp: Not determined
Flammability Limits in Air - LEL: N/A UEL: N/A
Extinguishing Media: Non-flammable. Use methods appropriate for
surroundings.
Special Fire Fighting Procedures: Wear self-contained breathing

apparatus if there is danger of leakage.

Unusual Fire and Explosion Hazards: Emits toxic and corrosive fumes under fire
conditions.

SECTION V - REACTIVITY DATA

Unstable [] Conditions to Avoid: N/A

Stable [X]

Incompatibility (Materials to Avoid): Reactive metals such as sodium, potassium, or finely divided zinc, aluminum or magnesium, especially at high temperature.

Hazardous Decomposition or By-products: Halogen acids and carbonyl halides formed by thermal or oxidative decomposition.

Hazardous Polymerization [] May Occur [X] Will Not Occur

Conditions To Avoid: N/A

=====

=====SECTION VI - HEALTH HAZARD DATA

RTECS Number KN6799000

Rat: oral LD50 4770 mg/kg (KSRNAM 21,3031,87)

Rat: inhalation LC50 15,300 ppm/3 hours

Rat: intraperitoneal LD50 4280 mg/kg

Mouse: oral LD50 5080 mg/kg

Mouse: inhalation LC50 16,800 ppm/3 hours

Mouse: intraperitoneal LD50 3030 mg/kg

Reproductive effects (RTECS)

Inhalation of isoflurane at a concentration of 0.5-3.0% can induce general anesthesia in 7 to 10 minutes, with analgesia, muscle relaxation, and loss of consciousness. Isoflurane is mildly pungent and may cause coughing, laryngospasm and breath holding in an unconscious individual; secretions may be slightly stimulated and pharyngeal and laryngeal reflexes may be obtunded. Isoflurane is a severe respiratory depressant, causing a decreased tidal volume that may produce hypercapnia. Blood pressure is depressed with an initial decrease in systemic vascular resistance, heart rate and cardiac output, although rate and output may increase due to compensatory mechanisms. Arrhythmias can occur, and the myocardium may be slightly sensitized to epinephrine. Renal blood flow, glomerular filtration and urine flow are decreased without residual renal depression or renal injury following isoflurane anesthesia. Isoflurane does not appear to produce liver injury when given for prolonged periods. Inhalation of higher concentrations may lead to death by medullary paralysis. Those recovering from exposure may exhibit shivering, nausea, vomiting, ileus, or excitation,

and there may be a transient white blood count increase. A slight decrease in intellectual function may persist for 2-3 days, with small mood changes or symptoms possible for 6 days. Induction of general anesthesia may cause malignant hyperthermia from hypermetabolism of skeletal muscles in susceptible individuals.

Target organs are respiratory, cardiovascular and central nervous system.

Primary routes of entry: [X] Inhalation [X] Skin [] Eyes [] Oral

Acute Effects of Overexposure: Anesthesia, respiratory depression, coughing

Chronic Effects of Overexposure: No present evidence demonstrates that isoflurane is a mutagen, teratogen or carcinogen.

In a study by Corbett, male Swiss ICR mice (but not females) exposed to isoflurane were found to have a higher incidence of liver tumors than control mice. The study was found to be flawed. When the flaws were corrected the results were negative.

May cause sterility or other reproductive effects.

Carcinogenicity listing: [NO] NTP [NO] IARC [NO] OSHA

[NO] Other:

IARC Cancer Review: Group-3, Human Inadequate Evidence, Animal Inadequate Evidence.

Exposure Limits/Toxicity: See also Section II

NIOSH: 2ppm/1 hr. ceiling limit is the recommended exposure limit to waste anesthetic gas

Internal: 50 ppm TWA (same TWA recommended by the ACGIH for Halothane, a similar inhalation anesthetic)

First Aid

Inhalation: Remove to fresh air. If necessary give artificial respiration and seek medical help.

Skin: Wash immediately with soap and water.

Eye: Flush eyes out for at least 15 minutes with water. Seek medical help.

Oral: Induce vomiting if conscious. Seek medical help.

Medical Conditions Generally Aggravated by Exposure: Myocardial sensitization to epinephrine.

Other Health Hazards: None known

=====

=====

SECTION VII - PROTECTION INFORMATION

Respiratory: Self-contained breathing apparatus for emergency use

Ventilation: Adequate general and local ventilation

Eye and Face: Safety glasses or goggles and/or face shield

Gloves: Impervious gloves

Other equipment: Provide safety shower and eye wash facilities

=====

=====

SECTION VIII - SPILL, LEAK AND DISPOSAL PROCEDURES

Spill, Leak, or Release: Allow small spills to dissipate with good ventilation. For large spills wear self-contained breathing apparatus and absorb on vermiculite and place in closed container.

Waste Disposal: This material may be incinerated by licensed waste disposal company. Observe all federal, state & local regulations.

=====

=====SECTION IX - OTHER INFORMATION

1. Hazardous Materials/Dangerous Goods Shipping Regulations

Anesthetics are classified as Dangerous Goods/Hazardous Materials when shipped by air. U.S. and international shipping regulations require that any person(s) shipping Dangerous Goods be properly trained and certified. Shipping Dangerous Goods without meeting these requirements is a violation of U.S. law and the shipper could be subject to fines and/or imprisonment. Anesthetics cannot be shipped by U.S. Mail. U.S.

(49 CFR): N/A (Regulated by Air Only)

IATA: Proper Shipping Name: Aviation Regulated Liquid, N.O.S.

(1-Chloro-2,2,2-Trifluoroethyl Difluoromethyl Ether)

Hazard Class: 9; ID No.: UN 3334

Packaging Group: NA

IMDG: N/A (Regulated by Air Only)

2. Other Information: HMIS Labeling: H1; F 0; R0, PB

=====

===== REVISED: JULY 7, 2003

(AccessButler 2007)

16.1.6 Ivomec

----- MATERIAL SAFETY DATA SHEET -----
ECOMECTIN CATTLE POUR-ON
IVERMECTIN 5 MG/ML

MANUFACTURED FOR ACCESS ANIMAL HEALTH, INC

SECTION I - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

IDENTITY:

ANADA 200-348

TRUE NAME: IVERMECTIN

TRADE NAME: ECOMECTIN CATTLE POUR-ON

PRODUCT NUMBER(S): 30234, 30225, 30205, 30231

ANADA SPONSOR: ECO LLC LAS VEGAS, NV 89131

MARKETED BY: ACCESS ANIMAL HEALTH ARGYLE, NY 12809

1-866-483-7632

EMERGENCY TELEPHONE NUMBER FOR SPILLS AND ACCIDENTAL

RELEASE: CHEMTREC 1-800-424-9300

DATE PREPARED: 16 SEPTEMBER 2002

SECTION II - COMPOSITION, INFORMATION ON INGREDIENTS

COMPOSITION:

Hazardous Components

(Specific Chemical Identity;

Common Name(s)), CAS Number OSHA PEL ACGIH TLV %

Ivermectin Mixture 70288-88-7 Not Est. Not Est. 0.5 w/v
(Comp. B1a and B1b)

Other Limits Recommended: ECL: 0.08 mg/M3

Isopropyl Alcohol 67-63-0 400 ppm 400 ppm 80.0 v/v

Other Limits Recommended: Not Established

Inert Ingredients 16.0 w/v

Other Limits Recommended: Not Established

SECTION III - HAZARDS IDENTIFICATION

APPEARANCE AND ODOR: Clean, clear, blue liquid.

OSHA/DOT HAZARD CLASSIFICATION(S):

PRODUCT 30234: Drugs or medicines, NOI, Consumer
Commodity, Class 70 NMFC 6000RVNX

PRODUCTS 30225, 30205 & 30231: Isopropanol Solution, Class 3,
UN1219, PG II, Drugs or medicines, NOI, Class 70 RVNX

POTENTIAL HEALTH HAZARDS: Pure Ivermectin in Rats

INHALATION:

INHALATION LD50: >5.11 mg/L

INGESTION:

ORAL LD50: 50 mg/kg

SKIN:

DERMAL LD50: >660 mg/kg

Page 1 of 5

SECTION IV – FIRST AID MEASURES

SIGNS AND SYMPTOMS OF EXPOSURE:

Symptoms may include decreased activity, slow rate of breathing, dilation of pupils, muscle tremors, and incoordination.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:

None Known

EMERGENCY AND FIRST AID PROCEDURES:

EYE: Immediately flush with water for at least 5 minutes. Get medical attention if irritation persists.

SKIN: Flush with water and wash contact area with soap and water after handling. Remove contaminated clothing and wash before reuse.

INHALATION: Remove to fresh air. Get medical attention if symptoms persist.

INGESTION: Get immediate medical attention if significant quantity is ingested. Do NOT induce vomiting.

SECTION V – FIRE FIGHTING MEASURES

FLASH POINT (deg C/deg F) (Method Used): 14 deg C/58 deg F

Penske closed cup
FLAMMABLE LIMITS:

LEL: 2.5 (IPA)

UEL: Not Available

EXTINGUISHING MEDIA:

Carbon dioxide, dry chemical, alcohol resistant foam. Use water spray to cool fire-exposed containers.

SPECIAL FIRE FIGHTING PROCEDURES:

Do not use solid stream of water to avoid spreading fire. Firefighters should wear self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Isopropyl Alcohol is a moderate explosion hazard when exposed to heat, flames, or oxidizers. Vapors are heavier than air and may travel considerable distances to an ignition source.

SECTION VI – ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

Eliminate all ignition sources. Absorb small spills in suitable absorbent material and place in sealed container for disposal. Dike large spills and transfer to an appropriate container for disposal.

CALL CHEMTREC 1-800-424-9300. Avoid contact of spilled materials with soil and surface waterways.

SECTION VII – HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

Store in closed containers in a cool dry, well-ventilated area away from oxidizers, heat, sparks, and open

flame. Follow local regulation for the storage of flammable liquids. Protect from light. Avoid contact

with eyes and skin, do not breathe vapors or mist. Do not ingest. Wash thoroughly after handling. Do not

smoke or eat while handling the product.

OTHER PRECAUTIONS:

Keep container closed when not in use. Release any built-up pressure by loosening closure slowly. Do not

transfer contents to unlabelled containers. Use only with adequate ventilation. Keep out of reach of children.

SECTION VIII - EXPOSURE CONTROLS, PERSONAL PROTECTION

RESPIRATORY PROTECTION:

If vapors or mist are above the ECL, an approved respirator for vapors/mist is recommended.

VENTILATION:

LOCAL EXHAUST: Well ventilated area

MECHANICAL (General): Recommended

SPECIAL:

OTHER:

PROTECTIVE GLOVES: Rubber gloves and boots should be worn during application.

EYE PROTECTION: Goggles should be worn.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: Protective aprons and/or coveralls are

recommended. Wash protective clothing after use.

WORK/HYGIENIC PRACTICES: Avoid contact with eyes and skin. Do not breathe vapors or mist. Do

not ingest. Do not eat or smoke when handling material. Wash thoroughly with soap and water after handling.

SECTION IX - PHYSICAL AND CHEMICAL PROPERTIES

FLASH POINT (deg C/deg F) (Method Used): 14 deg C/58 deg F

Penskey closed cup

FLAMMABLE LIMITS:

LEL: 2.5 (IPA)

UEL: Not Available

APPEARANCE: Clean, clear, blue liquid

BOILING POINT (deg C/deg F): 82.5 deg C/180 deg F

SPECIFIC GRAVITY (H₂O = 1): 0.784 (IPA)

pH: Not Available

ODOR: Characteristic smell of alcohol

VAPOR PRESSURE (mm Hg.): 33 mmHg @ 20 deg C/88 deg F (IPA)

FREEZING/MELTING POINT (specify) (deg C/deg F): Not Available

PHYSICAL STATE: Liquid

VAPOR DENSITY (AIR = 1): 20 IPA

EVAPORATION RATE (Butyl Acetate = 1): Not Available

SOLUBILITY IN WATER: Not Available

SECTION X - STABILITY AND REACTIVITY DATA

STABILITY: Stable

CONDITIONS TO AVOID: None under normal conditions and use.

INCOMPATIBILITY (Materials to Avoid): Isopropyl alcohol is incompatible with acetaldehyde, chlorine, ethylene oxide, hypochlorous acid, isocyanates, phosgene, oleum, perchloric acid, and strong oxidizing agents.

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: None Known

HAZARDOUS POLYMERIZATION: Will Not Occur

Page 3 of 5

SECTION XI - TOXICOLOGICAL INFORMATION

ACUTE DATA:

PURE IVERMECTIN IN RATS:

ORAL LD50: 60 mg/kg

DERMAL LD50: >550 mg/kg

INHALATION LD50: >5.11 mg/L

TARGET ORGANS: None Known

CARCINOGENICITY:

NTP? Not Listed

IARC MONOGRAPHS? Not Listed

OSHA REGULATED? Not Listed

SPECIAL STUDIES (epidemiology, carcinogenicity, other studies relevant to subject materials):

[Dr. William C. Campbell Ivermectin and Abacaetin (New York: Springer-Verlag. 1989) 100]

SECTION XII - ECOLOGICAL INFORMATION

ECOTOXICITY (fish and invertebrates, plant life, birds, other):

IVERMECTIN: Very toxic to certain aquatic species.

LC50 - Daphnia magna, 48 hours = 0.025 ppb; NOEL (No Observable Effect Level) Daphnia magna = 0.01 ppb;

LC50 - Rainbow trout, 96 hours = 3.0 ppb;

LC50 - Bluegill sunfish, 96 hours = 4.8 ppb.

ENVIRONMENTAL FATE (persistence, degradation, hydrolytic/photolytic stability, etc.): Ivermectin

photodegrades rapidly in the environment and is metabolized in the soil. Water solubility is limited and

it binds to soil very tightly. It does not bioconcentrate in fish and is not taken up from soil to plants. Both

aquatic and terrestrial studies confirm rapid degradation of Ivermectin in the environment and lack of accumulation and persistence.

SECTION XIII - DISPOSAL CONSIDERATIONS

Responsibility for proper waste disposal is with the owner of the waste.

EPA/RCRA WASTE NUMBERS UNDER RCRA 40CFR 261: D001,

Flammable Liquids

WASTE DISPOSAL METHOD: Residual surface areas, spill residues, and absorbing materials will be

incinerated at temperatures greater than 600 deg C.

SPECIAL INSTRUCTION OR SPECIFIC LIMITATIONS: Avoid contact of spilled materials and runoff

with soil and surface waterways.

SECTION XIV- REGULATORY INFORMATION

OSHA: N/A

DOT/IATA/IMDG:

DOT: 49CFR

IATA: Dangerous Goods Regs.

IMDG: International Marine Dangerous Goods Regs.

EPA/RCRA: 29 CFR

SECTION XV - OTHER

RIGHT TO KNOW HAZARD INFORMATION: (4=Severe Hazard; 3=Serious Hazard;
2=Moderate Hazard; 1=Slight Hazard; 0=Minimal Hazard)

HEALTH: 1

FIRE: 3

REACTIVITY: 0

OTHER (Specify): 0

KEY/LEGENDS USED:

"N/A" = Not Applicable

"CFR" = Code of Federal Regulations

"DOT" = Department of Transportation

"IATA" = International Air Transport Association

"IMDG / IMO" = International Marine Dangerous Goods /

International Maritime Organization

PREPARATION DATE: 01 September 2002

REVISION INFORMATION: Initial Version

OTHER:

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(AccessButler 2007)

16.1.7 Ketamine

10 July 2003 Page 1 of 3

Replaces MSDS Dated 27 August 1998

Material Safety Data Sheet: *Parnell Ketamine Injection*

STATEMENT OF HAZARDOUS NATURE:

Hazardous substance according to criteria of Worksafe Australia.

MANUFACTURER COMPANY DETAILS: LICENSEE (NEW ZEALAND) DETAILS:

Parnell Laboratories (Aust) Pty Ltd Parnell Laboratories New Zealand Limited

Address Address

Unit 6, Century Estate Unit 2, 13-19 Highbrook Drive
476 Gardeners Road East Tamaki
Alexandria, NSW 2015 New Zealand
Australia

Telephone Number Telephone Number

61 (0)2-9667 4411 64 (0)9 273 7270 (Business Hours)
0800 446282 (Toll free from NZ to Australia) (BH)

Emergency Telephone Number Emergency Telephone Number

61 (0)2-9667 4411 (Business Hours) 64 (0)9 273 7270 (Business Hours)
0800 446282 (Toll free from NZ to Australia) (BH)

Facsimile Number Facsimile Number

61 (0)2-9667 4139 64 (0)9 273 7260

IDENTIFICATION

Product Name

Parnell Ketamine Injection

Other Names

Ketamine

U.N. Number

No UN number allocated

Dangerous Goods Class and Subsidiary Risk

No class and subsidiary risk allocated

Hazchem Code

No Hazchem code allocated

Poisons Schedule

Schedule 4 (Australia)

Prescription Animal Remedy (P.A.R) Class II (New Zealand)

Packaging

Labelled 20mL or 50mL amber glass vial sealed with rubber stopper and aluminium closure

Use

FOR ANIMAL TREATMENT ONLY.

For veterinary use for induction of anaesthesia; for use singly or in combination with muscle relaxants or

tranquillisers.

PHYSICAL DESCRIPTION AND PROPERTIES:

Appearance and Odour Solubility in Water

Clear, colourless solution Aqueous solution

10 July 2003 Page 2 of 3

Replaces MSDS Dated 27 August 1998

Material Safety Data Sheet:

Parnell Ketamine Injection

Boiling Point Melting Point

Not determined Not determined

10 July 2003 Page 3 of 3

Replaces MSDS Dated 27 August 1998

Material Safety Data Sheet:

Parnell Ketamine Injection

Vapour Pressure Specific Gravity

Not determined Not determined

Flash Point Flammability Limits

Not determined Not determined

pH Other Properties

3.5 - 5.5

INGREDIENTS:

Chemical Entity CAS Number Proportion

Ketamine Hydrochloride 1867-66-9 10%

Preservative <1%

Water 7732-18-5 to 100%

HEALTH HAZARD INFORMATION

HEALTH EFFECTS:

Acute Exposure:

LD₅₀ mice, ip 224 ± 4mg/kg

Rats, ip 229 ± 5mg/kg

Ketamine may cause confusion hallucinations and irrational behaviour, increased muscle tone, tachycardia and

hypertension (although hypotension, cardiac arrhythmias and bradycardia have also been reported), and respiratory depression. Nausea and vomiting have also been reported. High doses produce dissociative anaesthesia (anaesthetic doses: intravenously: 2mg/kg ketamine, equivalent to 1.4mL/70kg *Parnell Ketamine Injection*; intramuscularly: 10mg/kg, equivalent to 7mL 70kg *Parnell Ketamine Injection*.) Significant effects as a result of accidental exposure to *Parnell Ketamine Injection* are unlikely. Ketamine may be subject to substance abuse.

Swallowed

Ketamine may be absorbed from the gastrointestinal tract.

Eye

Ketamine may be absorbed from the conjunctival mucosa, and may cause eye irritation.

Skin

Significant absorption of ketamine through intact skin is unlikely.

Inhaled

Significant accidental absorption of ketamine via inhalation is unlikely.

Chronic Exposure:

Hallucinations may recur and there is the possibility of psychoses resulting from repeated substance abuse involving ketamine.

FIRST AID:

Swallowed

Seek medical attention if required

Eye

10 July 2003 Page 4 of 3

Replaces MSDS Dated 27 August 1998

Material Safety Data Sheet:

Parnell Ketamine Injection

If in eyes, hold eyes open, flood with water for at least 15 minutes. Seek medical assistance if required.

Skin

If skin contact occurs remove contaminated clothing and wash skin thoroughly with soap and water.

Inhaled

No specific requirements. Seek medical attention if required.

First Aid Facilities

No specific first aid facilities required.

ADVICE TO DOCTOR

Treat symptomatically as required. Provide respiratory support if necessary. Diazepam or other benzodiazepines may reduce hallucinogenic and other effects.

PRECAUTIONS FOR USE

Exposure Standards

No exposure standard allocated

Engineering Controls

Not applicable

Personal Protection

Wear gloves when handling product.

Avoid spraying or splashing of the preparation.

Avoid eating, drinking or smoking in area of product or during handling of product.

Avoid contamination of work area.

Flammability

Not flammable under conditions of use.

SAFE HANDLING INFORMATION

Storage and Transport

Store in secure area. Prevent unauthorised access.

Store below 30°C (Room Temperature). Protect from light.

Spills and Disposal

Clean up spilled material with absorbent ensuring no contact with skin during operation. Flush contaminated

area with water and detergent.

Dispose of waste in accordance with local, state or federal laws.

Fire/Explosion Hazards

This material is not considered a fire hazard. Use standard fire fighting techniques to extinguish fires involving

this material. Use water spray, dry chemical, carbon dioxide or foam.

OTHER INFORMATION

Contact Point

Production Manager Technical Services Manager

Parnell Laboratories (Aust) Pty Ltd Parnell Laboratories (Aust) Pty Ltd

Telephone: 61 (0)2 9667 4411 Telephone: 61 (0)2 9667 4411

(AccessButler 2007)

16.1.8 Lethobarb

VIRBAC (AUSTRALIA) PTY. LTD.

Document No:

Lethabarb

Revision A

MATERIAL SAFETY DATA SHEET

Product Name:

Lethabarb Euthanasia Injection

Page: 1 of 5

Date of Issue

24 November,

2004

Section 1 - Identification of Chemical Product and Company

Company: Virbac (Australia) Pty. Ltd ABN 77 003 268 871

Address 15 Pritchard Place, Peakhurst, NSW 2210, Australia

Locked Bag 1000, Peakhurst Delivery Centre, Peakhurst, NSW 2210, Australia

Telephone: (02) 9533 2000 or 1800 242 100

Fax: (02) 9533 1522

Emergency phone As above during business hours; answering machine after hours

Substance: Active ingredient is a barbiturate derivative.

Trade Name: Lethabarb Euthanasia Injection

Product Use: Injectable rapid euthanasia agent for dogs and cats.

Creation Date: June, 2002

Revision Date: November, 2004

Section 2 - Hazards Identification

STATEMENT OF HAZARDOUS NATURE

This product is classified as: Hazardous according to the criteria of NOHSC Australia.

Dangerous according to the Australian Dangerous Goods (ADG) Code.

Risk Phrases: R25, R36/37/38. Toxic if swallowed. Irritating to eyes, respiratory system and skin.

Safety Phrases: S20, S23, S38, S24/25. When using, do not eat or drink. Do not breathe mists. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin and eyes.

SUSDP Classification: S4

ADG Classification: Class 6.1 (TOXIC LIQUID, INORGANIC, N.O.S.)

UN Number: 3287

Emergency Overview

Physical Description & colour: Clear green solution in amber glass bottle.

Odour: No data.

Major Health Hazards: In all cases of excessive dose intake, the symptoms would be as follows: Nystagmus (rapid eye movements), miosis (contraction of pupils), slurred speech and ataxia (uncoordination in movements). With overdose, coma, respiratory and cardiovascular depression with hypotension (lowering of blood pressure) and shock leading to death. Also after rapid intravenous administration, apnoea (stop in respiration) may occur.

Potential Health Effects

Extremely dangerous, especially if injected intravenously as it will cause death very rapidly.

We suggest that this product only be used when the user is in the presence of another responsible adult.

Due to the high concentration of the active ingredient in this product, the principal danger is due to acute toxicity.

Chronic toxicity would appear if extremely low doses of the product were administered over a prolonged period (dependence). This is very unlikely to occur with this product.

Inhalation

Short term exposure: This product is an inhalation irritant. Symptoms may include headache, irritation of nose and throat and increased secretion of mucous in the nose and throat. Other symptoms may also become evident, but they should disappear after exposure has ceased. The product may be absorbed if it is actually instilled into the nose.

Skin Contact:

Short term exposure: This product is a skin irritant. Symptoms may include itchiness and reddening of contacted skin. Other symptoms may also become evident, but all should disappear once exposure has ceased. Not normally absorbed through the skin, unless applied on extensive skin lesions (broken skin).

Eye Contact:

Short term exposure: Irritating to eyes. Some absorption may occur through the eye mucosa. In addition, this product is an eye irritant. Symptoms may include stinging and reddening of eyes and watering which may become

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copious. Other symptoms may also become evident. If exposure is brief, symptoms should disappear once exposure has ceased. However, lengthy exposure or delayed treatment may cause permanent damage.

Ingestion:

Short term exposure: Toxic if swallowed. Can cause death, as pentobarbitone sodium is well absorbed by the oral route. First symptoms of intoxication (narcosis) may occur as early as 15 minutes after intake (with as low a dose as 100 to 200 mg for an adult person, i.e. less than 1 mL of LETHABARB). The acute oral LD₅₀ of the active ingredient in the rat is 118 mg/kg.

Carcinogen Status:

NOHSC: No significant ingredient is classified as carcinogenic by NOHSC.

NTP: No significant ingredient is classified as carcinogenic by NTP.

IARC: No significant ingredient is classified as carcinogenic by IARC.

Section 3 – Composition/Information on Ingredients

Ingredients CAS No Conc,% TWA (mg/m3) STEL (mg/m3)

Pentobarbital sodium 57-33-0 29.7 not set not set

Other non hazardous ingredients secret <10 not set not set

Water 7732-18-5 to 100 not set not set

This is a commercial product whose exact ratio of components may vary slightly. Minor quantities of other non

hazardous ingredients are also possible.

The TWA exposure value is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5

day working week. The STEL (Short Term Exposure Limit) is an exposure value that should not be exceeded for more than 15 minutes and should

not be repeated for more than 4 times per day. There should be at least 60 minutes between successive exposures at the STEL. The term "peak "is

used when the TWA limit, because of the rapid action of the substance, should never be exceeded, even briefly.

Section 4 - First Aid Measures

General Information:

You should call The Poisons Information Centre if you feel that you may have been poisoned, burned or irritated by

this product. The number is 13 1126 from anywhere in Australia and is available at all times.

Have this MSDS with

you when you call.

This product contains a barbiturate (sodium pentobarbitone) in a very high concentration form. It is intended to kill

animals and should not be used for any other purposes, such as anaesthesia, for example.

Gastric lavage, oral

administration of activated charcoal, intensive symptomatic and supportive therapy are part of the treatment. The

solution being extremely alkaline, necrosis or gangrene can follow subcutaneous injection.

Inhalation: If inhalation occurs, contact a Poisons Information Centre, or call a doctor at once.

Remove source of

contamination or move victim to fresh air. If breathing is difficult, oxygen may be beneficial if administered by trained

personnel, preferably on a doctor's advice. DO NOT allow victim to move about unnecessarily.

Symptoms of

pulmonary oedema can be delayed up to 48 hours after exposure.

Skin Contact: Quickly and gently, blot or brush away excess chemical. Wash gently and thoroughly with water (use

non-abrasive soap if necessary) for 20 minutes or until chemical is removed. Under running water, remove

contaminated clothing, shoes and leather goods (e.g. watchbands and belts). If irritation persists, repeat flushing and

obtain medical advice. Completely decontaminate clothing, shoes and leather goods before reuse or discard.

Eye Contact: If poisoning occurs, contact a Poisons Information Centre. Urgent hospital treatment is likely to be

needed. Quickly and gently blot or brush away chemical. Immediately flush the contaminated eye(s) with lukewarm,

gently flowing water for 20 minutes or until the chemical is removed, while holding the eyelid(s) open. Take care not to

rinse contaminated water into the unaffected eye or onto the face.

Ingestion: If swallowed, rinse mouth thoroughly with water and contact a Poisons Information Centre, or call a

doctor at once. Give activated charcoal if instructed.

Section 5 – Fire Fighting Measures

Fire and Explosion Hazards: There is no risk of an explosion from this product under normal circumstances if it is involved in a fire.

Fire decomposition products from this product may be toxic if inhaled. Take appropriate protective measures.

This product is likely to decompose only after heating to dryness, followed by further strong heating.

Extinguishing Media: Not Combustible. Use extinguishing media suited to burning materials. water fog. Water fog or fine spray is the preferred medium for large fires.

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Fire Fighting: When fighting fires involving significant quantities of this product, no special equipment is believed to be necessary.

Flash point: Does not burn.

Upper Flammability Limit: Does not burn.

Lower Flammability Limit: Does not burn.

Autoignition temperature: Not applicable - does not burn.

Flammability Class: Does not burn.

Section 6 – Accidental Release Measures

Accidental release: In the event of a major spill, prevent spillage from entering drains or water courses. Evacuate the spill area and deny entry to unnecessary and unprotected personnel. Immediately call the Fire Brigade. Wear full protective chemically resistant clothing including face mask, face shield, gauntlets and self contained breathing apparatus. See above under Personal Protection regarding Australian Standards relating to personal protective equipment. Suitable materials for protective clothing include rubber, PVC. Stop leak if safe to do so, and contain spill.

Absorb onto sand, vermiculite or other suitable absorbent material. If spill is too large or if absorbent material is not available, try to create a dike to stop material spreading or going into drains or waterways. Avoid using sawdust or other combustible material. Because of the toxicity of this product, special personal care should be taken in any cleanup operation. Sweep up and shovel or collect recoverable product into labelled containers for recycling or salvage, and dispose of promptly. After spills, wash area preventing runoff from entering drains. If a significant quantity of material enters drains, advise emergency services. Full details regarding disposal of used containers, spillage and unused material may be found on the label. If there is any conflict between this MSDS and the label,

instructions on the label prevail. Ensure legality of disposal by consulting regulations prior to disposal. Thoroughly launder protective clothing before storage or re-use. Advise laundry of nature of contamination when sending contaminated clothing to laundry.

Section 7 – Handling and Storage

Handling: Keep exposure to this product to a minimum, and minimise the quantities kept in work areas. Check

Section 8 of this MSDS for details of personal protective measures, and make sure that those measures are followed.

The measures detailed below under "Storage" should be followed during handling in order to minimise risks to

persons using the product in the workplace. Also, avoid contact or contamination of product with incompatible materials listed in Section 10.

Storage: This product is a Scheduled Poison. Observe all relevant regulations regarding sale, transport and storage

of this class of poison. Store in a cool, well ventilated area. Check containers periodically for leaks. Containers should

be kept closed in order to minimise contamination. Make sure that the product does not come into contact with

substances listed under "Materials to avoid" in Section 10. If you keep more than 1000kg or 1000L of Toxic

Substances of Packaging Group III, you will require a license to do so. If you have any doubts, we suggest you

contact your licensing authority in order to clarify your obligations. Check packaging - there may be further storage

instructions on the label.

Section 8 Exposure Controls and Personal Protection

The following Australian Standards will provide general advice regarding safety clothing and equipment:

Respiratory equipment: **AS/NZS 1715**, Protective Gloves: **AS 2161**, Industrial Clothing: **AS2919**, Industrial Eye

Protection: **AS1336** and **AS/NZS 1337**, Occupational Protective Footwear: **AS/NZS2210**.

Exposure Limits TWA (mg/m³) STEL (mg/m³)

Exposure limits have not been established by NOHSC for any of the significant ingredients in this product.

Ventilation: No special ventilation requirements are normally necessary for this product.

However make sure that

the work environment remains clean and that dusts are minimised.

Eye Protection: Protective glasses or goggles must be worn when this product is being used.

Failure to protect

your eyes may lead to severe harm to eyes or to general health. Emergency eye wash facilities must also be available

in an area close to where the product is being used.

Skin Protection: Prevent skin contact by wearing impervious gloves, clothes and, preferably, apron. Make sure that

all skin areas are covered. See below for suitable material types.

Protective Material Types: We suggest that protective clothing be made from the following materials: rubber, PVC.

Respirator: If there is a significant chance that vapours or mists are likely to build up in the area where this product

is being used, we recommend that you use a respirator. It should be fitted with a suitable cartridge.

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Eyebaths or eyewash stations and safety deluge showers should be provided near to where this product is being used.

Section 9 - Physical and Chemical Properties:

Physical Description & colour: Clear green solution in amber glass bottle.

Odour: No data.

Boiling Point: Approximately 100°C at 100kPa.

Freezing/Melting Point: Approximately 0°C.

Volatiles: Water component.

Vapour Pressure: 2.37 kPa at 20°C (water vapour pressure).

Vapour Density:

Specific Gravity: 1.08

Water Solubility: Completely soluble in water.

pH: 11.0 approx

Volatility: No data.

Odour Threshold: No data.

Evaporation Rate: No data.

Coeff Oil/water distribution: No data

Autoignition temp: Not applicable - does not burn.

Section 10 – Stability and Reactivity

Reactivity: This product is unlikely to react or decompose under normal storage conditions.

However, if you have

any doubts, contact the supplier for advice on shelf life properties.

Conditions to Avoid: None known.

Incompatibilities: strong acids, strong bases.

Fire Decomposition: Carbon dioxide, and if combustion is incomplete, carbon monoxide and smoke. Nitrogen and its compounds, and under some circumstances, oxides of nitrogen. Occasionally hydrogen cyanide gas. Water.

sodium compounds. Carbon monoxide poisoning produces headache, weakness, nausea, dizziness, confusion, dimness of vision, disturbance of judgment, and unconsciousness followed by coma and death. Hydrogen cyanide

poisoning signs and symptoms are weakness, dizziness, headache, nausea, vomiting, coma, convulsions, and death.

Death results from respiratory arrest. Hydrogen cyanide gas acts very rapidly; symptoms and death can both occur quickly.

Polymerisation: This product is unlikely to undergo polymerisation processes.

Section 11 – Toxicological Information

Target Organs: There is no data to hand indicating any particular target organs.

Classification of Hazardous Ingredients

Ingredient Risk Phrases

Pentobarbital Sodium: R25, R36/37/38

Pentobarbital Sodium: LD₅₀ Oral, Rat 118mg/kg

Section 12 – Ecological Information

Insufficient data to be sure of status.

Section 13 – Disposal Considerations

Disposal: Instructions concerning the disposal of this product and its containers are given on the product label.

These should be carefully followed.

Section 14 – Transport Information

ADG Code: 3287, TOXIC LIQUID, INORGANIC, N.O.S.

Hazchem Code: 2X

Special Provisions: SP109, SP185, SP274

Packaging Group: III

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Packaging Method: 3.8.6

This product is classed as UN3287, Dangerous Goods Class 6.1 Toxic Substances. Proper Shipping name is TOXIC

LIQUID, INORGANIC, N.O.S.. Class 6 Toxic Substances shall not be loaded in the same vehicle or packed in the

same freight container with Classes 1 (Explosives), 3 (Flammable Liquids where the Flammable Liquid is

nitromethane), 5.1 (Oxidising Agents where the Toxic Substances are Fire Risk Substances), 5.2 (Organic Peroxides

where the Toxic Substances are Fire Risk Substances), 8 (Corrosive Substances where the Toxic Substances are

cyanides and the Corrosives are acids), Foodstuffs and foodstuff empties. They may however be loaded in the same

vehicle or packed in the same freight container with Classes, 2.1 (Flammable Gases), 2.2 (Non-Flammable, Non-

Toxic Gases), 2.3 (Toxic Gases), 3 (Flammable liquids, except where the flammable liquid is nitromethane), 4.1

(Flammable Solids), 4.2 (Spontaneously Combustible Substances), 4.3 (Dangerous When Wet Substances), 5.1

(Oxidising Agents except where the Toxic Substances are Fire Risk Substances), 5.2 (Organic Peroxides except

where the Toxic Substances are Fire Risk Substances), 7 (Radioactive Substances), 8 (Corrosive Substances except

where the Toxic Substances are cyanides and the Corrosives are acids), 9 (Miscellaneous Dangerous Goods)

Section 15 – Regulatory Information

AICS: All of the significant ingredients in this formulation are to be found in the public AICS Database.

The following ingredient: Pentobarbital sodium is listed in the SUSDP.

Section 16 – Other Information

This MSDS contains only safety-related information. For other data see product literature.

Contact point: Technical Manager, QA Manager or R&D Director

Telephone (02) 9533 2000 or 1800 242 100

Fax (02) 9533 1522

Acronyms:

ADG Code Australian Code for the Transport of Dangerous Goods by Road and Rail

AICS Australian Inventory of Chemical Substances

CAS number Chemical Abstracts Service Registry Number

Hazchem Number Emergency action code of numbers and letters that provide information to emergency services especially firefighters

IARC International Agency for Research on Cancer

NOHSC National Occupational Health and Safety Commission

NOS Not otherwise specified

NTP National Toxicology Program (USA)

R-Phrase Risk Phrase

SUSDP Standard for the Uniform Scheduling of Drugs & Poisons

UN Number United Nations Number

THIS MSDS SUMMARISES OUR BEST KNOWLEDGE OF THE HEALTH AND SAFETY HAZARD INFORMATION OF THE PRODUCT AND

HOW TO SAFELY HANDLE AND USE THE PRODUCT IN THE WORKPLACE. EACH USER MUST REVIEW THIS MSDS IN THE CONTEXT OF

HOW THE PRODUCT WILL BE HANDLED AND USED IN THE WORKPLACE.

IF CLARIFICATION OR FURTHER INFORMATION IS NEEDED TO ENSURE THAT AN APPROPRIATE RISK ASSESSMENT CAN BE MADE,

THE USER SHOULD CONTACT THIS COMPANY SO WE CAN ATTEMPT TO OBTAIN ADDITIONAL INFORMATION FROM OUR SUPPLIERS

OUR RESPONSIBILITY FOR PRODUCTS SOLD IS SUBJECT TO OUR STANDARD TERMS AND CONDITIONS, A COPY OF WHICH IS SENT

TO OUR CUSTOMERS AND IS ALSO AVAILABLE ON REQUEST.

Please read all labels carefully before using product.

This MSDS is prepared in accord with the NOHSC document "National Code of Practice for the

Preparation of Material Safety Data Sheets" 2nd Edition [NOHSC:2011(2003)]

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<http://www.kilford.com.au/> Phone (02)9251 4532

(Virbac 2007)

16.1.9 Lignocaine

Troy Laboratories Pty. Limited
ABN: 21 000 283 769
98 Long Street Smithfield NSW 2164
Tel: (02) 9604 6266
Fax: (02) 9725 1772

MATERIAL SAFETY DATA SHEET

Hazardous according to the criteria of NOHSC Australia.

I IDENTIFICATION

Product Name: **ILIUM LIGNOCAINE 20**

Other Names: None.

Product Code: 3440

UN No: None allocated Hazchem Code: None allocated

Dangerous Goods Class: None allocated

Sub Risk Class: None allocated

Packaging Group: None allocated

Poison Schedule: S4

Chemical Family: Water solution of ingredients (see below). Active ingredient is a local anaesthetic.

Uses: Local anaesthetic used in horses, sheep, cattle, pigs, dogs and cats.

Physical Appearance & Properties

Appearance & Odour: Clear, colourless liquid. No odour.

Melting/softening point: Approximately 0°C.

Boiling point and vapour pressure: Approximately 100°C at 100kPa.

Volatile materials: Water component.

Flashpoint: Does not burn.

Specific gravity: No data.

Solubility in water: Completely soluble.

Corrosiveness: Not corrosive.

Ingredients Worksafe Exposure Limits

Chemical Entity CAS No Proportion, % TWA, mg/m³ STEL, mg/m³

Lignocaine hydrochloride 6108-05-0 2.0 not set not set

Other non hazardous ingredients secret <2.0 not set not set

Water 7732-18-5 to 100 not set not set

This is a commercial product whose exact ratio of components may vary. Trace quantities of impurities are also likely.

II HEALTH HAZARD DATA

Health Effects:

No specific data is available for the product for chronic exposure symptoms. The ingredients are not listed as carcinogenic in Worksafe's document "Exposure Standards for Atmospheric Contaminants in the Occupational Environment" (May 1995), nor in NOHSC's "List of Designated Hazardous Substances" (April 1999).

Acute Effects:

This is a pharmacologically active preparation, and contact should be avoided except in actual use. If you have come into contact with this product, seek medical attention if you feel drowsy or experience any unusual symptoms.

Swallowed: Data suggests that this product is harmful if swallowed. May cause anaesthesia. May also lead to

headaches, nausea, vomiting and possible convulsions.

Eye: This product is mildly irritating to the eyes. It is likely to cause mild discomfort such as watering and redness of the

eyes. However, this should quickly disappear once exposure is over.

Skin: This product may be mildly irritating to skin. However, it is unlikely to cause any more than mild transient

discomfort. It is also unlikely to cause any lasting effects.

Inhalation: Data suggests that this product should present no significant problems.

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First Aid:

If poisoning occurs, contact a Doctor or Poisons Information Centre. Phone 13 1126 from anywhere in Australia.

Accidental self-injection: Accidental self-injection may produce tranquilisation and other central nervous system effects.

In such instances, seek medical advice immediately. If possible the application of gentle squeezing pressure with absorbent material (e.g. facial tissue) at the injection site will swab up unabsorbed material.

Strong squeezing of the site should be avoided. The damaged area should be thoroughly cleansed and a topical antiseptic applied.

Eyes: If product gets in eyes, wash material from them with running water. If they begin watering or reddening, take special care in washing thoroughly.

Skin: If product gets on skin, thoroughly wash contacted areas. No further measures should normally be required

unless irritation is noticed. If irritation persists, seek medical attention.

Inhalation: No first aid measures normally required. However, if vapours or mists have been inhaled, and irritation has

developed, remove to fresh air and observe until recovered. If irritation becomes painful or persists more than about 30

minutes, seek medical advice.

Advice to Doctor: Accidental self-injection may lead to an inflammatory response and deep injections, particularly those

near a joint or associated with bruising should be treated medically or surgically.

III PRECAUTIONS FOR USE

Risk Phrases are: R40/22. Harmful: possible risk of irreversible effects if swallowed.

Exposure Standards:

A time weighted average (TWA) concentration for an 8 hour day, and 5 day week has not been established by NOHSC

Australia for any of the major ingredients in this product. There is a blanket limit of 10mg/m³ for dusts or mists when

limits have not otherwise been established.

Engineering Controls:

In industrial situations, concentration values below the TWA value should be maintained. Values may be reduced by

process modification, use of local exhaust ventilation, capturing substances at the source, or other methods. If you believe air borne concentrations of mists, dusts or vapours are high, you are advised to modify the process or environment to reduce the problem.

Personal Protection:

The following measures are applicable when using or handling opened or damaged containers of the product.

Respiratory Protection: It is usually safe to not use a dust mask or respirator protection on account of this product.

However, if the product is being used in dusty or confined conditions, use of a mask or respirator may be preferred. For

help in selecting suitable equipment, consult AS/NZS 1715.

Protective Gloves: Impermeable protective gloves should be worn when you are using this product, to prevent irritation.

For help in selecting suitable equipment, consult AS 2161.

Eye Protection: Protective eyewear is suggested when using this product. It is always prudent to use protective

eyewear. Consult AS1336 and AS/NZS 1337 for advice on Industrial Eye Protection.

Clothing: Clean overalls or protective clothing should be worn, preferably with an apron. Consult AS2919 for advice on

Industrial Clothing.

Safety Boots: Wearing safety boots in industrial situations is advisory. Consult AS/NZS2210 for advice on Occupational

Protective Footwear.

Always wash hands before smoking, eating or using the toilet. Wash contaminated clothing and other protective

equipment before storing or re-using.

IV SAFE HANDLING INFORMATION

Safety Phrases are: S20. When using, do not eat or drink.

Storage & Transport

No special storage and transport requirements. This product has no UN classification. This product is a S4 Poison.

Observe all relevant regulations regarding sale, transport and storage of this class of product.

Containers should be

kept closed in order to minimise contamination. Keep from extreme heat and open flames, and make sure that the

product does not come into contact with substances listed under "Materials to avoid" below.

Spills & Disposals

In the event of a major spill, prevent spillage from entering drains or water courses. Evacuate the spill area and deny

entry to unnecessary and unprotected personnel. Wear full protective clothing including face mask, face shield and

MATERIAL SAFETY DATA SHEET

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gauntlets. All skin areas should be covered. Thoroughly launder protective clothing before storage or re-use. See

above under Personal Protection regarding Australian Standards relating to personal protective equipment. Stop leak if

safe to do so, and contain spill. Absorb onto sand, vermiculite or other suitable absorbent material. Sweep up and

shovel or collect recoverable product into labelled containers for recycling or salvage. After spills, wash area

preventing runoff from entering drains. If a significant quantity of material enters drains, advise emergency services.

Full details regarding disposal of used containers, spillage and unused material may be found on the label. If there is

any conflict between this MSDS and the label, instructions on the label prevail. Dispose of only in accord with all

regulations. Advise laundry of nature of contamination when sending contaminated clothing to laundry.

Fire & Explosion Hazard

There is no risk of an explosion from this product under normal circumstances if it is involved in a fire.

Flashpoint: Does not burn.

Flammability limits: Not applicable. This product does not burn.

Extinguishing Media: This product does not burn. Use extinguishing media suited to the materials that are burning.

Special Fire Fighting procedures: When fighting fires involving significant quantities of this product, wear safety boots,

non-flammable overalls, gloves, hat and preferably, goggles.

Unusual Fire & Explosion Hazards: Likely to decompose only after heating to dryness followed by further strong heating.

Stability: This product is unlikely to spontaneously decompose.

Polymerisation: This product is unlikely to spontaneously polymerise.

Decomposition Products: No significant quantities of decomposition products are expected at temperatures normally achieved in a fire.

Materials to avoid: No particular incompatibilities.

V OTHER INFORMATION

This MSDS is prepared in accord with the Worksafe Australia document "National Code of Practice for the Preparation of Material Safety Data Sheets", 1994.

Contact Points:

Chief Chemist

TROY LABORATORIES PTY LIMITED

98 Long Street Smithfield NSW 2164

Telephone: (02) 9604 6266

Facsimile: (02) 9725 1772

Police and Fire Brigade: 000

National Poisons Information Centre: 13 1126 (from anywhere in Australia)

Please read all labels carefully before using product.

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<http://www.kilford.com.au/> Phone (02) 9516 2079

(Troy Laboratories 2007)

16.1.10 Metacam

Metacam 0.5% Injection

Material Safety Data Sheet

Section 2: Hazardous Ingredients

Name CAS# % by Weight TLV/PEL LC50 / LD 50

Ethanol

Meloxicam

64-17-5

71125-38-7

150 mg/ml

0.5

Not available

7.5 ug/m3 (Boehringer

exposure limit)

Not available

ORAL (LD50): Acute: 84

mg/kg [Rat]

ORAL 470 mg/kg

[Mouse]

ORAL 320 mg/kg

[Rabbit]

Section 3: First Aid Measures

Eye contact Check for and remove any contact lenses. IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. COLD water may be used. DO NOT use an eye ointment. Seek medical attention.

Skin contact After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated

skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. COLD water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated skin with soap and water.

Hazardous skin

contact

No additional information.

Slight inhalation No information available regarding inhalation. Seek immediate medical attention.

Hazardous inhalation No additional information.

Slight ingestion No information available regarding ingestion. Notify physician or Poison Control Center immediately.

Hazardous ingestion Not available

Section 4: Physical Data

Physical state and

appearance

Clear, yellow liquid

Odor Like ethanol

DOT HCS Risk Phrases Protective Clothing

Consumer Commodity, ORM-D

HCS CLASS: Flammable liquid

Section 1: Product Identification and Uses

Common/Trade

name

Metacam 0.5% Injection

CI# Not available

Synonyms Not available TSCA TSCA inventory:

No products were found.

Chemical name Not available CAS # Not available

Chemical formula Not available Code Not available

Chemical family Not available Molecular

weight

Not available

Supplier Boehringer Ingelheim Vetmedica, Inc.

2621 North Belt Hwy

St. Joseph MO 64506-2002

Manufacturer

Boehringer Ingelheim Vetmedica, Inc.

2621 North Belt Hwy

St. Joseph MO 64506-2002

816-233-2571

Material uses Non-steroidal anti-inflammatory drug for treatment of conditions of musculoskeletal system and management

of perioperative pain.

Metacam 0.5% Injection

PH (1% soln/water) 8.0 - 8.9 Taste Not available

Odor threshold Not available Color Clear yellow

Volatility Not available

Melting/Sublimation point Not available

Boiling/Condensation point Not available

Specific gravity (Water=1) 1.56

Vapor density Not available

Vapor pressure Not available

Water/oil dist. Coeff. Not available

Ionicity (surface active

agent)

Not available

Critical temperature Not available

Instability temperature Not available

Conditions of instability Not available

Dispersion properties Not available

Solubility Insoluble.

Section 5: Fire and Explosion Data

The product is: Flammable

Auto-ignition

temperature

Not available

Fire degradation

products

These products are carbon oxides (CO, CO₂), nitrogen oxides (NO, NO₂...)

Flash points 98° F

Flammable limits Flammable

Fire extinguishing

procedures

SMALL FIRE: Use DRY chemicals, CO₂, water spray or foam.

LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet.

Flammability Flammable

Risks of explosion No specific information is available in our database regarding the product's risks of explosion in the presence

of various materials.

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Section 6: Reactivity Data

Stability The product is stable.

Hazardous decomp.

products

Not available

Degradability Not available

Product of

degradation

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise. The products of degradation are less toxic than the product itself.

Corrosivity No specific information is available in our database regarding the corrosivity of this product in presence of

various materials.

Reactivity No specific information is available in our database regarding the reactivity of this product in presence of various materials.

Metacam 0.5% Injection

Page 3 of 4

Section 7: Toxicological Properties

Routes of entry Eye contact. Ingestion. Skin contact.

TLV Not available

Toxicity for animals Not available

Environmental hazards Not available

Chronic effects on humans Not available

Acute effects on humans Hazardous in case of skin contact (irritant) and/or eye contact (irritant). Slightly hazardous in case of

ingestion and/or inhalation. Non-sensitizer for skin. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Section 8: Preventive Measures

Waste information Not available

Waste stream Not available

Storage Materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F)

Precautions Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Keep container tightly closed and in a well-ventilated place. DO NOT ingest. Do not breathe gas, fumes, vapor or spray. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Small spill and leak Dilute with water and mop up, or absorb with an inert DRY material and place in an appropriate waste

disposal container. If necessary, neutralize the residue with a dilute solution of acetic acid.

Large spill and leak Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. DO NOT

touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed.

Eliminate all sources of ignition. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities. Keep away from heat. Keep away from sources of ignition.

Protective Clothing Splash goggles. Full suit Boots. Gloves. Wear NIOSH approved respirator if inadequate ventilation

Section 9: Classification

DOT Consumer Commodity, ORM-D

Maritime

transportation

Consumer Commodity, ORM-D

HCS HCS CLASS: Flammable liquid

Federal and

State

Regulations

Not available

HMIS (U.S.A.)

Reactivity

Personal Protection

1

3

0

B

National Fire Protection

Association (U.S.A.)

1 0

3 Fire Hazard

Reactivity

Specific hazard

Metacam 0.5% Injection

Page 4 of 4

Section 10: Protective Measures

Protective

clothing

Safety glasses. Lab coat. Be sure to use a MSHA approved respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Engineering
controls

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Section 11: Other Information

References Not available

Not available

Validated by Company: 3/22/05

CALL 1(800) 821-7467

Emergency Medical: (800)530-5432

Chemtrec: (800)424-9300

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(amedical.com)

16.1.11 Neomycin

MATERIAL SAFETY DATA SHEET

May be used to comply with
OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List) Neomycin 325 Soluble Powder		<i>Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.</i>			
Manufacturer's Name Bimeda, Inc.		Emergency Telephone Number 816-364-3777 (days); 816-487-2010 (evenings)			
State and ZIP Code Address (Number, Street, City, 460 NW Parkway Riverside, MO 64150		Telephone Number for Information 816-364-3777 (days); 816-487-2010 (evenings)			
Date Prepared February, 25, 2002					
Signature of Preparer (optional)					
Section II - Hazardous Ingredients/Identity Information					
COMPOSITION: Antibacterial					
Hazardous Components (Specific Chemical Identity, Common Name(s))		OSHA PEL	ACGIH TLV	Other Limits Recommended	% (Optional)
Neomycin (base)		Na		Na	50%
Section III - Physical/Chemical Characteristics					
Boiling Point	N / A	Specific Gravity (H ₂ O = 1)			N/A
Vapor Pressure (mm Hg.)	N / A	Melting Point			N/A
Vapor Density (AIR = 1)	N / A	Evaporation Rate (Butyl Acetate = 1)			N / A
Solubility in Water Complete					
Appearance and Odor Brown powder with earthy odor.					
Section IV - Fire and Explosion Hazard Data					
Flash Point (Method Used) NA	Flammable Limits NA			LEL N / A	UEL N / A
Extinguishing Media Water spray, carbon dioxide, dry chemical powder, foam.					
Special Fire Fighting Procedures Firefighter should use self-contained breathing apparatus and turn out gear.					
Unusual Fire and Explosion Hazards This material is assumed to be combustible. As with all dry powders, it is advisable to ground mechanical equipment in contact with dry material to dissipate the potential buildup of static electricity. When heated to decomposition, material emits toxic fumes. Emits toxic fumes under fire conditions.					

(Reproduce locally)
OSHA 174, Sept. 1985

Section V - Reactivity Data		
Stability	Unstable	Conditions to Avoid
Stable		X
Incompatibility (<i>Materials to Avoid</i>) Avoid contact with solutions of anionic substances such as sodium lauryl sulfate, sodium cephalothin and sodium novobiocin.		
Hazardous Decomposition or Byproducts Toxic fumes of carbon monoxide, carbon dioxide, nitrogen oxides and sulfur oxides.		
Hazardous Polymerization	May Occur	Conditions to Avoid
Will Not Occur		X
Section VI - Health Hazard Data		
Route(s) of Entry: Eyes? Inhalation? Skin? Ingestion? May cause irritation. May be harmful. May be harmful May be toxic.		
Health Hazards (<i>Acute and Chronic</i>) Can be toxic upon ingestion.		
Carcinogenicity: NTP? IARC Monographs? OSHA Regulated? Unknown		
Signs and Symptoms of Exposure Irritation to skin, nasal, respiratory tracts and eyes. Can be toxic. Persons developing hypersensitivity (anaphylactic) reactions must receive immediate medical attention.		
Medical Conditions Generally Aggravated by Exposure Not listed.		
Emergency and First Aid Procedures: In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. In case of eye contact, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating eyelids with fingers. Persons developing serious hypersensitivity reactions must receive immediate medical attention.		
Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing id difficult, give oxygen. Ingestion: Wash out mouth with water. Call a physician.		
Section VII - Precautions for Safe Handling and Use		
Steps to Be Taken in Case Material Is Released or Spilled Wear a respirator, chemical safety goggles, rubber boots and heavy rubber gloves. Sweep up, place in a bag, and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.		
Waste Disposal Method Dispose of in solid waste fill in accordance with local, state or federal regulations.		
Precautions to Be Taken in Handling and Storing May cause allergic skin reaction. Avoid prolonged or repeated exposure. Wash thoroughly after handling. Keep tightly closed. Store in a cool, dry place.		
Other Precautions Light and air sensitive.		
Section VIII - Control Measures		
Respiratory Precaution (<i>Specify Type</i>) Wear NIOSH/MSHA approved respirator for dust.		
Ventilation	Local Exhaust Should be provided.	Special
Mechanical (<i>General</i>) Yes		Other Use with adequate ventilation.
Protective Gloves Yes, chemical resistant gloves.		Eye Protection Yes, safety goggles/glasses
Other Protective Clothing or Equipment Safety shower and eye wash station.		
Work/Hygienic Practices Normal accepted practices which minimize contact with eyes, mouth, nose and skin.		
OTHER STORAGE REQUIREMENT: Keep tightly closed, store in a cool, dry place. Light and air sensitive. ANIMAL TOXICITY: Neomycin (base) – oral mouse LD50: 1250mg/kg		

The information contained herein is considered to be correct as of the date of this data sheet but does not purport to be all inclusive and shall be used only as a guide.

No warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.

Bimeda, Inc. assumes no responsibility for damages caused by the use, storage or disposal of the product in a manner not recommended on the product label. Users assume all risks associated with such unrecommended use, storage, or disposal of the product.

16.1.12 Panacur

Panacur 100 – Issue 2

Page 1 of 4

MATERIAL SAFETY DATA SHEET

PANACUR 100

Issue Date: March 24th, 2001

Review Date: March 24th, 2003

Company Address: Intervet Ltd

P O Box 4079

Auckland

New Zealand

Phone: (09) 309-0600

Fax: (09) 309-9101

Emergency Tel. No.: John Southworth

R & D Manager

Intervet Ltd

021-932-876

Poisons Information Centre: 0800-764-766

1. IDENTIFICATION

1.10 Product Name: Panacur 100

1.11 Correct Shipping Name: Panacur 100 (1L, 5L, 10L and 20L)

1.12 ARB Number: 7154

1.13 UN Number: Not applicable

1.14 Hazchem Code: Not applicable

1.15 Dangerous Goods Class: Not classified

Sub-risk:

1.16 Poison Schedule: NA

1.17 Manufacturers Product

Code: 000006 (1L), 000007 (5L)

1.18 Use: Oral anthelmintic for sheep, goats, cattle and horses.

Panacur 100 – Issue 2

Page 2 of 4

1.2 Ingredients

1.20 Chemical Entity CAS Number. Proportion

*Fenbendazole 43210-67-9 100g/L

Water carrier 7732-18-5 >600g/L

*(5 – (phenylthio) – 1H – Benzimidazol – 2 – YL) Carbamic Acid Methyl Ester

* Active Constituent

+ Confidential Manufacturing Information

1.21 Chemical Characterisation: Suspension.

1.3 Physical Description / Properties

1.30 Form: A white liquid

1.31 Colour: White

1.32 Odour: Slightly chalky odour

1.33 Change in Physical State: Stable under normal conditions

1.34 SG: Not available

1.35 Vapour Pressure: Not available

1.36 Viscosity: Not available

1.37 Solubility in Water: Dispersion

1.38 pH Value: Not available

1.39 Flash Point: Not available

1.40 Boiling Point: Not available

1.41 Explosive Limits: Not applicable

2. HEALTH HAZARD INFORMATION

2.1 Health Effects:

2.10 Information on Toxicity: a) Eyes – Avoid contact with the eyes

b) Skin – Not considered hazardous

c) Ingestion – Only hazardous if swallowed in large amounts

d) Inhalation – Not considered hazardous

2.2 First Aid

2.20 First Aid: a) Eyes – Wash with copious amounts of clean water for 15 minutes.

b) Skin – Wash with soap and water

c) Ingestion – Contact doctor or Poisons Information Centre

d) Inhalation – Remove from the source of the fumes

Reassure the casualty and encourage them to rest.

Panacur 100 – Issue 2

Page 3 of 4

2.21 Advice to Doctor: Note ingredients and their possible irritant effects

3. PRECAUTIONS FOR USE

3.1 Exposure Standards / Engineering Control

3.10 Regulations: This product is not subject to Australian Code for the Transport of Dangerous Goods by Road and Rail.

3.11 Technical Protective Measures: No special measures are required. Store away from

food, drink and animal feedstuffs. Store below 30°C. Do not freeze. Shake before use. Wash hands thoroughly after handling. Do not eat, drink or smoke until after washing.

3.2 Personal Protective Measures

3.21 Personal Protective

Equipment: None required

3.22 Industrial Hygiene: Avoid contact with the skin and eyes. Follow the data sheet instructions.

3.3 Flammability

3.31 Protection Against Fire: No special precautions required. The product is not flammable.

4. MEASURES IN CASE OF ACCIDENTS AND FIRES

4.1 Storage and Transport Store below 30°C. Do not freeze.

4.11 Classification under the

Transportation of

Dangerous Goods Code: Not classified as a dangerous good

Shipping Name: Panacur 100

Packing Group: None allocated

UN Number: None allocated

DG Class: None allocated

Sub-risk: None allocated

Hazchem: None allocated

4.12 International Transport

Codes: Not applicable

4.2 Spills and Disposals

4.21 Place unused material in a sealed container and dispose of in an authorised landfill.

4.22 After Spillage/Leakage: Eliminate sources of ignition.

Absorb spills into an inert material (sand, soil, hydrated lime or vermiculite) or another absorbent material (i.e. paper towel). Wash the residue from the area with large quantities of water.

4.23 Disposal of Spillage: Place recovered material in a sealed container and dispose of in an authorised landfill

Panacur 100 – Issue 2

Page 4 of 4

4.3 Fire / Exposure Hazards

4.35 Thermal Decomposition: No hazards known

4.36 Hazardous Decomposition

Products: No hazards known

4.37 Hazardous Reactions: None known

4.38 Extinguishing Media: Water, foam or dry chemical

5. OTHER INFORMATION

5.10 Information on Ecological Effects:

Flora: No effects anticipated

Fauna (rat): Oral LD₅₀ = >1000mg/kg

Fish: No effects anticipated

Birds: No effects anticipated

Soil: No effects anticipated

Water: Do not allow product to enter waste water, rivers or creeks.

6. CONTACT POINT (For Non-Emergency Calls)

6.10 Product Safety Coordinator: John Southworth

R & D Manager

Intervet Limited

09-309-0600

DISCLAIMER

The Material Safety Data Sheet has been developed according to OSH guidelines.

The data, information and recommendations herein ("information") are represented in good faith and believed to be correct as of the date hereof.

The purpose of this Material Safety Data Sheet is to describe product in terms of their safety requirements. Intervet Ltd makes no representation of merchantability, fitness for a particular purpose or application, or of any other

nature with respect to the information or the product to which the information refers ("the product").

The information is supplied upon the condition that the persons receiving same will make their own determination as

to its suitability for their purposes prior to use of the product.

The physical data shown herein are typical values based on material tested. These values should not be construed

as a guaranteed analysis of any specific lot or as guaranteed specification for the product or specific lots thereof.

Due care should be taken to make sure that the use or disposal of this product is in compliance with relevant Local

Government regulations.

(AccessButler 2007)

16.1.13 Repti-cal

Not classified as Hazardous according to criteria of Worksafe Australia

Issue date: February 2005 MSDS 129

|

IDENTIFICATION

Product Name: Aristopet Repti-Cal

Synonyms: NIL

Manufacturer's Product Code(s): RE04,RE05,RE055

Use: Natural Phosphorus-Free Calcium & Vitamin D3 Supplement

UN Number: None allocated

Proper Shipping Name: NONE ALLOCATED

Dangerous Goods Class: None allocated

Subsidiary risk: None allocated

Packing Group: None allocated

Hazchem Code: None allocated

Poison Schedule: None allocated

PHYSICAL PROPERTIES

Appearance: Fine white powder

Melting Point: N/A

Vapour Pressure: N/A

Specific Gravity: N/A

Flash Point: N/A

Flammability Limits: Not flammable

Solubility in Water: Insoluble

|

INGREDIENTS

SUBSTANCE NAME Proportion CAS Number

CALCIUM CARBONATE Greater than 60% 471-34-1

NON-HAZARDOUS SUBSTANCES 1 to 10% Mixture

H

HEALTH HAZARD INFORMATION

ACUTE HEALTH EFFECTS

NOT CLASSIFIED AS HAZARDOUS ACCORDING TO THE CRITERIA OF WORKSAFE AUSTRALIA

HAZARD CATEGORY: None allocated

ACUTE HEALTH EFFECTS

Swallowed:

Large doses may cause irritation to mouth and throat.

Eye:

May cause irritation to the eyes, with effects including: tearing, pain, stinging and blurred vision.

Skin:

Not expected to cause any health effects.

|

Inhaled:

This product may cause irritation to the nose, throat and respiratory system with effects including: Cough, discomfort, difficulty breathing and shortness of breath.

Not classified as Hazardous according to criteria of Worksafe Australia

Issue date: February 2005 MSDS 129

MSDS 129 Page 2 of 3

Document Issue: 01 Aristopet Pty Ltd Printed 14/02/2005

Chronic:

None allocated

FIRST AID

Swallowed:

If swallowed, DO NOT induce vomiting. Give 3 to 4 glasses of water to drink. If irritation persists transport to hospital or doctor.

Eye:

If dust enters the eyes, flush with plenty of water for at least 15 minutes, ensuring eye lids are held open. If irritation persists, immediately transport to hospital or doctor.

Skin:

None required.

I

Inhaled:

Move victim to fresh air.

First Aid Facilities:

Eye wash fountain, safety shower and normal wash room facilities.

Advice to Doctor:

Treat symptomatically.

In case of poisoning, contact Poisons Information Centre

In Australia call Tel: 131126

In New Zealand Tel:0800 764 766

P

RECAUTIONS FOR USE

Exposure Standards

No exposure standards are available for this product, however, the following exposure standards have been assigned by the

National Occupational Health & Safety Commission (NOHSC) to the following components of the product:

CALCIUM CARBONATE

(Worksafe Australia)

[TWA]10 mg/m³

WATER AND OTHER NON-HAZARDOUS SUBSTANCES

No Exposure details available

Engineering Controls

Good industrial hygiene practice requires that employee exposure be maintained below the recommended exposure standards. This

is preferably achieved through the provision of adequate ventilation where necessary. Where dust cannot be controlled in this way,

personal respiratory protection should be employed.

Personal Protection Equipment

GLOVES: None required during normal use..

EYES: Chemical goggles or faceshield may be desirable when handling large quantities.to protect eyes.

RESPIRATORY PROTECTION: Avoid breathing of dusts. The use of a respirator is not normally required, however, if high dust

levels are present, then the use of a suitable dust mask or half-face respirator with a P1 filter is recommended. All respirators must

comply with AS/NZS 1715 and AS/NZS 1716.

S

AFE HANDLING INFORMATION

Avoid generating dusts. Store in a cool place and out of direct sunlight. Store away from sources of heat or ignition. Store away from oxidizing agents. Keep containers closed, when not using the product. Store in original packages as approved by manufacturer.

Not classified as Hazardous according to criteria of Worksafe Australia

Issue date: February 2005 MSDS 129

MSDS 129 Page 3 of 3

Document Issue: 01 Aristopet Pty Ltd Printed 14/02/2005

Transport

UN Number: None allocated

Proper Shipping Name: NONE ALLOCATED

Dangerous Goods Class: None allocated

Subsidiary risk: None allocated

Packing Group: None allocated

Hazchem Code: None allocated

Not classified as a Dangerous Good according to the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Code) 6th Edition. Not classified as a Dangerous Good according to the UN, DOT(US), ICAO(IATA) or IMO(IMDG).

Spills

This product is a powder, under appropriate conditions dusts may be generated. Wear suitable protective equipment in these

circumstances. Ventilate area. If possible wet area down to prevent high dust levels. If spill occurs, use dustless methods, such as a

HEPA vacuum and filter. Otherwise, use a non-sparking shovel and place into a suitably labeled container for later disposal. Do not

dry sweep. Remainder of material can be picked up and re-cycled or disposed.

Disposal

Refer to appropriate authority in your State. Dispose of material through a licensed waste contractor. Normally suitable for disposal

by approved waste disposal agent.

Fire

Fire/Explosion Hazard

If safe to do so, move undamaged containers from fire area.

Hazardous Decomposition Products: Decomposes on heating emitting soot, smoke and decomposition products.

Fire Fighting Procedures: Fire fighters to wear Self-contained breathing apparatus (SCBA) in confined spaces, in oxygen deficient

atmospheres or if exposed to products of decomposition. Full protective clothing is also recommended.

Extinguishing Media: Use extinguishing media suitable for surrounding fire situation.

Flammability

This material is not a combustible or flammable solid.

O

OTHER INFORMATION

There is no toxicological information available for this product.

Ecotoxicity

None allocated

Poison Schedule

None allocated

RISK PHRASES

None allocated

SAFETY PHRASES

S26 In case of contact with eyes, rinse immediately with plenty of water and contact a doctor or Poisons Information Centre.

S39 Wear eye/face protection.

C

CONTACT POINT**Contact Point**

Mr Len Walker

Tel: 07 3630 2166

Disclaimer

The information herein is to the best of our knowledge, correct and complete. It describes the safety requirements for this product

and should not be construed as guaranteeing specific properties. Since methods and conditions are beyond our control we do not

accept liability for any damages resulting from the use of, or reliance on, this information in inappropriate contexts.

(Aristopet 2006)

16.1.14 Repti-hand



Material Safety Data Sheet

Not classified as Hazardous according to criteria of Worksafe Australia

Aristopet Repti- Hand

Issue date: April 2005

MSDS160

IDENTIFICATION

Product Name: Aristopet Repti-Hand
Synonyms: NIL
Manufacturer's Product Code(s): RE22, RE22-2093, RE23
Use: Used to sanitise hands before and after handling animals reducing spread of disease.
UN Number: 1170
Proper Shipping Name: ETHANOL SOLUTION (ETHYL ALCOHOL SOLUTION)
Dangerous Goods Class: 3
Subsidiary risk: None allocated
Packing Group: II
Hazchem Code: 2[Y]E
Poison Schedule: None allocated

PHYSICAL PROPERTIES

Appearance: Clear light green gel
Boiling Point: <100°C
Vapour Pressure: Not determined
Flash Point: Not determined
Flammability Limits: Not determined
Solubility in Water: Miscible
pH: 5.2-6.0

INGREDIENTS

SUBSTANCE NAME	Proportion	CAS Number
ETHANOL	Greater than 60%	64-17-5
TRICLOSAN	<1%	3380-34-5
WATER AND OTHER NON-HAZARDOUS SUBSTANCES	10 to 30%	Mixture

HEALTH HAZARD INFORMATION

ACUTE HEALTH EFFECTS

NOT CLASSIFIED AS HAZARDOUS ACCORDING TO THE CRITERIA OF WORKSAFE AUSTRALIA

HAZARD CATEGORY: None allocated

ACUTE HEALTH EFFECTS

Swallowed:

May cause irritation to mouth, throat and stomach with effects including mucous build up, irritation to the tongue and lips and pains in the stomach, which may lead to nausea, vomiting and diarrhoea.

Eye:

May cause irritation to the eyes, with effects including: tearing, pain, stinging and blurred vision.

Skin:

When used according to directions, none expected.

aristopet

Aristopet Pty Ltd. ABN 99 009 697 152
Head Office >>874 Kingsford Smith Drive
Eagle Farm Q Australia 4009
Postal Address >>PO Box 2
Fortitude Valley Q Australia 4006
Phone >>07 3630 2166
Fax >>07 3630 2177
email >>sales@aristopet.com.au
www.aristopet.com.au

We Love your pet too!

Material Safety Data Sheet

Not classified as Hazardous according to criteria of Worksafe Australia

Aristopet Repti- Hand

Issue date: April 2005

MSDS160

Inhaled:

Mists from the product may cause irritation to the nose, throat and respiratory system with effects including: Cough, discomfort, difficulty breathing and shortness of breath.

Chronic:

Prolonged or repeated skin contact may cause redness and itching.

FIRST AID

Swallowed:

If swallowed, DO NOT induce vomiting. Give 3 to 4 glasses of water to drink. Seek urgent medical assistance.

Eye:

If material is splashed into eyes, flush with plenty of water for at least 15 minutes, ensuring eye lids are held open. Immediately transport to hospital or doctor.

Skin:

If large amounts of material is splashed onto the skin, wash skin thoroughly with water.

Inhaled:

Product is a gel, and this is not a route of entry.

First Aid Facilities:

Eye wash fountain, safety shower and normal wash room facilities.

Advice to Doctor:

Treat symptomatically.

In case of poisoning, contact Poisons Information Centre

In Australia call Tel: 131126

In New Zealand Tel: 0800 764 766

PRECAUTIONS FOR USE

Exposure Standards

No exposure standards are available for this product, however, the following exposure standards have been assigned by the National Occupational Health & Safety Commission (NOHSC) to the following components of the product:

ETHANOL

(Worksafe Australia)

[TWA]1,000 ppm 1,880 mg/m³

References: H

(ACGIH)

[TWA]1,000 ppm 1,880 mg/m³

WATER AND OTHER NON-HAZARDOUS SUBSTANCES

No Exposure details available

Engineering Controls

Highly flammable liquid. Maintain adequate ventilation at all times. Prevent accumulation of vapours in hollows or sumps. Eliminate any sources of ignition. Elevated temperature or mechanical action may form vapours, mists or fumes which may require local exhaust ventilation systems.

MSDS-160
Document Issue: 01

Aristopet Pty Ltd

Page 2 of 4
Printed 19/04/05

Material Safety Data Sheet

Not classified as Hazardous according to criteria of Worksafe Australia

Aristopet Repti- Hand

Issue date: April 2005

MSDS160

Personal Protection Equipment

CLOTHING: None required during normal use.
GLOVES: None required during normal use.
EYES: None required during normal use.
RESPIRATORY PROTECTION: None required during normal use. Avoid breathing of vapours/gases. Select and use respirators in accordance with AS/NZS 1715/1716.

SAFE HANDLING INFORMATION

Store in a cool place and out of direct sunlight. Store away from sources of heat or ignition, strong alkalis, acids, combustibles and oxidizing agents. All equipment must be earthed. Store in original packages as approved by manufacturer. For further information please refer to the Engineering Controls of this MSDS.

Transport

UN Number: 1170
Proper Shipping Name: ETHANOL SOLUTION (ETHYL ALCOHOL SOLUTION)
Dangerous Goods Class: 3
Subsidiary risk: None allocated
Packing Group: II
Hazchem Code: 2[Y]E

Classified as a CLASS 3 (FLAMMABLE LIQUID) Dangerous Good according to the Australian Code for the Transport of Dangerous Goods by Road and Rail, 6th Edition.

Dangerous goods of Class 3 (Flammable Liquid) are incompatible in a placard load with any of the following:

- Class 1
- Class 2.1, if both the Class 3 and Class 2.1 dangerous goods are in bulk
- Class 2.3
- Class 4.2
- Class 5
- Class 6, if the Class 3 dangerous goods are nitromethane
- Class 7

Emergency information(Transport):

Dangerous Goods - Initial Emergency Response Guide (SAA/SNZ HB76:1997)

For LIQUIDS - Highly flammable, Guide No: 14

Spills

EMERGENCY ACTION:

Keep unnecessary people away; Isolate hazard area and deny entry. Stay upwind; Keep out of low areas. Do not walk or touch spill material unless wearing personal protection as outlined under MSDS.

SPILL OR LEAK PROCEDURE:

Shut off ignition sources, no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapour; but it may not prevent ignition in closed spaces.

SMALL SPILLS:

Take up with sand, dirt or vermiculite. DO NOT use sawdust. Use non-sparking tools or HEPA vacuum system. Place into labeled drum(s) for later disposal.

LARGE SPILLS:

Notify Emergency Services (Police or Fire Brigade). Tell them exact location, nature, hazards, quantities, type of vehicle and any other information that would be helpful. Contain spill. Remove all ignition sources and safely stop flow of spill. Bund area. Trained personnel should wear Personal Protective equipment as highlighted in this MSDS. Blanket the spill with foam or use water fog to disperse vapour clouds. Consult an expert regarding disposal of this product.

Material Safety Data Sheet

Not classified as Hazardous according to criteria of Worksafe Australia

Aristopet Repti- Hand

Issue date: April 2005

MSDS160

Disposal

Refer to appropriate authority in your State. Dispose of material through a licensed waste contractor. Advise flammable nature. Normally suitable for disposal by approved waste disposal agent.

Fire

Fire/Explosion Hazard

EXTINGUISHING MEDIA: Use dry chemical, carbon dioxide or foam.

SPECIAL FIRE FIGHTING PROCEDURES: Self-contained breathing apparatus (SCBA) required for fire-fighting personnel. If possible to do so safely, shut off fuel to fire. Use water spray to spray to cool fire-exposed surfaces and to protect personnel. Avoid spreading burning liquid with water used for cooling fire exposed containers when using water spray, boil-over may occur when the product temperature reaches the boiling point of water.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapours from this product may travel or be moved by air currents and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge or other ignition sources at locations distant from the point of handling.

Flammability

Highly flammable liquid. Avoid all sources of ignition, heat and naked flames.

OTHER INFORMATION

There is no toxicological information available for this product.

Ecotoxicity

This substance may cause long term adverse effects in the environment

Poison Schedule

None allocated

RISK PHRASES

R11 Highly flammable

SAFETY PHRASES

S2 Keep out of reach of children.

S7 Keep container tightly closed.

S16 Keep away from sources of ignition - No smoking.

CONTACT POINT

Contact Point

Len Walker

07 3630 2166

Disclaimer

The information herein is to the best of our knowledge, correct and complete. It describes the safety requirements for this product and should not be construed as guaranteeing specific properties. Since methods and conditions are beyond our control we do not accept liability for any damages resulting from the use of, or reliance on, this information in inappropriate contexts.

16.1.15 Repti-vite

Not classified as Hazardous according to criteria of Worksafe Australia

Issue date: February 2005 MSDS 125

|

IDENTIFICATION

Product Name: Aristopet Repti Vite Powder

Synonyms: [to be filled in]

Manufacturer's Product Code(s): RE02,RE03,RE035

Use: Vitamin & mineral supplement for reptiles

UN Number: None allocated

Proper Shipping Name: NONE ALLOCATED

Dangerous Goods Class: None allocated

Subsidiary risk: None allocated

Packing Group: None allocated

Hazchem Code: None allocated

Poison Schedule: None allocated

PHYSICAL PROPERTIES

Appearance: Brown Powder

|

INGREDIENTS

SUBSTANCE NAME Proportion CAS Number

CALCIUM HYDROGEN PHOSPHATE, DIHYDRATE 30 to 60% 7789-77-7

CALCIUM CARBONATE 10 to 30% 471-34-1

MAGNESIUM OXIDE Less than 1% 1309-48-4

COPPER SULFATE (Below Cutoff) Less than 1% 7758-98-7

ZINC OXIDE POWDER Less than 1% 1314-13-2

MANGANESE SULPHATE (Below Cutoff) Less than 1% 7785-87-7

FERROUS SULFATE HEPTAHYDRATE (Below Cutoff) 1 to 10% 7782-63-0

SODIUM CHLORIDE Less than 1% 7647-14-5

ETHOXYQUIN [6-ETHOXY-1,2-DIHYDRO-2,2,4-TRIMETHYLQUINOLINE] (Below Cutoff) Less than 1% 91-53-2

OTHER NON-HAZARDOUS SUBSTANCES 1 to 10% Mixture

H

HEALTH HAZARD INFORMATION

ACUTE HEALTH EFFECTS

NOT CLASSIFIED AS HAZARDOUS ACCORDING TO THE CRITERIA OF WORKSAFE AUSTRALIA

HAZARD CATEGORY: None allocated

ACUTE HEALTH EFFECTS

Swallowed:

May cause irritation to mouth, throat and stomach with effects including mucous build up, irritation to the tongue and lips and pains in the stomach, which may lead to nausea, vomiting and diarrhoea.

Eye:

May cause irritation to the eyes, with effects including: tearing, pain, stinging and blurred vision.

Skin:

May cause irritation to the skin, with effects including: Redness and itchiness.

Not classified as Hazardous according to criteria of Worksafe Australia

Issue date: February 2005 MSDS 125

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I

Inhaled:

May cause irritation to the nose, throat and respiratory system with effects including: Cough, discomfort, difficulty breathing and shortness of breath.

Chronic:

Additional information for Chronic

No significant long term exposure effects have been reported. However, repeated ingestion of some phosphates (120 - 240

mg/kg/day) has been shown to cause increased calcium excretion and soft tissue calcification in man

FIRST AID

Swallowed:

If swallowed, DO NOT induce vomiting. Give 3 to 4 glasses of water to drink. If irritation persists transport to hospital or doctor.

Eye:

If dust enters the eyes, flush with plenty of water for at least 15 minutes, ensuring eye lids are held open. If irritation persists, immediately transport to hospital or doctor.

Skin:

If dust is falls onto the skin, remove any contaminated clothing and wash skin thoroughly with soap and water. If irritation persists transport to hospital or doctor.

I

Inhaled:

Move victim to fresh air.

First Aid Facilities:

Eye wash fountain, safety shower and normal wash room facilities.

Advice to Doctor:

Treat symptomatically.

In case of poisoning, contact Poisons Information Centre

In Australia call Tel: 131126

In New Zealand Tel: 0800 764 766

P

RECAUTIONS FOR USE

Exposure Standards

No exposure standards are available for this product, however, the following exposure standards have been assigned by the

National Occupational Health & Safety Commission (NOHSC) to the following components of the product:

CALCIUM HYDROGEN PHOSPHATE, DIHYDRATE

(Worksafe Australia)

[TWA]10 mg/m³

CALCIUM CARBONATE

(Worksafe Australia)

[TWA]10 mg/m³

M

AGNESIUM OXIDE

(Worksafe Australia)

[TWA]10 mg/m³

References: H

Not classified as Hazardous according to criteria of Worksafe Australia

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(ACGIH)

[TWA]10 mg/m³

COPPER SULFATE (Below Cutoff)

No exposure standards have been assigned by the National Occupational Health & Safety Commission (NOHSC)

Z

INC OXIDE POWDER

(Worksafe Australia)

[TWA]10 mg/m³

References: H

(ACGIH)

[TWA]10 mg/m³

M

ANGANESE SULPHATE (Below Cutoff)

No exposure standards have been assigned by the National Occupational Health & Safety Commission (NOHSC)

F

ERROUS SULFATE HEPTAHYDRATE (Below Cutoff)

No exposure standards have been assigned by the National Occupational Health & Safety Commission (NOHSC)

SODIUM CHLORIDE

(Worksafe Australia)

[TWA]10 mg/m³

ETHOXYQUIN [6-ETHOXY-1,2-DIHYDRO-2,2,4-TRIMETHYLQUINOLINE] (Below Cutoff)

No exposure standards have been assigned by the National Occupational Health & Safety Commission (NOHSC)

WATER AND OTHER NON-HAZARDOUS SUBSTANCES

No Exposure details available

Engineering Controls

Good industrial hygiene practice requires that employee exposure be maintained below the recommended exposure standards. This

is preferably achieved through the provision of adequate ventilation where necessary. Where dust cannot be controlled in this way,

personal respiratory protection should be employed.

Personal Protection Equipment

GLOVES: Not required during normal use..

EYES: Chemical goggles or faceshield may be desirable to protect eyes.

RESPIRATORY PROTECTION: Avoid breathing of dusts.

S

SAFE HANDLING INFORMATION

Avoid generating dusts. Store in a cool place and out of direct sunlight. Store away from sources of heat or ignition.

Store away from

oxidizing agents. Keep containers closed, when not using the product. Store in original packages as approved by manufacturer.

Transport

UN Number: None allocated

Proper Shipping Name: NONE ALLOCATED

Dangerous Goods Class: None allocated

Subsidiary risk: None allocated

Packing Group: None allocated
Hazchem Code: None allocated

Not classified as Hazardous according to criteria of Worksafe Australia

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Not classified as a Dangerous Good according to the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

Code) 6th Edition. Not classified as a Dangerous Good according to the UN, DOT(US), ICAO(IATA) or IMO(IMDG).

Spills

This product is a powder, under appropriate conditions dusts may be generated. Wear suitable protective equipment in these

circumstances. Ventilate area. If possible wet area down to prevent high dust levels. If spill occurs, use dustless methods, such as a

HEPA vacuum and filter. Otherwise, use a non-sparking shovel and place into a suitably labeled container for later disposal. Do not

dry sweep. Remainder of material can be picked up and re-cycled or disposed.

Disposal

Refer to appropriate authority in your State. Dispose of material through a licensed waste contractor. Normally suitable for disposal

by approved waste disposal agent.

Fire

Fire/Explosion Hazard

If safe to do so, move undamaged containers from fire area.

Hazardous Decomposition Products: Decomposes on heating emitting soot, smoke and decomposition products.

Fire Fighting Procedures: Fire fighters to wear Self-contained breathing apparatus (SCBA) in confined spaces, in oxygen deficient

atmospheres or if exposed to products of decomposition. Full protective clothing is also recommended.

Extinguishing Media: Use extinguishing media suitable for surrounding fire situation.

Flammability

This material is not a combustible or flammable solid.

O

OTHER INFORMATION

There is no toxicological information available for this product.

Ecotoxicity

None allocated

Poison Schedule

None allocated

RISK PHRASES

None allocated

SAFETY PHRASES

S2 Keep out of reach of children.

S22 Do not breathe dust.

S24/25 Avoid contact with skin and eyes.

S26 In case of contact with eyes, rinse immediately with plenty of water and contact a doctor or Poisons Information Centre.

S36/39 Wear suitable protective clothing and eye/face protection.

C

CONTACT POINT

Contact Point

Mr Len Walker
Tel: 07 3630 2166

Disclaimer

The information herein is to the best of our knowledge, correct and complete. It describes the safety requirements for this product and should not be construed as guaranteeing specific properties. Since methods and conditions are beyond our control we do not accept liability for any damages resulting from the use of, or reliance on, this information in inappropriate contexts.
(Aristopet 2006)

16.1.16 Top of descent

CALLINGTON HAVEN TOP OF DESCENT
INSECTICIDE

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Revision No: 2

Hazard Alert Code:
MODERATE

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Hazard Alert Code:
MODERATE

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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: CALLINGTON HAVEN TOP OF DESCENT
INSECTICIDE

SYNONYMS

"d-phenothrin aircraft cabin insecticide spray"

PROPER SHIPPING NAME

AEROSOLS

PRODUCT USE

Aircraft aerosol insecticide for cabin spraying before landing.

SUPPLIER

Company: Callington Haven Pty Ltd

Address:

PO Box 144

Rydalmere

NSW, 2116

AUS

Company: Callington Haven Pty Ltd

Address:

30 South Street

Rydalmere

NSW, 2116

AUS

Telephone: +61 2 9898 2788

Emergency Tel: 1800 039 008 (24
hours)

Emergency Tel: +61 3 9573 3112

Fax: +61 2 9684 4215

HAZARD RATINGS

	Min	Max
Flammability:	0	
Toxicity:	0	
Body Contact:	2	Min/Nil=0 Low=1 Moderate=2 High=3 Extreme=4
Reactivity:	0	
Chronic:	0	

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

DANGEROUS GOODS. NON-HAZARDOUS SUBSTANCE. According to
the Criteria of NOHSC, and the ADG Code.

POISONS SCHEDULE

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None

RISK	SAFETY
Risk of explosion if heated under confinement.	Do not breathe gas/fumes/vapour/spray.
May produce discomfort of the respiratory system*.	Avoid contact with skin.
Possible respiratory and skin sensitiser*.	This material and its container must be disposed of as hazardous waste.

* (limited evidence).

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
d-phenothrin	51186-88-0	<10
propellant, as HFC		>60
NOTE: Manufacturer has supplied full ingredient information to allow CHEMWATCH assessment.		

Section 4 - FIRST AID MEASURES

SWALLOWED

For advice, contact a Poisons Information Centre or a doctor.

- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

EYE

If this product comes in contact with the eyes:

- Wash out immediately with fresh running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away

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from eye and moving the eyelids by occasionally lifting the upper and lower lids.

- If pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

If solids or aerosol mists are deposited upon the skin:

- Flush skin and hair with running water (and soap if available).
- Remove any adhering solids with industrial skin cleansing cream.
- DO NOT use solvents.
- Seek medical attention in the event of irritation.

INHALED

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor.

NOTES TO PHYSICIAN

Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- Water spray or fog.
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.

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- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water courses.
- Use fire fighting procedures suitable for surrounding area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

FIRE/EXPLOSION HAZARD

- Non combustible.
- Not considered to be a significant fire risk.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- Aerosol cans may explode on exposure to naked flames.
- Rupturing containers may rocket and scatter burning materials.
- Hazards may not be restricted to pressure effects.
- May emit acrid, poisonous or corrosive fumes.
- Decomposes on heating and may emit toxic fumes of carbon monoxide (CO).

Other combustion products include:
carbon dioxide (CO₂).
phosgene.
chlorides and fluorides.

HAZCHEM

2Y

Personal Protective Equipment

Breathing apparatus.

Gas tight chemical resistant suit.

Limit exposure duration to 1 BA set 30 mins.

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS

- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Wear protective clothing, impervious gloves and safety glasses.

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- Shut off all possible sources of ignition and increase ventilation.
- Wipe up.
- If safe, damaged cans should be placed in a container outdoors, away from all ignition sources, until pressure has dissipated.
- Undamaged cans should be gathered and stowed safely.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water courses
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse / absorb vapour.
- Absorb or cover spill with sand, earth, inert materials or vermiculite.
- If safe, damaged cans should be placed in a container outdoors, away from ignition sources, until pressure has dissipated.
- Undamaged cans should be gathered and stowed safely.
- Collect residues and seal in labelled drums for disposal.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

+ + + + + +

X: Must not be stored together

O: May be stored together with specific preventions

+: May be stored together

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.

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- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- Avoid smoking, naked lights or ignition sources.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- DO NOT incinerate or puncture aerosol cans.
- DO NOT spray directly on humans, exposed food or food utensils.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

SUITABLE CONTAINER

- Aerosol dispenser.
- Check that containers are clearly labelled.

STORAGE INCOMPATIBILITY

Avoid reaction with alkali metals, magnesium and magnesium alloys, zinc, aluminium alloys (2% magnesium).

Avoid contact with plastics such as methacrylate polymers, polyethylene and polystyrene.

STORAGE REQUIREMENTS

- Store in original containers.
- Store in an upright position.
- DO NOT store in pits, depressions, basements or areas where vapours may be trapped.
- No smoking, naked lights, heat or ignition sources.
- Keep containers securely sealed.
- Contents under pressure.
- Store in a cool, dry, well ventilated area; away from incompatible materials.
- Avoid storage at temperatures higher than 40 deg C.
- Protect containers against physical damage.
- Check regularly for leaks.

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- Observe manufacturer's storing and handling recommendations.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records

- d-phenothrin: CAS:51186-88-0

MATERIAL DATA

Not available. Refer to individual constituents.

INGREDIENT DATA

D-PHENOTHRIN:

No exposure limits set by NOHSC or ACGIH.

PERSONAL PROTECTION

EYE

No special equipment for minor exposure i.e. when handling small quantities.

- OTHERWISE:
- Safety glasses with side shields.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59]

HANDS/FEET

No special equipment needed when handling small quantities.

OTHERWISE: Wear general protective gloves, eg. light weight rubber gloves.

Or as required: Wear chemical protective gloves, eg. PVC. Wear safety footwear.

OTHER

No special equipment needed when handling small quantities.

OTHERWISE:

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- Overalls.
- Barrier cream.
- Eyewash unit.

DO NOT spray on hot surfaces.

ENGINEERING CONTROLS

General exhaust is adequate under normal operating conditions. If risk of overexposure exists, wear SAA approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Liquid in aerosol pack. Contains non-combustible propellant.

PHYSICAL PROPERTIES

Liquid.

Gas.

Does not mix with water.

Molecular Weight: Not applicable.	Boiling Range (°C): Not available.
Melting Range (°C): Not available.	Specific Gravity (water=1): Not available
Solubility in water (g/L): Immiscible	pH (as supplied): Not applicable
pH (1% solution): Not applicable.	Vapour Pressure (kPa): Not available.
Volatile Component (% vol): Not available	Evaporation Rate: Not available
Relative Vapour Density (air=1): >1	Flash Point (°C): Not applicable
Lower Explosive Limit (%): Not applicable	Upper Explosive Limit (%): Not applicable
Autoignition Temp (°C): Not applicable	Decomposition Temp (°C): Not available
State: Liquid	Viscosity: Not available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- Elevated temperatures.
- Presence of open flame.
- Product is considered stable.

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- Hazardous polymerisation will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

Overexposure is unlikely in this form.

Considered an unlikely route of entry in commercial/industrial environments.

The mist is discomforting to the gastro-intestinal tract.

EYE

The mist is discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/ or other transient eye damage/ ulceration.

Not considered an irritant through normal use.

SKIN

The material may be slightly discomforting to the skin.
if exposure is prolonged.

INHALED

The vapour/mist is discomforting to the upper respiratory tract and lungs.

Acute effects from inhalation of high vapour concentrations may be chest and nasal irritation with coughing, sneezing, headache and even nausea.

WARNING: Intentional misuse by concentrating/inhaling contents may be lethal.

Not considered an irritant through normal use.

CHRONIC HEALTH EFFECTS

Principal routes of exposure are usually by skin contact and inhalation of vapour/spray mist.

As with any chemical product, contact with unprotected bare skin; inhalation of vapour, mist or dust in work place atmosphere; or ingestion in any form, should be avoided by observing good occupational work practice.

WARNING: Aerosol containers may present pressure related hazards.

Section 12 - ECOLOGICAL INFORMATION

Marine Pollutant: Not Determined

Refer to data for ingredients, which follows:

D-PHENOTHIN:

Synthetic pyrethroids are examples of optimised insecticidal activity, selectivity and tailored environmental persistence. Through modifications of both acid and alcohol portions of the ester, compounds of desired residual activity have been synthesised whilst maintaining a biodegradable ester linkage. These compounds are generally very toxic to crustaceans and fish in laboratory bioassays. Under

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field conditions, however, the residues are tightly bound in sediment, and ingested residues are readily metabolised. Their toxicity in natural systems are generally less than laboratory test data might indicate. They are generally non-persistent in the environment.

Pyrethrins are generally unstable in the presence of light, are hydrolysed rapidly under alkaline conditions and oxidise rapidly in air. Vapour phase pyrethrins may combine chemically with ozone to produce hydroxy radicals.

Because agricultural dose rates are low and biological degradation is generally rapid, residues are unlikely to attain significant levels. Permethrin disappears from ponds and streams within 6-24 hours, pond sediments within 7 days and foliage and forest soil within 58 days. Pyrethroids are highly toxic to fish; the bioaccumulation factor of cypermethrin in fish is approximately 1000 when measured experimentally, although the potential for significant toxicity is not reached in fields. Under aerobic conditions in soil, permethrin degrades in a relatively short time (half-life 28 days).

Drinking Water Standards:
pesticide 0.1 ug/l (UK max.).

Section 13 - DISPOSAL CONSIDERATIONS

- Recycle where possible

Otherwise ensure that:

- licenced contractors dispose of the product and its container.
- disposal occurs at a licenced facility.

Section 14 - TRANSPORTATION INFORMATION

Labels Required: NON-FLAMMABLE COMPRESSED GAS

HAZCHEM: 2Y

UNDG:

Dangerous Goods Class:	2.2	Subrisk:	NONE, NONE
UN Number:	1950	Packing Group:	NONE
Shipping Name:	AEROSOLS		
Air Transport IATA:			

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ICAO/IATA Class:	2.2	ICAO/IATA Subrisk:	None
UN/ID Number:	1950	Packing Group:	None
ERG Code:	2L		

Shipping Name: Aerosols, non-flammable

Maritime Transport IMDG:

IMDG Class:	2	IMDG Subrisk:	SP63
UN Number:	1950	Packing Group:	None
EMS Number:	F-D,S-U	Marine Pollutant:	Not Determined

Shipping Name: AEROSOLS

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE

None

REGULATIONS

d- phenothrin (CAS No:51186- 88- 0):

No regulations applicable

No data available for d- phenothrin as CAS: 51186- 88- 0.

Section 16 - OTHER INFORMATION

REPRODUCTIVE HEALTH GUIDELINES

These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise. CR = Cancer Risk/10000; UF = Uncertainty factor: TLV believed to be adequate to protect reproductive health: LOD: Limit of detection Toxic endpoints have also been identified as: D = Developmental; R = Reproductive; TC = Transplacental carcinogen Jankovic J., Drake F.: A Screening Method for Occupational Reproductive American Industrial Hygiene Association Journal 57: 641-649 (1996).

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Issue Date: 4-Jun-2003

Print Date: 30-Nov-2006

(Chemwatch 2007)

16.2 Maintenance schedules

16.2.1 Maintenance Schedule: Annual

Annual	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Torpor									X	X	X	X	X	X	X	X								
Active	X	X	X	X	X	X	X	X	X								X	X	X	X	X	X	X	X
Mating																	X	X	X	X	X			
Birth				X	X	X	X	X																
Renovations									X	X	X	X	X	X	X	X								
Major furnishing changes									X	X	X	X	X	X	X	X								
Physical examination								X											X					
Deworming								X											X					

16.2.2 Maintenance Schedule: Weekly - Active

Weekly - Active	M	T	W	T	F	S	S
Record temperature	X	X	X	X	X	X	X
Record humidity	X	X	X	X	X	X	X
Distant examination of all animals	X	X	X	X	X	X	X
Remove food bowl		X		X		X	
Remove water bowl							X
Spot check	X	X	X	X	X	X	X
Feed animals	X		X		X		
Water animals						X	
Clean enclosure / change substrate	X						
Clean Glass	X						
Mop floor	X						

16.2.3 Maintenance Schedule: Weekly - Torpor

Weekly - Torpor	M	T	W	T	F	S	S
Record temperature	X	X	X	X	X	X	X
Record humidity	X	X	X	X	X	X	X
Distant examination of all animals	X	X	X	X	X	X	X
Remove water bowl							X
Water animals						X	
Mop floor	X						

16.3 Daily SOPs

- **Wash hands when entering the Reptile Unit**
- **Wear PPE**
 - Enclosed shoes must be worn at all times
 - Mask to be worn when handling bedding material
 - Gloves to be worn when handling faecal matter and other hazardous material
 - Read MSDS for all chemicals being used
- **Refer to weekly Active or Torpor chart as applicable**
- **Record Reptile Unit temperature**
 - Record current, minimum and maximum temperature in daily diary
 - Reset thermometer
- **Record Reptile Unit humidity**
 - Record current, minimum and maximum humidity in daily diary
 - Reset hygrometer

- **Distant examination (DE)**

The condition of Shingleback Lizards is assessed by looking for fat deposits in the tail. Emaciated lizards will have protruding hips but bear in mind that there is considerable seasonal variation (refer Figure 6.1).

During health examinations keep in mind that “abnormalities” may be due to something other than ill health (e.g. pregnancy, mating season, change in diet, change in environment, introduction of new animals) which may be temporary.

In order to effectively examine an animal, you need to know what is “normal” for the species and individual being kept. If things become “abnormal” this may be a sign of ill health or disease.

This type of examination is done simply by looking at the animal. It should be done at least once daily.

Signs of ill health to look for during a distant examination include:

- Abnormal smells
- Diarrhoea
- Haemorrhage
- Blood
- Regurgitated food
- Lameness or stiffness
- Dehydration

- Swelling
- Deformities
- Injury or sores
- Discharges (oral, nasal, ocular, aural or cloacal)
- Change in behaviour
- Not eating or drinking
- Excessive eating or drinking
- Not sloughing properly (dysecdysis)
- Change in animal condition – weight loss / gain

If any abnormalities are detected during the distant examination a physical examination should be performed. Any abnormalities should also be recorded in the daily diary and reported to the manager.

- **Physical Examination (PE)**

A physical examination is hands on. Signs of ill health to look for during a physical examination include some additional observations:

- Teeth abnormalities
- Poor scale condition, look and feel for lumps, parasites, ulcers, blisters and foreign bodies
- Any abnormal odours coming from the animal
- Swollen joints
- Any areas of heat, swelling, discolouration or discharge (sign of infection)
- Abnormal respiratory sounds
- Loss of weight

Any abnormalities should also be recorded in the daily diary and reported to the manager.

- **Remove food bowl**

Record how much food has been consumed

Wash bowl in F10SC

- **Remove water bowl**

Record how much water has been consumed

Wash bowl in F10SC

- **Spot check**

Remove any clumped faecal material

- **Feed animals**

Ensure that food preparation knives are kept sharp

- **Water animals**
- **Clean enclosure / change substrate**
 - Remove animals
 - Remove all enclosure decorations
 - Remove all substrate
 - Spray cage and decorations with F10SC and leave to air dry
 - Put in clean bedding
 - Return decorations
 - Return animals
- **Clean Glass**
 - Clean glass inside and outside enclosure with F10SC
- **Mop floor**
 - Mop floor with F10SC
- **Wash hands when leaving the Reptile Unit**

16.4 Product suppliers

PRODUCT	MANUFACTURER	SUPPLIER
Betadine	Mundipharma B.V., Netherlands www.betadine.com.au	Local chemist
Blood collection equipment (syringes, needles, collection pots, vacutainers, microhaematocrit tubes)	Idexx Laboratories www.idexx.com.au	Provet www.provet.com.au
Lizard food, canned (crickets, grasshoppers, mealworms, silkworms, snails)	Exo-terra www.exo-terra.com	Petbarn 117 Coreen Avenue Penrith NSW 2750 www.petbarn.com.au
F10SC	Health and Hygiene Pty Ltd www.healthandhygiene.net	Chemical Essentials Pty Ltd www.chemicalessentials.com.au
Fecalyzer	Evsco Pharmaceuticals A division of Vetoquinol USA Inc. www.vetoquinolusa.com	Provet www.provet.com.au
Fecasol (Sodium nitrate)	Evsco Pharmaceuticals A division of Vetoquinol USA Inc. www.vetoquinolusa.com	Provet www.provet.com.au
Formalin	First Priorety inc.	Southern Biological Services Pty Ltd Po box 57 Nunawading VIC 3131 www.southernbiological.com
Isoflurane	Halocarbon Laboratories www.halocarbon.com	Provet www.provet.com.au
Ivomec (Avermectins)	Animal Health Inc. www.ah.novartis.com	Provet www.provet.com.au
Ketamine	Parnell Laboratories (Aust) Pty Ltd www.parnell.biz	Provet www.provet.com.au
Lethobarb	Virbac (Australia) Pty Ltd www.virbac.com.au	Provet www.provet.com.au
Lignocaine	Troy Laboratories Pty Ltd www.troylab.com.au	Provet www.provet.com.au
Neomycin	Bimeda, Inc www.bemida.com	Provet www.provet.com.au
Panacur (Fenbendazole)	Intervet Ltd www.intervet.com.au	Provet www.provet.com.au

Metacam	Boehringer Ingelheim Vetmedica, Inc. www.bi-vetmedica.com	Provet www.provet.com.au
Microscope and equipment	Carolina Biological Products www.carolina.com	Southern Biological Services Pty Ltd Po box 57 Nunawading VIC 3131 www.southernbiological.com
Repti-cal	Aristopet www.aristopet.com.au	Petbarn 117 Coreen Avenue Penrith NSW 2750 www.petbarn.com.au
Repti-hand	Aristopet www.aristopet.com.au	Petbarn 117 Coreen Avenue Penrith NSW 2750 www.petbarn.com.au
Repti-vite	Aristopet www.aristopet.com.au	Petbarn 117 Coreen Avenue Penrith NSW 2750 www.petbarn.com.au
Scalpel and blades	Feather Surgical Blades	Southern Biological Services Pty Ltd Po box 57 Nunawading VIC 3131 www.southernbiological.com
Top Of Descent	Callington Haven Pty Ltd www.callingtonhaven.com	Ultimate Reptile Supplies P.O. Box 11 Enfield Plaza Enfield SA 5085 www.ultimatereptiles.com.au
Woodshavings	Hysorb www.ecw.com.au	Petbarn 117 Coreen Avenue Penrith NSW 2750 www.petbarn.com.au
Repti Glo UV lights Night Glo night lights	Exo-terra www.exo-terra.com	Petbarn 117 Coreen Avenue Penrith NSW 2750 www.petbarn.com.au
PPE	SafetyEquipment.net.au is a subsidiary of Australian Safety Equipment. www.safetyequipment.net.au	SafetyEquipment.net.au P.O Box 373 Concord West NSW 2138. www.safetyequipment.net.au

16.5 Safety With Lizards

Information for Students Safety with Lizards

This document should be used in conjunction with Standard Operating Procedures (SOPs) related to Lizards. It provides general principles that apply to any activity involving Lizards.

1. Instructions

At all times follow the instructions of the supervisor or teacher. If you are unclear about an instruction or not confident about performing what is being asked, tell the supervisor/ teacher BEFORE the procedure starts.

2. Animal Behaviour – Critical Aspects

- Always observe the behaviour of the animals you are going to work with before starting any procedure
- Always research the handling history of lizards before starting a procedure
- Always make lizards aware of your presence before entering their enclosure
- There is considerable variation in temperament between lizards
- At all times handle hazardous lizards with care due to their ability to bite and scratch and inflict serious wounds
- Avoid starting a procedure until an animal is settled if it is nervous or frightened
- Avoid abrasive surfaces or surfaces with chemical residue
- Wash hands before handling lizards
- Avoid use of heavily scented soaps when washing hands

3. Animal Welfare

Animal welfare is essential for the animals you work with but also important to help ensure your own safety. The following points will help in maximising the welfare of lizards.

- All procedures should occur in an appropriate environment.
- Lizards should not be handled in extremes of temperature
- Ensure there is adequate shelter, food and water in the lizards enclosure
- Ensure area where lizards are kept or the procedure is to occur is free of potential hazards such as sharp objects, equipment, electrical leads, hoses or wire
- If hides or cage furniture are removed during a procedure, ensure it is returned to enclosure and secured so it will not fall and injure the lizards
- Maintain a quiet environment around the lizards
- Maintain a calm environment around the lizards avoiding large numbers of people moving through the facility
- Confirm reproductive status of female animals and adjust procedure if pregnant or caring for young
- Do not restrain an animal for excessive amounts of time. Lizards should be returned to their usual environment as soon as possible.
- Keep dogs and other predators away from lizards

4. Safety Procedures

- Ensure that a risk assessment of the venue has been conducted to ensure it is a safe environment
- Wash hands before and after (avoiding heavily scented soaps) assisting with any procedure to minimise the risk of contracting a zoonotic disease

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- Ensure you do not work alone, request assistance from a second qualified person
- Be aware of species of lizards being handled and the damage/injury they can cause
- Awareness of possible allergens eg. Feed or animal secretions
- Ensure all equipment is working and fully maintained before commencing a procedure

5. Clothing

Appropriate clothing must be worn at all times. This includes:

- Foot wear – non slip shoes, preferably closed toe
- Long-sleeved shirt especially if working outdoors
- Avoid wearing jewellery
- Shade hat and sunscreen if working outdoors
- PPE as required for particular procedures e.g. gloves

6. Handling and Restraint

- Assess each animal individually before deciding on appropriate restraint
- Initially use appropriate less invasive forms of restraint before stepping up to more invasive restraints, if needed.
- Always concentrate on the animal you are restraining so as to observe any changes in demeanour, which might signal that the animal is about to react e.g. move suddenly
- Remain calm and quiet around animal to minimise its stress and potential injury to yourself or other people
- If you are not directly assisting in a procedure or restraining the animal, remain at an appropriate distance

7. Veterinary Procedures

- Do not touch needles directly. Do not recap needles to minimise the risk of needle stick injuries or accidental self injection of the drug
- Avoid skin contact with drugs or other solutions, certain individuals may have an adverse or anaphylactic reaction to these substances
- Always dispose of waste in the appropriate containers:
 - ☑ Sharps (needles and scalpels) and syringes into designated sharps containers
 - ☑ Empty drug bottles / vials into designated sharp or contaminated waste containers
 - ☑ Contaminated materials (ie blood covered, tissue etc) into designated contaminated waste containers
 - ☑ General rubbish into rubbish containers

8. Emergencies

Notify your teacher immediately if there is an emergency

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16.6 TAFE lizard SOPs

16.6.1 Assess Body Condition of Lizards

Standard Operating Procedure LIZ001

Purpose

To assess body condition in lizards

Alternatives

- Audiovisual media
- Reference books

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Using caution when working with hazardous lizards (eg varanids)
- Awareness of animal's reaction to procedure (biting, scratching and tail whipping)
- Washing hands before and after handling lizard
- Using appropriate handling techniques on animals
- Wearing appropriate personal protective equipment
- Adherence to industry premises OH&S policies

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using appropriate capture and handling techniques to avoid injury
- Using caution when working with species that have autotomy

(See the document 'Safety with Lizards' for further details.)

Preparation

- Have appropriate reference material ready
- Have animal feeding records available
- Request assistance if required
- Confirm that animal is not hazardous

Procedure

- Review records to determine any changes in activity levels
- Review records to determine appetite
- Consider following variables: gravid female, shedding, hibernation/cooling, low environmental temperatures
- Capture and restrain animal appropriately
- Scan for and record micro chip number
- Assess body condition by looking for any of the following signs: prominent backbone, muscle wasting, laterally compressed tail, sunken eyes, noticeably thin limbs, prominent pelvic area
- Check for swellings (eg abscesses, inflammation, blockage)

Post Procedure

- Update animals history card/notes
- Address any problem areas found
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- Return animal back to its home cage or travel box
- Wash equipment used and place away
- Wash hands thoroughly using disinfectant

Underpinning SOPs

LIZ004 Capture and Handle Lizards

LIZ013 Transport Lizards

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16.6.2 Collect Faeces/ Urates from Lizards

Standard Operating Procedure LIZ002

Purpose

To collect and store faecal/urate samples from lizards

Alternatives

- Audiovisual media
- Reference books

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Using caution when working with hazardous lizards (eg varanids)
- Awareness of animal's reaction to procedure (bitting, scratching and tail whipping)
- Washing hands before and after handling lizard
- Using appropriate handling techniques on animals
- Wearing appropriate personal protective equipment
- Adherence to industry premises OH&S policies

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using appropriate capture and handling techniques to avoid injury

(See the document 'Safety with Lizards' for further details.)

Preparation

- Select appropriate collection container
- Select appropriate faecal collector
- Determine how many animals are in the enclosure/bag before it is opened
- Request assistance if required

Procedure

- Use appropriate faecal sampler to collect fresh droppings
- Identify faecal and urate components in waste sample
- Deposit selected waste into appropriate collection container.
- Store all samples in sealed double bag and keep refrigerated for further analysis

Post Procedure

- Secure home cage of animal
- Clean collection scoop
- Wash hands thoroughly using disinfectant

Underpinning SOPs

LIZ004 Capture and Handle Lizards

LIZ013 Transport Lizards

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16.6.3 Count Lizards

Standard Operating Procedure LIZ003

Purpose

To identify, count and record all animals within enclosure

Alternatives

- Audiovisual media
- Reference books

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Not handling venomous lizards
- Using caution when accessing hazardous lizard enclosures
- Awareness of animals reaction to procedure (bitting, scratching and tail whipping)
- Avoid handling rodents, rabbits or other preferred varanid foods prior to accessing goanna enclosures
- Washing hands before and after handling
- Using appropriate personal protective equipment
- Adherence to industry premises OH&S policies
- Using appropriate handling techniques on live animals

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using appropriate capture and handling techniques to avoid injury
- Avoiding predators such as birds, cats, dogs, and other reptiles
- Ensuring cage materials are stable to prevent animals being squashed/hurt
- Limiting noise to prevent animals from darting off and escaping
- Awareness that tails readily come off geckos, skinks, and legless lizards

(See the document 'Safety with Lizards' for further details.)

Preparation

- Prepare existing records
- Prepare appropriate handling equipment
- Prepare appropriate holding bags/containers
- Be familiar with appropriate handling techniques across the lizard species

Procedure

- Using records, identify the quantity, species and age of animals meant to be within the enclosure
- Open enclosure and locate animal(s) Consider: Behaviour, number of hides within the cage, time of day and available heat, last meal and quantity
- Only count heads
- If large numbers (e.g. hatchlings) then separate into holding containers once counted

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Post Procedure

- Update records accordingly
- Replace all hides, branches, water bowls etc that were removed
- Be sure that all cage items are stable and will not move
- Confirm that animals have appropriate thermal gradient
- Return animals to enclosure
- Wash any equipment used and place away
- Wash hands

Underpinning SOPs

LIZ004 Capture and Handle Lizards

LIZ013 Transport Lizards

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16.6.4 Capture and Handle Lizards – small, medium and large species

Standard Operating Procedure LIZ004

Purpose

To catch, handle, and release lizards appropriately

Alternatives

- Audiovisual media
- Reference books

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Washing hands before and after procedure
- Adherence to industry premises OH&S policies
- Using appropriate handling techniques to avoid injury
- Not handling live venomous lizards to demonstrate catching/handling/restraint techniques
- Wearing appropriate personal protective equipment
- Awareness of animal's reaction to procedure (biting and scratching)

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using appropriate capture and handling techniques to avoid injury
- Avoiding predators such as birds, cats, dogs, and other reptiles
- Limiting noise to prevent animals from darting off occasioning potential trauma
- Awareness that tails readily come off geckos, skinks, and legless lizards

(See the document 'Safety with Lizards' for further details.)

Preparation

- Assess animals behaviour
- Determine if animal is hazardous
- Determine how many animals are in the enclosure/bag before it is opened
- Request assistance if required
- Confirm that animal is not venomous
- Block off small escape routes

Procedure

FOR SMALL SIZED LIZARDS

- **CAPTURE:** Gently pin animal to floor or side of container using flat hand
- **HANDLING:** Use light and delicate handling
- **RESTRAINT**
 - Physical Restraint: Grasp the thorax between thumb and first two fingers whilst supporting the rest of the abdomen, avoid restrictive handling as some lizards will struggle and will be more likely to 'drop' their tails
 - Thermal Restraint: Gradually lower temperature – do not place animal in freezer
 - Chemical Restraint: Consider appropriate drugs to use for effective and humane restraint

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FOR MEDIUM SIZED LIZARDS

- *CAPTURE*: Gently pin animal to floor or side of container using flat hand
- *HANDLING*: Use firm handling
- *RESTRAINT*:
 - Physical Restraint: Use one hand to grasp the front legs against thorax and the other hand to restrain the hind limbs against the tail
 - Thermal Restraint: Gradually lower temperature – do not place animal in freezer
 - Thermal Restraint: Consider appropriate drugs to use for effective and humane restraint

FOR LARGE SIZED LIZARDS

- *CAPTURE*: Quickly grasp animal by tail or by pressing back of head down with open hand
- *HANDLING*: Use firm handling and remove animal from enclosure, large animals have explosive strength and can free themselves from a momentarily relaxed grip
- *RESTRAINT*:
 - Physical Restraint: use one hand to grasp the front legs against thorax and the other hand to restrain the hind limbs against the tail.
 - Thermal Restraint: Gradually lower body temperature – do not place animal in freezer
 - Chemical Restraint: Consider appropriate drugs to use for effective and humane restraint

Post Procedure

- Reverse/release restraint
- Securely and gently return animal to it's home cage or transport container
- Be sure that all cage furnishings are stable
- Remove any animal waste and clean handling area
- Wash hands thoroughly using disinfectant

Underpinning SOPs

LIZ010 Inspect Lizards from a Distance

LIZ009 Identify Lizards

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16.6.5 Euthanase Lizards

Standard Operating Procedure LIZ005

Purpose

To correctly euthanase lizards

Alternatives

- Audiovisual media
- Reference books

Preferred Location

- TAFE or industry premises where suitable

OH&S

Specific issues to be aware of for this activity include:

- Not accessing or handling venomous lizards
- Using caution when accessing hazardous lizard enclosures
- Awareness of animals reaction to procedure (biting, scratching and tail whipping)
- Not handling rodents, rabbits or other preferred varanid foods prior to accessing goanna enclosures
- Washing hands before and after handling
- Avoiding needle stick injuries by correct handling of sharps
- Avoiding exposure to euthanasia gases
- Adherence to industry premises OH&S policies
- Using appropriate handling techniques to avoid injury

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using appropriate capture and handling techniques to avoid injury
- Avoiding predators such as birds, cats, dogs, and other reptiles
- Limiting noise to prevent animals from darting off and escaping
- Awareness that tails readily come off geckos, skinks, and legless lizards

(See the document 'Safety with Lizards' for further details.)

Preparation

- Consider type and size of animal prior to handling
- Consider the reason for euthanasia
- Consider appropriate type of euthanasia technique

Procedure

- Handle and/or restrain selected animal correctly
- Check ID (microchip or other)
- Prepare all necessary drugs and associated applicators
- Place animal into appropriate collection container
- Select and apply appropriate euthanasia technique

Post Procedure

- Confirm death
- Place body in freezer (or fridge if samples are to be taken)

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- Clean up working area
- Secure all sharps in sharps container
- Update all records

Underpinning SOPs

LIZ009 Identify Lizards

LIZ010 Inspect Lizards from a Distance

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16.6.6 *Feed Lizards*

Standard Operating Procedure LIZ006

Purpose

To select, prepare and offer appropriate food for lizards

Alternatives

- Audiovisual media
- Reference books

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Using caution when feeding hazardous lizards (eg varanids)
- Awareness of animal's reaction to procedure (biting, scratching)
- Washing hands before and after handling food
- Washing hands before and after handling lizard
- Wearing appropriate personal protective equipment
- Use appropriate handling techniques to avoid injury
- Adherence to industry premises OH&S policies

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using appropriate capture and handling techniques to avoid injury
- Using caution when group feeding lizard species that have autotomy
- Ensuring that group housed animals all receive share of food
- Ensuring balanced diet of food selected

(See the document 'Safety with Lizards' for further details.)

Preparation

- Confirm that lizard is not hazardous
- Prepare feeding tubs where appropriate
- Select appropriate feeding equipment eg feeding tongs
- Determine how many animals are in the enclosure/bag before it is opened
- Request assistance if required

Procedure

- Select appropriate food type and quality
- Prepare food appropriately – let thaw to room temp. Do not wash. Do not pre heat. Be sure it is of high nutritional quality
- Remove warm lizard from home cage, if appropriate to do so, and place in separate feeding container
- Select appropriate delivery of food to animal

Post Procedure

- Leave lizard quiet and undisturbed until finished feeding
- Securely return animal to it's home cage (if appropriate)
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- Be sure that home cage is heated appropriately to allow animal to digest it's meal
- Remove any animal waste, uneaten food and clean feeding area
- Do not re-freeze any uneaten food but rather place in rubbish
- Clean feeding equipment and place away
- Wash hands thoroughly using disinfectant
- Update feeding records
- Establish next feeding period

Underpinning SOPs

LIZ004 Capture and Handle Lizards

LIZ015 Water Lizards

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16.6.7 Identify Australian Lizard Families – Pygopodidae, Gekkonidae, Scincidae, Varanidae, Agamidae

Standard Operating Procedure LIZ007

Purpose

To identify lizards as belonging to the families Pygopodidae (Snake lizards i.e. worm-like, legless lizard), Agamidae (Dragon Lizards), Varanidae (Goannas or Monitor Lizards), Scincidae (Skinks), Gekkonidae (Geckos)

Alternatives

- Audiovisual media
- Preserved specimens or Cadavers

- Reference books

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Wearing appropriate personal protective equipment
 - Knowledge that some lizards can be dangerous
 - Ensuring appropriate ventilation required when handling preserved specimens
 - Adherence to Industry premises OH&S policies
 - Using appropriate handling techniques to avoid injury
- (See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using appropriate handling and restraint techniques to avoid injury
 - Using caution when handling, Scincidae, Gekkonidae as the tail can readily be broken at any point.
- (See the document 'Safety with Lizards' for further details.)

Preparation

- Prepare reference material

- Prepare preserved specimens if being used

- Prepare live animals

Procedure

- Remove lizard from enclosure, container or bag
- Handle appropriately and with care (refer to LIZ004)

PYGOPODIDAE (Snake lizards)

- Identify that no obvious limbs are present – though a small scaly flap may be seen in some animals
- Identify that there are two lidless eyes

AGAMIDAE (Dragon Lizards)

- Identify that two pairs of well developed limbs are present
- Identify that there are movable eyelids

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- Identify that the top of head is covered in very small scales
- Identify that the tongue is broad and flat and usually not protruding
- Identify that the body scales are juxtaposed i.e. not overlapping

VARANIDAE (Goannas or Monitor Lizards)

- Identify that two pairs of well developed limbs are present
- Identify that there are movable eyelids
- Identify that the tongue is long and slender and deeply forked as in the snake.
- Identify that the body scales are juxtaposed i.e. not overlapping

SCINCIDAE (Skinks)

- Identify that limbs are present – or if absent, that eyes have movable lids
- Identify that there are movable eyelids – or if not moveable then the pupil is NOT a narrow vertical slit during daylight
- Identify that the top of the head is covered in large, regular and symmetrical, shield-like scales.
- Identify that the body scales are imbricate (i.e. overlapping)

GEKKONIDAE (Geckos)

- Identify that two pairs of obvious limbs are present
- Identify that there are two lidless eyes.
- Identify that pupils are in the shape of a narrow vertical slit during daylight.
- Identify that the body scales are juxtaposed i.e. not overlapping

Post Procedure

- Return live animal to enclosure/bag or return preserved specimens to specimen container
- Clean all equipment used and place away
- Wash hands thoroughly

Underpinning SOPs

LIZ004 Capture and Handle Lizards

LIZ009 Identify lizards

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16.6.8 Identify Gender of Lizards – Sexual Characteristics, Temperature Dependant Sex Determination

Standard Operating Procedure LIZ008

Purpose

To identify gender of Australian lizard families by sexual characteristics of geckos or Temperature Dependent Sex Determination

Alternatives

- Audiovisual media
- Reference books
- Preserved specimens or cadavers

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Adherence to Industry premises OH&S policies
- Wearing appropriate personal protective equipment
- Ensuring adequate ventilation when using preserved specimens
- Using appropriate handling to avoid injury

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using discussion , live animals may not be needed
- Handling geckos with care to avoid losing tails

(See the document 'Safety with Lizards' for further details.)

Preparation

- Prepare reference material
- Prepare preserved specimens or live animals if using

Procedure

TEMPERATURE DEPENDENT SEX DETERMINATION

- List Australian lizards families that have TSD; - All Agamids (dragon lizards) - Some

Gekkonids (Geckos) - Some Scincids (skinks)

SECONDARY SEXUAL CHARACTERISTICS IN GECKOS

- Remove lizard or specimen and handle appropriately
- Place lizards in a clear plastic container
- Locate tail base
- During breeding season symmetrical bulging at the tail base indicates the presence of mature hemipenes (hemipenal bulge)

Post Procedure

- Return reference material
- Clean work area and place equipment away

Underpinning SOPs

LIZ009 Identify Lizards

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16.6.9 Identify lizards

Standard Operating Procedure LIZ009

Purpose

To identify lizards as animals belonging to Class: REPTILIA; Order: Squamata; Sub-order: Sauria (lizards)

Alternatives

- Audiovisual media
- Preserved specimens (or cadavers)
- Reference books

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Wearing appropriate personal protective equipment
- Ensuring appropriate ventilation when handling preserved specimens
- Adhere to Industry premises OH&S policies
- Using appropriate handling techniques to avoid injury

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using appropriate handling and restraint techniques to avoid injury

(See the document 'Safety with Lizards' for further details.)

Preparation

- Prepare reference material
- Prepare preserved specimens if being used
- Prepare live animals

Procedure

- Use reference guide to ID reptile as being a vertebrate, cold blooded (ectotherm), having hemipenes, having a 3 chambered heart, breathing air via lungs
- Remove live lizard from enclosure
- Use appropriate handling techniques
- Check that the animal has the following characteristics: scales; dry and smooth to touch, broad and fleshy tongue, visible ear openings, moveable eyelids (where present), two equally developed limbs (where present), tail length equal or longer than the body length, small ventral (belly) scales similar to the scales on the rest of their body, fused jaw ligaments

Post Procedure

- Return live animal to enclosure;
- Return preserved specimens to specimen container
- Wash hands thoroughly

Underpinning SOPs**LIZ004 Capture and Handle Lizards**

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16.6.10 Inspect Lizards from a Distance

Standard Operating Procedure LIZ010

Purpose

Regular visual observation for normal and abnormal health and behaviour of lizards in their normal environment

Alternatives

- Audiovisual media
- Reference books

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Washing hands before and after handling any waste;
- Wearing appropriate personal protective equipment
- Using appropriate handling techniques to avoid injury
- Preventing the spread of zoonoses
- Adherence to industry premises OH&S policies

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using appropriate capture and handling techniques to avoid injury
- Avoiding transfer of pathogens from one animal to another

(See the document 'Safety with Lizards' for further details.)

Preparation

- Understand normal health and behaviour of the lizard species
- Obtain animal history where appropriate – housing and care routines, medical/health, feeding, and thermal ranges within the enclosure
- Determine how many animals are in the enclosure/bag before it is opened
- Request assistance if required

Procedure

- Signs of illness include: checking that ecdysis is complete, abnormal lethargy, disinterest in feed or feeding, loss of body weight/ condition, localised swellings, excessive secretions, diarrhoea, respiratory difficulties
- Perform distant examinations to address above signs of illness
- Remove lizard with care from home cage/container or bag
- Handle appropriately for physical examination to address above signs of illness
- Return animal with care to home cage/container or bag

Post Procedure

- Clean up any animal waste
- Secure home cage
- Clean and return any equipment used
- Wash hands thoroughly using disinfectant

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- Update records

Underpinning SOPs

LIZ004 Capture and Handle Lizards

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16.6.11 Microchip Lizards

Standard Operating Procedure LIZ011

Purpose

To effectively mark lizards for identification purposes using implanted microchip transponders

Alternatives

- Audiovisual media
- Reference books
- Web based training

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Using caution when handling live hazardous lizards
- Using appropriate personal protective equipment
- Using appropriate manual handling policies
- Washing hands before and after handling animals
- Adherence to industry premises OH&S policies
- Using appropriate handling techniques to avoid injury

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Avoiding thermal extremes for all reptile species
- Avoiding predators such as birds, cats, dogs, and other reptiles
- Handle animal appropriately to injury

(See the document 'Safety with Lizards' for further details.)

Preparation

- Establish species and select appropriate needle gauge
- Establish appropriate location of microchip implantation
- Collect appropriate paperwork
- Select appropriate handling and restraint equipment if required
- Request assistance if required

Procedure

- Check and record microchip number by scanning chip
- Load chip into needle
- Prepare site for microchip implantation
- Implant microchip

Post Procedure

- Scan microchip implant and check number
- Return animal safely to its enclosure
- Remove any animal waste

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- Clean any equipment used and place away
- Wash hands thoroughly using disinfectant

Underpinning SOPs**LIZ004 Capture and Handle Lizards**

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16.6.12 Provide Thermal Gradient

Standard Operating Procedure LIZ012

Purpose

To provide a suitable thermal gradient within a reptiles enclosure. This allows an animal to thermoregulate and reach its preferred body temperature (PBT).

Alternatives

- Audiovisual media
- Reference books

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Not accessing or handling venomous lizards
- Using caution when accessing hazardous lizard enclosures
- Awareness of animal's reaction to procedure (bitting, scratching and tail whipping)
- Not handling rodents, rabbits or other preferred varanid foods prior to accessing goanna enclosures
- Washing hands before and after handling
- Using a licensed electrician for all electrical connections
- Using appropriate personal protective equipment
- Adherence to industry premises OH&S policies
- Using appropriate handling techniques to avoid injury

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using appropriate capture and handling techniques to avoid injury
- Avoiding predators such as birds, cats, dogs, and other reptiles
- Ensuring cage materials are stable to prevent animals being squashed/hurt
- Limiting noise to prevent animals from darting off and escaping
- Knowledge that tails readily come off geckos, skinks, and legless lizards

(See the document 'Safety with Lizards' for further details.)

Preparation

- Understand thermoregulation
- Understand the requirements of a thermal gradient
- Know the species specific preferred body temperature
- Prepare appropriate handling gear
- Prepare appropriate holding bags/containers

Procedure

- Using records, identify the species, quantity and age of the animals within the enclosure
- Observe animals thermoregulating in home cage
- Assess the thermal gradient and temperature range within the home cage by evaluating; heat source, thermometers, thermostat, furnishings, electronic timers, seasonal temperature fluctuations, vertical & horizontal thermal gradients

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- Assess ease of access to basking sites and evaluate; location and number of hot spots, number of basking sites, temperature of hot and cold spots
- Locate, catch and remove animal(s) from enclosure
- Place animals in secure holding tank/bag/container/bin
- Correct thermal gradients, basking sites, and provide animals with opportunities to express appropriate thermoregulatory behaviour as required

Post Procedure

- Update and maintain temperature and thermoregulatory behavioural records accordingly
- Replace all hides, branches, water bowls etc that were removed
- Be sure that all cage furnishings are stable and will not move
- Confirm that animals have appropriate thermal gradient
- Return animals to enclosure
- Wash any equipment used and place away
- Wash hands

Underpinning SOPs

LIZ004 Capture and Handle Lizards

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16.6.13 Transport Lizards

Standard Operating Procedure LIZ013

Purpose

To safely transport lizards

Alternatives

- Audiovisual media
- Reference books
- Web based IATA animal transport policies and guidelines

Preferred Location

- TAFE or industry premises with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Using caution when handling live hazardous lizards
- Using appropriate manual handling policies to avoid injury
- Using correct handling to avoid injury
- Washing hands before and after packaging
- Adherence to industry premises OH&S policies

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Avoiding thermal extremes for all reptiles
- Avoiding predators such as birds, cats, dogs, and other reptiles
- Ensuring transport container is labelled appropriately
- Using strong container for transport
- Providing secure and comfortable transport conditions
- Ensuring container is well ventilated

(See the document 'Safety with Lizards' for further details.)

Preparation

- Establish reason for transport
- Establish species and quantity for transport
- Select appropriate transport container and label correctly
- Select appropriate handling and restraint equipment if required
- Request assistance if required

Procedure

- Place animal into container
- Load container securely into transport vehicle ensuring container is away from thermal extremes and direct sunlight
- Upon receipt of animal, unload container carefully from transport vehicle and place in a secure and thermally comfortable location
- Ensure that label details are correct and carefully remove animal from transport container
- Place animal in appropriate housing, providing shelter, feed, water and heating as required – specific to species needs and health status.

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Post Procedure

- Check all transport details are correct
- Remove any animal waste and clean transport container
- Secure all associated caging that was accessed for sending/receipt purposes
- Wash hands thoroughly using disinfectant

Underpinning SOPs

LIZ004 Capture and Handle Lizards

LIZ006 Feed lizards

LIZ014 Water Lizards

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16.6.14 Water Lizards

Standard Operating Procedure LIZ014

Purpose

To appropriately provide water for lizards

Alternatives

- DVD/video media or slides
- Reptile husbandry reference books

Preferred Location

- TAFE premises with appropriate equipment and facilities
- Industry premises such as zoos, fauna parks, animal rescue services or mobile wildlife exhibitors, with appropriate equipment and facilities

OH&S

Specific issues to be aware of for this activity include:

- Students and teachers must use caution when working with hazardous lizards (eg varanids)
- Possibility of being bitten, scratched, or tail whipped
- Wash hands before and after handling any food
- Wash hands before and after handling lizard
- Use appropriate handling techniques on live animals (if required)
- Wear PPE if applicable
- Adhere to industry premises OH&S policies

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Lizard handlers to use appropriate capture and handling techniques where required
- Caution is required when working with lizard species that have autotomy
- Animals must have daily access to clean water

(See the document 'Safety with Lizards' for further details.)

Preparation

- Confirm number of lizards in enclosure to water
- Have suitable water containers available
- Request assistance if required
- Confirm animal's temperament
- Select appropriate PPE and place on

Procedure

- Ensure that there are enough water locations proportionate to quantity and temperament of animals in the cage
- Select species specific volume of water e.g. aquatic versus terrestrial species
- Ensure clean water is available at all times – especially after feeding and during sloughing times
- Position water container away from sources of contamination e.g. directly beneath branches
- Position water container in location suitable for species needs e.g. arboreal drop licking

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- Use only clean water container
- To change water:
 - Select minimum number of weekly changes appropriate for species and number of animals in enclosure
 - Change more frequently if water is soiled
 - Confirm location and number of animals before opening enclosure
 - Perform following steps:
 - Remove, clean, disinfect, rinse, refill, and return of water bowl

Post Procedure

- Be sure enclosure is closed/locked
- Clean equipment used and place away
- Remove PPE
- Wash hands thoroughly using disinfectant
- Check water daily and change water regularly
- Clean water containers at each change

Underpinning SOPs

LIZ009 Handle small lizards

LIZ010 Handle medium lizards

LIZ011 Handle large lizards

LIZ014 Feed lizards

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16.6.15 Weigh Lizards

Standard Operating Procedure LIZ015

Purpose

To weigh lizards and update appropriate records

Alternatives

- Audiovisual media
- Reference books

Preferred Location

- TAFE or industry premises with appropriate facilities

OH&S

Specific issues to be aware of for this activity include:

- Not accessing or handling venomous lizards
- Using caution when accessing hazardous lizard enclosures.
- Awareness of animal's response to procedure (bitting, scratching and tail whipping)
- Not handling rodents, rabbits or other preferred varanid foods prior to accessing goanna enclosures
- Washing hands before and after handling;
- Adherence to industry premises OH&S policies
- Using appropriate handling techniques to avoid injury

(See the document 'Safety with Lizards' for further details.)

Animal Safety

Specific issues to be aware of for this activity include:

- Using appropriate capture and handling techniques to avoid injury
- Avoiding predators such as birds, cats, dogs, and other reptiles
- Ensuring cage materials are stable to prevent animals being squashed/hurt at a later time
- Limiting noise to prevent animals from darting off and escaping.
- Knowledge that tails readily come off geckos, skinks, and legless lizards

(See the document 'Safety with Lizards' for further details.)

Preparation

- Have existing records available
- Have appropriate handling gear available
- Have appropriate holding bags/containers available
- Have appropriate scales ready

Procedure

- Using records, identify the quantity, age and species of animals within the enclosure
- With an understanding of what to look for open enclosure and begin to locate animal(s) selected for weighing.
- Consider: behaviour, number of hides, time of day and available heat, last meal and quantity
- Handle selected animal correctly
- Place animal into collection bag and seal appropriately
- Select appropriate weighing method and weigh animal
- Restrain and scan for microchip if animal ID is required

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Post Procedure

- Record appropriate information on health record
- Replace all hides, branches, water bowls etc
- Be sure that all cage items are stable and will not move
- Confirm that animal(s) have appropriate thermal gradient
- Return animals to enclosure
- Wash hands

Underpinning SOPs

LIZ009 Identify Lizards

LIZ010 Inspect Lizards from a Distance

LIZ004 Capture and Handle Lizards

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