



DEPARTMENT OF PLANNING, INDUSTRY & ENVIRONMENT

# Guidelines for the initial treatment and care of rescued koalas



© 2020 State of NSW and Department of Planning, Industry and Environment

With the exception of photographs, the State of NSW and Department of Planning, Industry and Environment are pleased to allow this material to be reproduced in whole or in part for educational and non-commercial use, provided the meaning is unchanged and its source, publisher and authorship are acknowledged. Specific permission is required for the reproduction of photographs.

The Department of Planning, Industry and Environment (DPIE) has compiled this guideline in good faith, exercising all due care and attention. No representation is made about the accuracy, completeness or suitability of the information in this publication for any particular purpose. DPIE shall not be liable for any damage which may occur to any person or organisation taking action or not on the basis of this publication. Readers should seek appropriate advice when applying the information to their specific needs.

All content in this publication is owned by DPIE and is protected by Crown Copyright, unless credited otherwise. It is licensed under the [Creative Commons Attribution 4.0 International \(CC BY 4.0\)](#), subject to the exemptions contained in the licence. The legal code for the licence is available at [Creative Commons](#).

DPIE asserts the right to be attributed as author of the original material in the following manner: © State of New South Wales and Department of Planning, Industry and Environment 2020.

Cover photo: Koala at the Koala Hospital, Port Macquarie. David Finnegan/DPIE

Published by:

Environment, Energy and Science  
Department of Planning, Industry and Environment  
4 Parramatta Square, 12 Darcy Street, Parramatta NSW 2150  
Phone: +61 2 9995 5000 (switchboard)  
Phone: 1300 361 967 (Environment, Energy and Science enquiries)  
TTY users: phone 133 677, then ask for 1300 361 967  
Speak and listen users: phone 1300 555 727, then ask for 1300 361 967  
Email: [info@environment.nsw.gov.au](mailto:info@environment.nsw.gov.au)  
Website: [www.environment.nsw.gov.au](http://www.environment.nsw.gov.au)

Report pollution and environmental incidents  
Environment Line: 131 555 (NSW only) or [info@environment.nsw.gov.au](mailto:info@environment.nsw.gov.au)  
See also [www.environment.nsw.gov.au](http://www.environment.nsw.gov.au)

ISBN 978-1-922431-06-6  
EES 2020/0202  
May 2020

Find out more about your environment at:

**[www.environment.nsw.gov.au](http://www.environment.nsw.gov.au)**

# Contents

1.	Introduction	1
2.	Capture, restraint and physical examination	2
	Distance examination	2
	Capture and handling	2
	Transport	3
	Restraint for physical examination	4
	Physical examination	5
3.	Euthanasia	9
4.	Initial treatment – stabilisation	10
	Fluid rehydration	10
	Pain relief (analgesia)	10
	Wound care	11
	Managing bleeding (haemorrhage)	12
	External parasites	12
	Husbandry	12
5.	Common rescue encounters	14
	Trauma	14
	Burns	16
	Orphaned koala joeys	18
	Chlamydial disease	19
6.	Quarantine and managing infectious disease	21
7.	Record keeping	21
8.	References and further reading	22

## List of tables

Table 1	Classification of burns	17
---------	-------------------------	----

## List of figures

Figure 1	Decision tree directing the course of action for koala rescue encounters	1
Figure 2	Transport crate for a koala using sturdy laundry baskets, towel substrate and rolled-up towel for support, and velcro straps to hold the basket lid on securely. Photo: Cheyne Flanagan	3
Figure 3	A brief outline of the pathology of burns	16

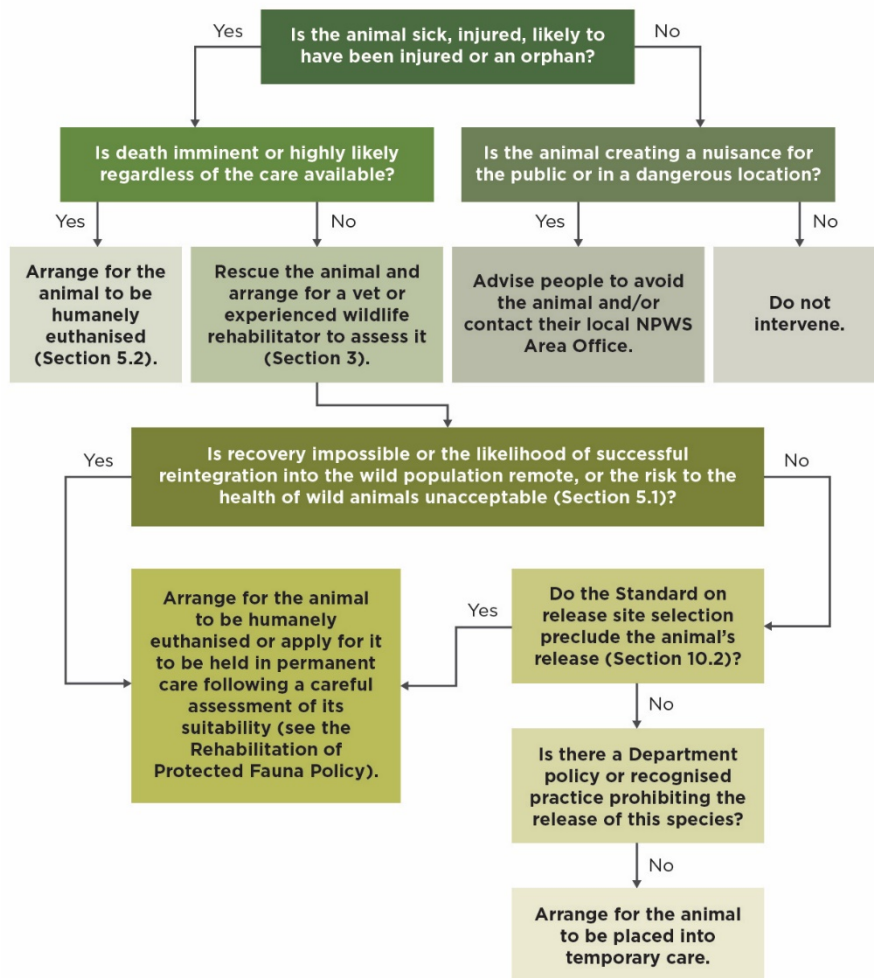
# 1. Introduction

The purpose of this document is to standardise the initial treatment of koalas requiring rescue or rehabilitation, in line with the *Code of Practice for Injured, Sick and Orphaned Koalas* (the 'Koala Code') (OEH 2018).

Understanding that each case is different and should be assessed individually, this document aims to guide licensed wildlife rehabilitators in New South Wales on assessment and first aid treatment principles for koalas first presenting for care.

The primary objective of rehabilitation is the successful reintegration of the individual into the wild population. This determines decision-making about the care and treatment of wild koalas.

The document provides guidance on the initial care and management of koalas following rescue, from capture to physical examination, initial treatment and stabilisation before presentation to a veterinarian or specialist koala care facility. It provides advice on how to manage the more common rescue encounters in koalas, including trauma, burns, orphaned joeys and chlamydial disease.



**Figure 1 Decision tree directing the course of action for koala rescue encounters**  
 (From the *Code of Practice for Injured, Sick and Orphaned Koalas*. Section numbers refer to numbering used in the Code.)

## 2. Capture, restraint and physical examination

As outlined in the Koala Code, rescuers must aim to have the koala assessed by a veterinarian or experienced carer within 24 hours of rescue to establish an accurate diagnosis and provide the best outcomes for the patient.

The clinical assessment aims to identify the severity of wounds, injuries or illness, to determine the best course of action.

Figure 1 provides an outline of the initial decision-making process for koala rescue cases. It is important to keep in mind that the ultimate goal of rescue and rehabilitation is to ensure successful reintegration of the individual into the wild population.

Clinical assessment begins before the animal is captured or in the hand. Identification of injuries such as lameness or wounds can be determined pre-capture by observing the koala and its movement. Rescue should be initiated as soon as appropriate to remove koalas from dangerous situations and to minimise further injury. Rescues should only be performed by trained individuals. Refer to the Koala Code for guidelines about rescue.

### Distance examination

Examine the koala before capture, focusing on gait and posture, climbing ability, signs of pain and distress, external wounds and respiratory rate.

If you observe severe injuries when examining the koala from a distance, for example, fractures or severe wounds or burns, arrange to have the animal taken straight to a veterinarian or a specialist koala care facility.

- **Gait and posture:** Lameness or abnormal gait or posture can indicate musculoskeletal or neurological injuries.
- **Signs of pain or distress:** Hunched posture, ear flicking, teeth grinding (bruxism), grunting vocalisation or increased respiratory rate can indicate pain or distress. The absence of these signs should not be assumed as an absence of pain as koalas can hide signs of pain.
- **Respiratory rate:** This is best measured before handling as handling and stress will increase the respiratory rate or effort.

Respiratory rate can be calculated by observing the koala's abdomen or chest expanding with each breath and counting the number of breaths per minute. A normal respiratory rate is 10–15 breaths per minute.

Panting, although uncommon, is a sign of severe stress or respiratory compromise in koalas. If the animal is observed panting, avoid further stress with handling and place the koala in a warm, dark, quiet environment and contact a veterinarian or experienced rehabilitator for advice.

### Capture and handling

Capture and handling of koalas should be performed only by appropriately trained people. Consider the time it takes to capture an animal – if capture is prolonged or first attempts are unsuccessful the koala should be given some time to rest before more attempts are undertaken (as long as the koala is not in imminent danger).

It is important to remember that the animal should not be picked up around the chest as they can easily turn around and injure the handler.

When attempting to capture and handle a koala:

- **Use a catch bag:** Canvas bags are ideal for catching koalas. Once the koala is placed in the bag, secure the opening with a tie. The koala can be restrained within the bag for examination or transport.
- **Use towels or blankets:** These can be used to envelop the koala to lift or move the animal or to provide cushioning or support when in transit. Ensure the animal's weight is supported by the towel or blanket when lifting or moving the koala.

Method of capture:

- **For koalas low in a tree:** Place the bag over the koala's head and work the bag around and under the rump. The arms and legs can then be detached from the tree and the koala placed gently into the bag.
  - Koalas have curved claws, and these must be carefully disengaged before removing a koala from a tree. Disengage claws by pushing forward then lifting.
- **Koalas higher up in trees:** These require more specialist techniques for capture such as flagging or the use of a trap. If you are not trained to perform these procedures, contact appropriate authorities for advice or assistance.
- **For koalas on the ground:** Approach quietly and place the catch bag over the top of the koala. Aim to cover the head of the koala with the bag, then slowly work the bag around the body before picking up the koala.

## Transport

Koalas should be transported in a padded container. For longer journeys, a wooden, ventilated transport crate with padding OR temporary transport crate (using two laundry baskets with towels for cushioning) can be used (see Figure 2). A towel can be placed over the container to provide some darkness and reduce stress.

Koalas should be transported in a stress-free environment – avoid excessive noise, movement and interaction with people.



**Figure 2** Transport crate for a koala using sturdy laundry baskets, towel substrate and rolled-up towel for support, and Velcro straps to hold the basket lid on securely. Photo: Cheyne Flanagan

Take care and use appropriate measures when transporting koalas in temperatures below 10°C or above 25°C to avoid shock caused by cold or heat.

## Restraint for physical examination

Observe the koala's demeanour while you are handling it, and monitor it for signs of stress. Be aware of the duration of handling and resultant stress to the animal. Aim to perform a brief clinical assessment initially, noting down vital signs. If the animal starts showing signs of stress (see below), replace it in a secure carrier and let the animal settle in a warm, dark, quiet location.

A more thorough clinical examination can then be repeated once the animal has had a chance to acclimatise to the new environment. In some situations, sedation or general anaesthesia, performed by a veterinarian, may be required for a thorough physical examination.

When restraining an animal, the aim is to perform a thorough examination with minimal stress to the animal. The restraint method employed should be tailored to each animal based on its health status and temperament.

If the koala is amenable, perform a physical examination while the koala is in the bag by extracting or uncovering different areas, such as limbs (see Figure 3). This is the preferred method of restraint and can be less stressful to the animal compared with more active restraint techniques described below. Ensure you are aware of the koala's position in the bag, especially its head. Keeping the koala's head covered during examination will reduce stress.



**Figure 3** Koala in a catch bag with forelimb exposed for examination. The handler must be aware of the koala's head position within the bag. Photo: Aditi Sriram

More active koalas may require sedation or anaesthesia for a physical examination. Following mild sedation, koalas can be restrained in a sitting position – holding both wrists and ankles with the koala facing away from the handler. Ensure the koala is supported on a lap or object (Figure 4). This will allow for examination of limbs, abdomen, chest and head. Use a towel or catch bag to cover the koalas head as this may help the koala to remain calmer during the examination.





**Figure 4** Koala under sedation restrained by holding wrists and ankles, with its body supported on the handler's lap. Photo: Marie-Claire Demens

Alternatively, koalas can be restrained from behind with one hand at the base of the neck and the other at the base of the rump. Koalas can be gently lifted and moved short distances using this technique.

### Signs of stress

Signs of stress in koalas can include:

- constant ear flicking
- vocalising
- urinating or defecating
- increased respiratory rate
- panting – a sign of severe stress
- refusing to uncurl from a hunched position.

As outlined in the Koala Code, following initial stabilisation, the carer must aim to have the koala assessed by a veterinarian or at a specialist koala care facility within 24 hours of rescue.

In situations where it is not logistically possible to have the animal physically assessed, the carer should contact a veterinarian or koala rehabilitator on the phone for advice on continued care of the patient, until it can be transported.

### Physical examination

A thorough examination of the koala, investigating the parameters described below, provides an overall health assessment which is necessary to determine treatment outcomes and prognosis. While progressing through the physical examination, ensure to make notes and keep records of findings (see Section 7).

### Body weight

The koala can be weighed in the catch bag or transport container (Figure 5). Once the koala is out of the bag (or container), its weight can be calculated by subtracting the weight of the bag from the total weight of the koala and the bag.

Body weight is an important indicator of health. Koalas have a unique digestive physiology. Weight loss or failure to gain weight, for example, could result from gastrointestinal problems and requires further investigation.



**Figure 5** Koala being weighed in a catch bag using hanging scales.  
**Photo:** Marie-Claire Demens

### Body condition score

This is best assessed by feeling (palpating) the muscles overlying the shoulder bone (scapula). Body condition can be scored between 1 and 5, where 5 is excellent and 1 is emaciated. A body condition scoring table is included in the [Koala Health Hub fact sheets](#) – see the [Clinical examination form](#). Assessing body condition can be difficult and takes practice; the intention is to identify emaciated animals or animals in poor condition rather than focusing on arriving at a precise number between 1 and 5.

Poor body condition can indicate a chronic disease process resulting in malnutrition. It provides direction for continued nutritional support for the animal. It is also used as a prognostic indicator – a body condition score of 1 or less carries a grave prognosis, whereby euthanasia should be considered.

### Identification

Ear tags and microchips are two types of permanent identification used in koalas. It is important to check for both as this can provide information on the animal's history, i.e. if the koala has previously been in care or involved in a research monitoring program.

- **Ear tags:** Record details including colour and identification number. Also record tears or wounds to the ear margins as these can indicate ear tag loss.
- **Microchip scan** – if a scanner is available: Microchips are generally placed under the skin (subcutaneously) between the shoulder blades. However they can migrate, so a complete scan of the back, neck and chest of the koala is recommended.

### Dental examination

Advanced tooth wear and periodontal disease can be a limiting health factor in koalas, therefore all koalas coming in to care should have a dental assessment. However, if the koala is resistant to oral examination, or the handler is not confident with performing an oral

examination, this is best performed by a veterinarian or experienced handler with the koala under sedation.

## Sex and age

Sex can be determined by the presence or absence of a pouch or external testicles. Age can be determined via a dental examination and assessing tooth wear pattern. See the [Tooth Wear Aging Charts](#) at the Koala Health Hub.

Determining tooth wear patterns to establish age range in koalas requires experience and is best performed with the koala under sedation or anaesthesia. The mouth can be opened by placing a pencil or finger into the gap (diastema) between the set of front teeth (incisors) and row of cheek teeth (premolars) and gently wedging the mouth open, with one hand on the top jaw and the other stabilising the bottom jaw. Taking photos of the teeth and wear pattern is useful for comparing with references and establishing an accurate age range for the animal.

## Hydration status

Koala skin is generally inelastic, therefore assessing hydration can be difficult. Koala skin should slide easily over the shoulder blades. In dehydrated koalas, the skin will feel tacky. Tacky or dry mucous membranes, sunken eyes, or folds of skin at the top of the head indicate dehydration.

## Coat condition

Palpation and visual examination of the coat can provide valuable information on koala condition and the presence of wounds or parasites.

- External parasites such as ticks can cause blood loss and can indicate poor condition and underlying disease processes. A thorough search for ticks should be performed, looking in the ears and around the face and body.
- Variations in coat quality should be noted as coat changes (scruffy, matted coat) can result from an inability to groom appropriately, for example, due to a musculoskeletal injury.
- Soiling and brown discolouration of the fur around the cloaca and rump, and matted fur in this area, can indicate urogenital disease resulting from chlamydial infection. The Koala Health Hub [rump scoring guide](#) is a useful reference for grading the severity of disease.
- Identify any wet patches or blood staining on the coat to check for deeper wounds or evidence of trauma.

## Heart rate

If available, use a stethoscope to listen to the heart by placing it over the mid-chest region. Alternatively, a pulse rate can be calculated by palpating the femoral pulse, on the inner thigh (Figure 6). A normal pulse rate in koalas is 65–90 beats/minute. Joeys may have a higher pulse rate than adults.



**Figure 6** Palpating the femoral pulse, using two fingers, on the inner thigh of a koala being restrained in a catch bag. Photo: Aditi Sriram

### **Circulation – oxygen levels**

Chin colour in koalas can correlate with circulating oxygen levels in the body. A healthy koala will have a light pink chin, whereas a koala that may have experienced shock or blood loss, or who is hypothermic, may have a blue–greyish colour chin. Veterinary attention is warranted as soon as possible if this is the case.

### **Eyes**

Check whether there is any discharge from the eyes, squinting, or abnormal pupil size when comparing the two eyes. Changes in the appearance of the transparent, outermost surface of the eye (cornea), discharge from the eyes, or redness (proliferation of the conjunctival tissues) can indicate trauma or infectious disease.

### **Nostrils and ears**

Check for discharge, wounds or abnormal shape of the nostrils and bridge of the nose. Ticks are commonly found in the ears, and ears should also be checked for wounds or evidence of trauma.

### **Gut fill**

The stomach should feel firm and round. Gut fill can be assessed by palpating the top left part of the abdomen, just below the ribs. A distended abdomen or ‘empty’ feel to the stomach can be indicative of gastrointestinal disease and requires further investigation by a veterinarian.

### **Limbs**

Palpate limbs for swelling, wounds and pain. Also assess motor function in the limbs (the koala’s ability to consciously move limbs). This can be performed by placing the koala on the ground in a small, quiet room and assessing mobility.

## Digits and nails

Check the koala's ability to grip and hold, and assess for neurological function in digits – this can be done by giving the digits of each limb a pinch and assessing if the koala is able to retract the limb or react to the stimulus. Koalas can be very stoic, so a lack of response may not always correlate with lack of function, but should be noted and relayed to the veterinarian for further assessment.

Irreversible injury or permanent loss to the claws are a deciding prognostic factor in koalas as the claws play an important role in grip and climbing ability. Koalas require a minimum of two to three functional claws on each hand to be candidates for rehabilitation and rescue.

## Body temperature

Assessment of core body temperature will likely require sedation, and is best performed by an experienced handler or veterinarian. This is done by inserting a lubricated thermometer into the cloaca and into the rectum, which is the opening closest to the tail (dorsal to the urogenital sinus). Normal body temperature in koalas is 35.5–36.5°C. Alternatively, feel the digits and ears to assess if they are cool or warm to touch to get a basic idea of whether the body temperature is too low (hypothermia) or too high (hyperthermia).

## Faecal production

Assess the quantity and quality of faeces produced. Normal koala faeces is olive to tan in colour (Figure 7). Faecal consistency can indicate gastrointestinal problems. In animals with a poor appetite, faecal pellets may be smaller, shorter or narrower. A normal pellet count is approximately 100–150 pellets a day. Fewer than 90 pellets a day can indicate reduced food intake or poor gastrointestinal function.



Figure 7 Koala faecal pellets. Photo: Cheyne Flanagan

## 3. Euthanasia

As stated in the Koala Code, euthanasia is necessary where recovery is not possible, death is imminent, the animal is suffering from chronic unrelievable pain, or the likelihood of reintegration into the wild population is remote. The Code including the decision-making tree (Figure 1) provides guidance on making a decision about euthanasia for rescued koalas.

Euthanasia should be performed by a veterinarian where available.

Where access to a veterinarian is not possible, a method appropriate for the species, ensuring minimal pain and suffering, should be employed: shooting with a firearm for koalas on the ground. Shooting should only be undertaken by licensed and skilled operators.

## 4. Initial treatment – stabilisation

### Fluid rehydration

Commonly, wildlife cases coming into care are dehydrated to varying degrees. The primary routes of fluid supplementation in koalas are intravenous (IV) or oral (PO). These are preferred over subcutaneous (SC) fluids as koalas have a minimal subcutaneous space therefore SC injections can be painful to administer and only limited volumes can be injected in one location.

### Intravenous fluid therapy

This is the best possible way to rehydrate an animal, however, it requires qualified and experienced carers, sterile techniques and appropriate equipment.

If severe dehydration is suspected, and in cases where oral fluid supplementation is not possible or inadequate, urgent referral to a veterinary facility for IV fluids is warranted.

### Oral supplementation

For koalas able to hold their head up, and without signs of head trauma or neurological deficits (see 'Trauma' in Section 5), fluids can be given orally using a syringe. Quantities are variable and will depend on how willing the koala is to accept oral fluids. Try not to force the koala if it is not willing to drink, as this results in stress, increases the risk of aspiration (fluid in the airways) and is counterproductive.

Insert the syringe into the gap (diastema) between the set of front teeth (incisors) and row of cheek teeth (premolars) and deliver fluids in small increments, in a controlled manner. Monitor the koala for active swallowing. Do not hold the head in a fixed position as this may inhibit swallowing and increase the risk of inhaling fluid.

Electrolyte solutions such as 'Lectade' or 'Vytrate' are ideal, and a volume of 100–200 millilitres can be given slowly in one sitting. This can be repeated through the day IF the koala is willing and able to drink.

If the koala is feeding, water intake can be increased by spraying leaves regularly and placing branches with cut ends in a secure water container.

### Pain relief (analgesia)

Koalas are generally stoic and may not show obvious signs of pain. Lack of appetite (inappetence) or lethargy, although non-specific, can be subtle indicators of pain in a koala.

In most rescue cases, especially with signs of trauma, pain relief is crucial for the welfare of the animal.

Depending on the assessment of injuries, and in consultation with a veterinarian, appropriate drugs can be administered to alleviate pain. Koalas have a unique metabolism and common medications used in dogs and cats may not be appropriate for koalas. Certain medications are also avoided in case of adverse metabolic effects. Therefore, once initially assessed, consultation with a veterinarian or specialist koala facility regarding the most appropriate drug and route of delivery is imperative.

## Wound care

For superficial contaminated wounds, lukewarm saline or topical disinfectants such as chlorhexidine or povidone iodine can be used to flush wounds. Use a syringe with an 18-gauge needle attached to create pressure and direction when flushing.

The benefits of flushing or irrigating wounds cannot be underestimated, as it helps clear debris, decreases potential for infection, hydrates tissues and optimises wound healing.

When using disinfectants, dilute solutions with saline and avoid flushing around the eyes or mouth (oral cavity). If chlorhexidine does get into the eyes, wash it out with saline immediately.

## Bandaging

If wounds are oozing or wet (exudative), following flushing, bandaging can be applied to try and wick exudate away from the wound. Superficial dressings such as low-adherent, absorbent wound dressing (e.g. 'Melolin') can be applied and bandaged in place with layers of wound-care padding (e.g. 'Softban') and a cohesive bandaging material (e.g. 'Vet Wrap') to stabilise the bandage (Figure 8). Bandaging can also prevent desiccation, flystrike and further contamination of wounds. Ensure bandages are not constricting as this can disrupt blood supply and consequently healing.

Bandages should be maintained clean and dry and should be changed if there is 'strike-through' – fluid from the wound wicking through to external bandaging layers.



Figure 8 Bandaging material commonly used for wound care: 'Melolin' (left), 'Softban' (centre) and vet wrap (right)

## Managing bleeding (haemorrhage)

Bleeding wounds can be managed in the short term with bandaging. Placing a bandage around bleeding wounds can apply pressure to the wound to control bleeding.

For external bleeding wounds, apply pressure using gauze swabs and bandage with wound padding (e.g. 'Softban') and cohesive bandaging (e.g. 'Vet Wrap') to apply even pressure. Ensure the bandage is applying pressure but is not constricting, as this can impede blood supply and damage tissue below the bandaged area. If you can still pass a finger between the skin and the bandage, that is adequate pressure. For wounds that are in a location that cannot be bandaged, apply digital pressure using gauze swabs and hold the pressure for a minimum of three to five minutes.

If there is profuse blood loss from a wound, or the source of bleeding is from deeper tissues (e.g. muscle rather than superficial skin wounds), apply a bandage and contact a veterinarian as soon as possible for advice.

## External parasites

Ticks are the most significant external parasite for koalas, as heavy tick burdens can cause anaemia and ultimately death in severe cases. High tick burdens can also indicate underlying disease as healthy and fit koalas are not generally found with heavy burdens and can adequately groom themselves.

Where there are only a few present, manual removal of ticks is the best management approach.

In cases where there is a high tick burden, topical preparations such as 'Advantix' or 'Fipronil' can be used. Contact a veterinarian or koala specialist facility to determine a dose appropriate for each patient.

As an alternative tick treatment, a preparation of amitraz ('Ectodex' acaricidal dog wash containing amitraz 50 grams/litre) can be diluted to a 0.025% solution and used to wet fur thoroughly.

If the animal is anaemic, vitamin B and iron injections may be useful in aiding recovery. Contact a veterinarian or koala specialist facility for advice.

## Husbandry

Husbandry requirements for koalas in the initial period following rescue differ to requirements for koalas in longer term care and should be adapted to each individual depending on the individual's abilities, injuries and health status.

## Housing

Koalas should be housed individually, in a warm and quiet environment (no sounds of domestic animals or people etc.). Koalas should be allowed to rest for long periods to minimise stress and conserve their energy.

Koalas should be maintained in 'intensive care' housing for the initial 24 hours at least.



### First 24 hours: intensive care housing

A debilitated animal or animal with musculoskeletal injuries requiring movement restriction (e.g. fractures) should be managed in a well-padded and confined enclosure, such as a laundry basket or wooden crate during the initial stabilisation period. The animal should have enough space to sit upright, but not enough space to move around. A stable fork close to the ground can be provided for support, with thick soft padding (towels or blankets) provided at the base. A rolled-up towel can provide support for the animal to lean against (Figure 2). Ensure bedding is changed regularly to avoid soiling. White towels are good to use when caring for koalas with urinary tract disease (due to chlamydial infection) and passing bloody urine, as you can monitor urine colour and quality.

### After the first 24 hours

Following the initial assessment and first 24 hours of care, if there are no obvious musculoskeletal injuries, a koala can be housed in an enclosure where it is allowed to climb both vertically and horizontally. Ideally, provide a resting fork (an upright pole with an angled pole attached at a 45-degree angle, Figure 9) to allow the koala to rest without effort. If you are concerned about the koala's mobility, the branches can be placed close to the ground with adequate padding below.



**Figure 9** An example of an enclosure set-up for a koala able to climb. Low forks are well-secured and leaf for feed can be attached close to the fork. Astroturf can be used as a substrate as it is easy to clean and non-abrasive. Photo: Cheyne Flanagan

Warmth can be provided using heat pads or hot water bottles. Ensure heat pads and hot water bottles are appropriately placed or wrapped in towels to avoid burn injuries, especially in severely debilitated animals which may be unable to move away from the heat source. Ensure ambient temperature is regularly monitored.

Provide a screen (leaves or a towel etc.) in case the koala prefers to hide from sight.

### Water

Provide a shallow drinking bowl at the base of the enclosure. Change the water daily. However, for a very debilitated animal, don't provide a water bowl as it is unlikely to drink and

it is better to reduce the risk of aspiration or accidental drowning, especially if the animal is unable to support its own body.

## Diet

Prolonged periods of poor appetite or fasting are detrimental to gastrointestinal function in koalas. Aim to get the koala eating as soon as possible.

- Provide branches of a variety of eucalyptus leaves in a water container and ensure the branches are well-secured in case the koala uses them for support.
- Spray the leaves with water before offering them to the koala.
- Offer fresh browse daily, consisting of at least two to three species and both young and mature leaves.
- Ensure the leaves have not been sprayed with pesticide, or contaminated by being used by other animals.

## Supplementary or assisted feeding

Self-feeding is always preferred, but if the animal has no appetite (inappetant) or is refusing or unable to consume leaves, consider supplementary feeding using a syringe of blended leaves or formulas such as 'Vetafarm Koala Crittacare'. Always continue to offer fresh leaves, even if supplementary feeding.

Contact an experienced carer or specialist koala care facility before assisting feeding, to determine the appropriate type, volume, method and frequency of assistance for each individual koala. This will vary depending on the weight, age and health status of each animal.

- **Formula** (e.g. 'Vetafarm Koala Crittacare'): Follow instructions on the packet to make up the formula, and feed 2 to 3 millilitres twice a day for the first 24 to 48 hours. This will provide some nutritional support until the animal is able to self-feed or until the animal can be taken to a veterinarian or specialist koala care centre for further investigation to identify the cause of inappetence.
- **Blended leaf mixture:** Blending leaves into a paste can be difficult, but is worthwhile. Blend eucalyptus leaves with water and make this into a slurry to feed using a syringe.

# 5. Common rescue encounters

## Trauma

Trauma is the most frequent cause of mortality in koalas rescued in New South Wales. Trauma can be related to a range of incidents such as motor vehicle accidents, dog attack, fighting with other koalas, etc.

Follow the basic principles for initial stabilisation (as set out above). After a traumatic incident the majority of victims will be in shock. Therefore, following an initial clinical assessment, it may be useful to allow the animal to rest in a warm, quiet location while preparing for treatment.

## Motor vehicle accidents

Important points to note specific to motor vehicle trauma-related injuries:

### Head trauma

Animals with head trauma may display a variety of clinical signs and care must be taken with handling these patients. Neurological injury can result in an inability to swallow, therefore be especially careful when offering oral fluids. Signs related to head trauma include:

- blood from the nostrils, mouth or ears
- abnormal pupil size, indicating injury to the brain or nervous system.

### Skull or jaw fractures

Drizzling from the mouth or blood in and around the mouth, nostrils or eyes can be a common presentation of skull fractures. Koalas with jaw fractures may have a misaligned jaw or hold their mouth open. Radiographs or more advanced imaging techniques are required to accurately assess fractures of the skull or jaw, therefore immediate transfer to a koala specialist centre or veterinary hospital is recommended. Broken or missing teeth, especially incisors, carry a grave prognosis and euthanasia should be considered in these cases.

### Haemorrhage

Check for signs of external and internal haemorrhage.

- Pale or blue-tinged mucous membrane colour can indicate blood loss, due to internal or external haemorrhage.
- Blood in the urine, coughing up blood or blood in the saliva can indicate internal haemorrhage.

### Abdominal trauma

Abdominal trauma is common in cases of motor vehicle accidents and dog attacks due to the koala's thin-walled abdomen and large size of the abdominal contents. The koala may be hunched over, inappetent and display an obvious pain response when the abdomen is palpated. Abdominal trauma carries a guarded prognosis and cases should be referred to a specialist koala centre or veterinary hospital as soon as possible.

### Fractures and dislocations

These are common complications of trauma and can result in lameness or a focal area of pain and swelling. Immobilising a fracture is vital to reduce pain and tissue trauma.

- Immobilising the koala by housing it in a confined carrier can help reduce pain and further tissue trauma. A laundry basket (e.g. Figure 2) can be ideal for this situation. The patient should be assessed by a veterinarian as soon as possible and kept confined, within minimal handling, until then.
- Open fractures (where there are external wounds or bone is exposed) are at increased risk of infection and complications and carry a grave prognosis. Animals with open fractures should be taken to a veterinarian for anaesthesia and assessment as soon as possible. In the interim, again, ensure the patient's mobility is restricted.
- Spinal fractures can result in compromised neurological function. The koala may have a loss of sensation or loss of motor function (conscious movement) in the limbs as a result of spinal injury. These injuries carry a grave prognosis and euthanasia must be considered. Radiographs are needed to adequately diagnose spinal injuries.

## Dog attack

Important points to note specific to dog attack injuries:

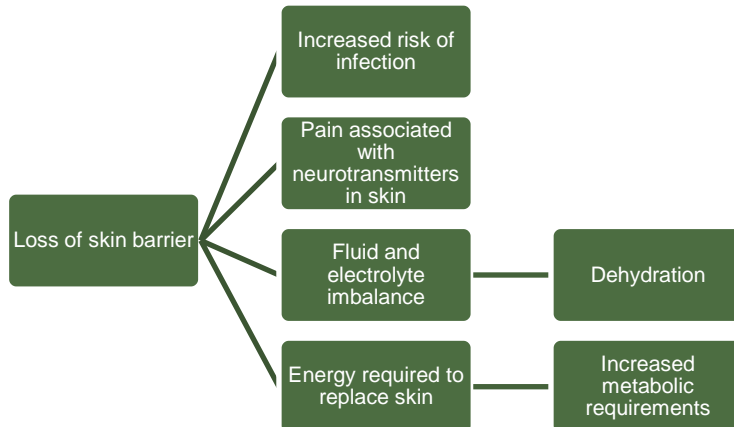
Internal injuries are often more severe than they appear to be externally. Often the only noticeable signs will be saliva staining of the fur, and on more thorough assessment, puncture wounds or grazes may be identified in saliva-stained areas. Superficial injuries might appear minimal, however injury to deeper structures such as muscle, bone or joints may be severe. In animals with bruising or wounds around the chest or abdomen, internal injuries must be assessed, and this usually requires advanced imaging techniques (e.g. radiographs or ultrasound). Severe dog attack injuries require surgical or antibiotic treatment prescribed by a veterinarian.

- Ensure a thorough physical examination has been performed once the animal is stabilised, and part fur to check for puncture wounds and bruising.
- Dog-bite wounds are contaminated wounds and require antibiotic treatment. Antibiotics need to be prescribed by a veterinarian, and the choice of medication and duration of treatment will depend on the severity and extent of injuries.
- Flush and treat external wounds as described in 'Wound care' in Section 4.

## Burns

Koala behaviour and response to bushfires has not yet been clearly defined, but it is understood that koalas are at high risk in bushfires (Matthews et al. 2016).

Rescuer safety is vital in rescue situations, and information on rescues on fire grounds are outside the scope of this document. Only qualified personnel with appropriate training should attend to rescues on fire grounds.



**Figure 3** A brief outline of the pathology of burns

Burn injuries should be classified based on their severity and extent. This is an important indicator of prognosis and will direct treatment. In addition to a burns assessment, an overall physical examination should be performed to check vital signs and identify any concurrent injuries or illnesses present.

Keep welfare in mind when triaging burns cases as burn injuries are severely painful and the experience in itself is traumatic. Assessment and provision of pain relief by a veterinarian should be sought as soon as possible.

## Depth of burns

The classification of the depth of burns can be subjective depending on the experience of the person assessing the patient. Table 1 provides some guidance on classifying burns as superficial, partial or full thickness burns.

## Extent and location of burns

Basic guidelines to apply when assessing the extent of burns in relation to prognosis or outcomes for the patient are:

- Burns affecting less than 15% of the body (excluding hands and feet) carries a reasonable prognosis.
- Burns affecting 15–50% of the body (excluding hands and feet) carries a poor prognosis and euthanasia must be considered.
- When greater than 50% of total body surface is affected, or there are significant burns to the face or genitals, euthanasia must be considered.
- In arboreal animals such as koalas, full thickness burns to the digits, nail beds or leather padding on feet carry a grave prognosis and euthanasia must be considered.

Radiant burns are very common in koalas and often do not manifest until several weeks post exposure. These animals are required to be kept in care for several weeks to adequately assess the extent and development of injuries. Radiant burns should be suspected in any animal with singed fur, and appropriate veterinary intervention sought as soon as possible.

**Table 1** Classification of burns

	Superficial	Partial thickness	Full thickness (3rd degree)
Pathology	Epidermis and upper dermis, most adnexal structures intact	Epidermis and part of the dermis. Superficial adnexal structures affected	Epidermis, dermis & cell adnexal structures destroyed
Appearance	Red, pale pink	Dark pink to red	Dry, leathery, white, black (charred) or yellow. Eschar may be present
Blisters	Large within hours	May be present	None
Sensation	Very painful	Less painful	Absent

Adapted from T Duratovic (2016)

## Stabilising the patient

Following classification of the burn injury, veterinarians or specialist koala care facilities should be contacted to discuss how best to stabilise the koala before transfer to a specialist facility. General guidelines for stabilising koalas with burn injuries are:

- If the burns are ‘fresh’, there is a high likelihood there is remnant heat in the wounds, therefore flush the wounds with lukewarm saline flushes or cover the wounds with saline-soaked gauze swabs.

- Fluid therapy is vital as animals can develop shock from severe dehydration. Administer intravenous fluid therapy if possible. If not possible, provide oral fluid replacement.
- For burns to the eyes or face, flush the eyes or face with saline and seek veterinary advice as soon as possible.
- For smoke inhalation or respiratory burns, observe the koala for any signs of respiratory distress, such as open-mouth breathing, panting or increased respiratory rate. Smoke inhalation can result in damage to the lungs and possible pneumonia. Ideally, oxygen therapy can be provided, but this requires specialist equipment. In the interim, improving humidity with nebulisers can improve clinical signs. If the koala will not tolerate a nebuliser mask held up to the face, a nebulising chamber can be created using blankets or towels to create a humid chamber.
- Nutritional support may be needed. The koala may struggle to feed itself initially and recovering from burns markedly increases metabolic requirements. Carers should trial hand-feeding leaves or syringe-feeding blended leaf mixture or Vetafarm Koala Critticare in the short term.

### Treating burn wounds

- Treatment should be undertaken only once the patient is stabilised. This may be 24 hours after initial presentation. In the majority of cases, burn injuries require pain relief and sedation or anaesthesia before cleaning and bandaging wounds.
- Wear gloves when handling burn injuries to reduce the risk of wound contamination.
- Prepare the required bandaging equipment beforehand so treatment can be performed quickly and efficiently.
- Flush burns with lukewarm saline to remove debris and gently pat dry. Apply an antibacterial cream such as 'Flamazine' (Silver Sulfadiazine) to wounds and bandage to protect wounds from further trauma, prevent desiccation and relieve pain from exposed nerve endings. Ensure bandages are not too tight or constricting. Bandage wounds with a low-adherent, absorbent dressing such as 'Melolin' as the primary dressing then use a padded bandaging material ('Softban') and a cohesive bandage ('Vet Wrap') as consecutive layers.

In most cases, sedation or anaesthesia is required to perform bandage changes, therefore following initial stabilisation, transfer to a veterinary or specialist koala facility is advised. A veterinarian can determine the severity of burns and determine the requirement for sedation or anaesthesia and frequency of bandage changes (which can be as frequent as once every three to four days).

### Orphaned koala joeys

Clinical assessment and decision-making regarding the treatment of orphaned joeys largely depends on the age of the joey. Joeys with ear canals and eyes closed have a poor prognosis for rehabilitation. Joeys above 120 grams, with eyes open and ear canals open, are more ideal candidates for rehabilitation.

Following initial rescue, long-term care of joeys should be undertaken by experienced carers as it is an intensive process requiring experience and time commitment. Aim to contact an experienced carer as soon as possible for advice on husbandry, feeding and care of joeys until the animal can be handed over to the carer.

## Husbandry

- Unfurred joeys must be placed into a lined pouch with an external heat source maintaining a constant ambient temperature of 32 to 35°C. The pouch or lining must be changed when soiled. Humidicribs are ideal, but hot water bottles or heat mats can also be used. Ensure the temperature is monitored regularly to prevent overheating.
- Once the joey is furred its ability to thermoregulate improves and it can be maintained at minimal temperatures of 28°C.
- Weigh joeys daily to monitor and ensure adequate weight gain.
- Minimise interaction with joeys, such as stroking or petting, as this can result in undue stress.

## Feeding

- Unfurred joeys should be fed every two hours, including through the night. Feeding frequency can be decreased as the joey gets bigger. It is important to record the amount of food taken at each feed and the frequency of feeds.
- There are various milk replacement supplements available to feed joeys (e.g. 'Wombaroo Koala Milk Replacer', 'Biolac'), however feeding regimens are very specific depending on the joey's weight and developmental stage. Coordinators must be contacted for advice on feeding.
- Joeys are best fed with a syringe, inserted in the space between the incisors and premolars (diastema), as it allows for regulated feeding. A teat can be attached to the tip of the syringe to ease feeding. Ensure all feeding equipment is cleaned and disinfected after each feed.
- Around 22 to 24 weeks of age or generally when the joeys are around 250–300 grams, they will seek pap. Pap is a specialised form of faeces produced by the mother to inoculate the joey's gastrointestinal tract with important bacteria, aiding in digestion. It is following this stage that joeys can be offered leaf. Experienced carers should be contacted for specific information on pap feeding where appropriate.

## Typhilitis

- Typhilitis is inflammation of the caecum (part of the large intestine) and is thought to be due to a combination of lack of maternal antibodies, low inoculation of the normal bacteria that colonises the caecum and administration of inappropriate milk supplements with or without leaf intake.
- Koala joeys are prone to typhilitis and it is often seen in-hand reared joeys when they emerge from the pouch.
- Clinical signs are variable – drinking less, teeth grinding, lethargy, diarrhoea, or reduced or no faecal output. The prognosis for survival is generally poor. If these symptoms are noted, contact the species coordinator or specialised koala care facility for advice.

## Chlamydial disease

Chlamydia is an infectious disease in koalas caused by an intracellular bacterium. It is very variable in presentation and animals without obvious clinical signs of disease may still be infectious. Commonly, infection occurs without overt clinical signs.

All koalas with suspicion of chlamydial disease should be assessed by a veterinarian and appropriate samples collected for diagnostics. The presence or absence of chlamydia will determine prognosis and outcomes for release.

The quarantine principles discussed in Section 6, 'Quarantine', should be applied to all koala cases coming in to care. However, in cases where chlamydial infection is suspected, it is especially important to ensure the koala is isolated and managed appropriately.

Clinical chlamydial infection in koalas is variable and depends on host and pathogen factors. There are three forms of the disease which may all co-occur in the same animal: ocular, urogenital and reproductive.

### Ocular disease

Symptoms can vary in severity and include discharge from the eye, redness of the fleshy part of the eye (conjunctival proliferation or erythema), or blueish tinge to the outer, normally transparent layer of the eye (corneal opacity or pannus). The Koala Health Hub [Clinical examination form](#) includes a useful reference to grade ocular disease most commonly associated with chlamydial infection in koalas.

### Urogenital disease

This is associated with soiling and brown discolouration of the fur around the cloaca and rump, and matted fur – commonly referred to as 'wet bottom'. The Koala Health Hub [Clinical examination form](#) has a useful scale to grade the severity of clinical signs. The koala may also show signs such as grunting when urinating, abnormal posture during urination, or red or pink discoloured urine.

### Reproductive disease

Koalas with reproductive disease associated with chlamydial infection may not show specific clinical signs. Ultrasound or diagnostic testing at a specialist facility is required to investigate reproductive involvement in potential cases of chlamydia-infected koalas.

Treatment of chlamydial disease requires specific antibiotic protocols. In the initial period, provide supportive care as described in Section 4, 'Initial treatment – stabilisation', and provide supplementary feeding until the koala can be transferred to a veterinarian for diagnostics and care. If possible, take photos of ocular lesions and urogenital staining, alongside grading, before initiating treatment.

- Flush and clean the eyes regularly with saline.
- Wash and dry wet bottom to prevent urine scalding.
- Ensure the koala is kept warm to avoid hypothermia after washing.

At present, there is no evidence for transmission of koala chlamydial strains (*Chlamydia pecorum* and *Chlamydia pneumoniae*) to humans. However appropriate personal protective equipment (PPE), such as disposable gloves, should always be used.



## 6. Quarantine and managing infectious disease

Quarantine practices are vital in controlling and preventing infectious disease being transmitted between patients.

Treat all koalas as potentially infectious and take precautions to minimise disease transmission.

- House animals separately.
- Do not share browse or water bowls.
- Thoroughly clean all enclosures, food and water bowls and equipment between patients.
- Ensure catch bags, towels etc. are thoroughly cleaned before use.
- Ensure biological materials such as leaves, wood, branches etc. are disposed of after use to prevent contamination between animals.
- Wash hands thoroughly and use PPE as required – with equipment in place before handling koalas.

Glutaraldehyde or chloramine-based disinfectants (or 'F10') should be used to clean equipment and enclosures between patients. Let disinfectant soak for 5 to 10 minutes before rinsing it off.

## 7. Record keeping

Accurate records must be maintained to track the progress and outcomes for koalas in care. If the koala is referred for treatment at a wildlife hospital, these records provide vital clinical information useful in determining continued treatment and outcomes for the koala. They are also a useful resource for research and government organisations.

Records to be maintained include:

- Encounter details – date, circumstances, location, name and details of people involved.
- Individual identification of koala – age, sex, identification (microchip, ear tags).
- Initial physical examination findings.
- Daily clinical notes – including treatments provided, progression or development of symptoms, weight, food intake, faecal output etc. Maintain daily record sheets while the koala is in care.
- Outcome – record the outcome for each individual coming in to care. For example, whether the animal was transferred to a carer or veterinarian, if the animal was euthanised or if the animal died while in care.

## 8. References and further reading

Duratovic T 2016, First Aid for Fires, in Proceedings of the Australian Wildlife Rehabilitation Conference.

Flanagan C 2019, *Koala Rehabilitation Manual* (6th ed.), Koala Conservation Australia Ltd.

Fowler A & Blankley M 2006, Treating Burnt Wildlife, in Proceedings of the National Wildlife Rehabilitation Conference.

Matthews A, Lunney D, Gresser S & Maitz W 2016, Movement patterns of koalas in remnant forest after fire, *Australian Mammalogy*, 38(1), pp.91–104.

Office of Environment and Heritage 2018, *Code of Practice for Sick, Injured and Orphaned Koalas* (OEH 2018/0298), Sydney NSW, Australia.

Vogelnest L & Portas T (eds) 2019, *Current Therapy in Medicine of Australian Mammals*, CSIRO Publishing.

Vogelnest L & Woods R (eds) 2008, *Medicine of Australian Mammals*, CSIRO Publishing.

Koala Health Hub, University of Sydney, fact sheets and protocols:  
<http://koalahealthhub.org.au/fact-sheets>.