POSSUMWOOD WILDLIFE

Where traumatised wildlife can recover in safety

Macropod Fence Injuries: Rescue, assessment, treatment & recovery

In the beginning

- **Pints**

  Our first fence hanger (20 years ago). Inspired us to treat and rehabilitate fence hangers.

- **Subsequent to ‘Pints’ we have undertaken more than a thousand macropod wire entanglement rescues.**

Why rescue macropod fence hangers?

- To reduce suffering
  - Consider the pain, fear & vulnerability to attacks by dogs, foxes, crows, ants
- High percentage of good outcomes
  - Refer 2008 paper AWRC paper on fence hangers (Austen & Garlick) on 50 consecutive fence rescues.
- Knowledge to ensure the future of macropod species
  - 1927 – the last slaughter of koalas in Australia occurred in Qld (Black August – 800,000 died). 2022 koala population in Qld, NSW, ACT listed as 'endangered'.
  - Kangaroos in Australia - the largest slaughter of a land-based native mammal in the world. With habitat loss, macropod species are heading in the same direction as koalas.
  - Wildlife carers are at front line. It is up to them to amass knowledge that could help macropod species in the future.

What will be covered

- **The rescue**
  - Equipment,
  - Plan (types of fences, form of entanglement, mother & joey situation
  - The approach.
  - Safety, on-site medication, transportation, hypothermia, hyperthermia.
- **Assessment**
  - Stress, exertional rhabdomyolysis, metabolic acidosis,
  - Hip Dislocation, pelvic & spinal injuries, fractures, other injuries,
  - Wounds and ischaemic damage,
  - Nerve palsy: Footdrop, knuckling, leg splaying.

Treatment

- Fluids & sodium bicarbonate,
- Wounds,
- Medication – pain relief, antibiotics.

Recovery

Physiotherapy, standing practice, exercise, bedding, dressing changes

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Rescue equipment

- Blankets
- Wire cutters/separators
- Stretcher
- Joey bag
- Medical bag: Saline, antiseptic cream, non-adherent dressings (NAD), crepe bandage, gloves, sedation, hand wash
- PPE clothing
- Towel/ bottle of cold water (hyperthermia)
- Heat blanket (hypothermia)
- Torch

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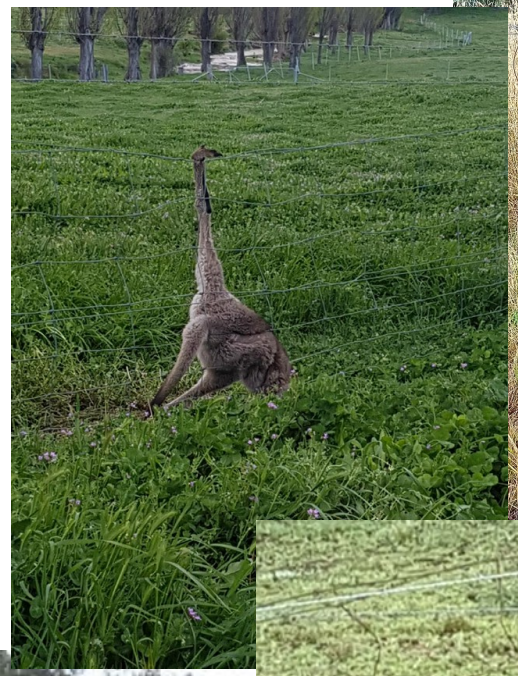
Planning the rescue

- Speed of response – critically important
- Safety – free leg, angry mother
- Preferably two rescuers
  - Hold with two hands to immobilize legs
  - Cover with blanket, sedation if necessary, and cut or prise open tight wire.
- Assess the situation at a distance and apportion tasks. Take note if the animal is too quiet.
- Mother/ joey situations, Alpha male situations.
- Types of fences & likely impacts
- Approach cautiously but deliberatel

MOPS & fence rescues.
Approx 98% of fence entanglement rescues need to come into care.






On-site treatment

- Prevent contamination of wounds. Lay the animals legs straight on to a blanket as tetanus is a real risk. Ensure head is covered to reduce stress.
- Treat any significant blood loss from wound (NAD plus crepe bandage with sufficient pressure).
- Flush wounds with saline. Apply antiseptic cream (eg Silvazine) Apply NAD, crepe bandage – not too tight and bandage the foot distal to the wire cut also to prevent swelling .
- Initial treatment for hypothermia or hyperthermia.

Transport to care centre

- Suspect pelvic or spinal injury or other fractures
- Gently roll the animal onto stretcher and lay flat in vehicle
- Wounds have already been dressed to prevent contamination. Heating or cooling in place depending on circumstance.
- Cover with blanket or sheet to reduce stress.

Key treatment issues

- Normalisation of temperature
- Fluid treatment for dehydration and exertional rhabdomyolysis
- Lactic acidosis
- Hip dislocation
- Wounds & ischaemic damage
- Neurological injury
- Fracture
- Stress

Exertional rhabdomyolysis

- Prolonged, strenuous muscle activity in hot conditions can cause exertional rhabdomyolysis especially if associated with dehydration.

- The breakdown of the muscle tissue releases the muscle protein myoglobin, enzymes: creatine kinase (CK, AST/ALT and potassium into the blood.

- The myoglobin results in dark brown or what is known as ‘Coca Cola’ urine and can result in kidney damage and consequent renal failure

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Anaerobic metabolism

Glucose

Glycolysis – in cell cytoplasm

ATP (energy source) + Pyruvate + H^+ (acid) → Lactate

OR

Creatine kinase (CK)

Creatine phosphate → Creatine + energy – in muscle cells

Phosphate + ADP → ATP (energy source)

Useful reference: http://www.teachpe.com/physiology/energy_systems.php

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Normalisation of temperature, fluid treatment & acidosis

- Check core body temperature is between 35 and 37 degrees C. We use a tympanic thermometer.

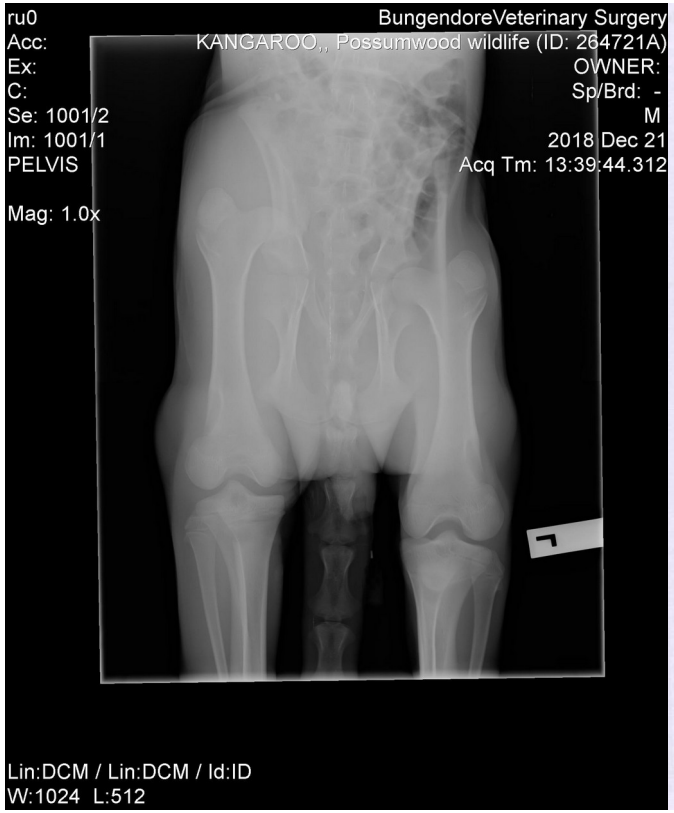
- Early & intensive fluid treatment is required to treat dehydration and help prevent kidney failure - acute due to dehydration or chronic due to kidney damage caused by the myoglobin. Use normal saline (0.9%) for infusion.
  - Subcutaneous (3% - 4%) depending on dehydration, warm fluids if normothermic or hypothermic.
  - Intravenous (great care has to be used when giving IV fluids to prevent fluid overload). If an animal is severely dehydrated, a bolus of 10-20ml/kg of normal saline given over 10-20mins can be used

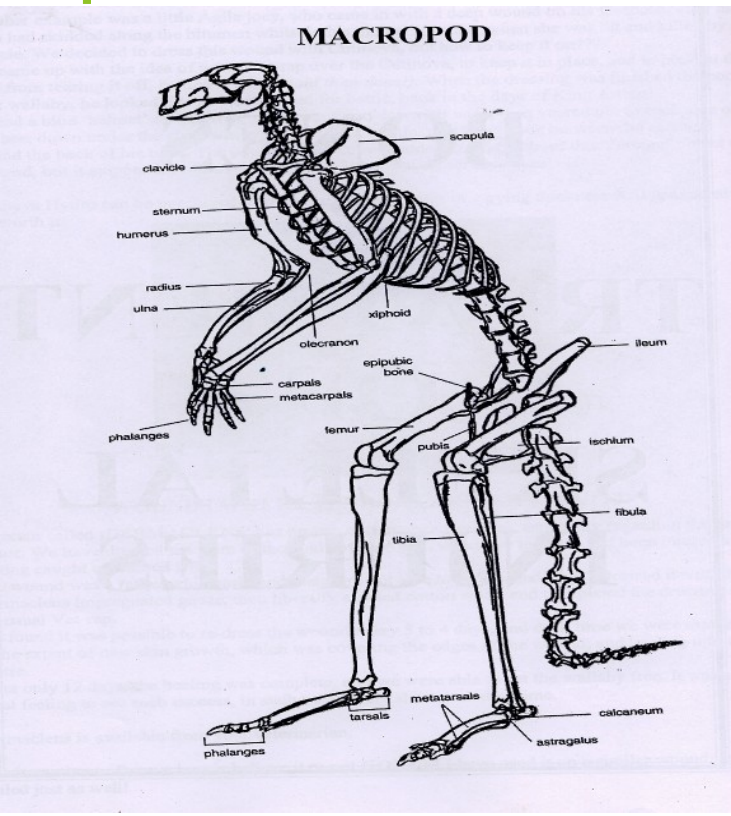
- If lactic acidosis is suspected ie. elevated respiration rate despite temperature being normal and animal relaxed then give sodium bicarbonate sterile solution for injection at a rate of 1 ml per kg SC. It is likely dose will need to be repeated.

Other treatment

- Vit E/ Selenium and Analgesia – discussed later
- Wound treatment – discussed later
- Ultravac 5 in 1 for Tetanus vaccination (1ml SC, 2nd dose @ 4 weeks, booster dose @ 12 months)
- Piglet Baycox (0.4ml/ kg) in first week of care.
- Ivermectin/ cydectin (1ml/ 10kg pour on).
- Treat for lice if necessary (eg Frontline)
- VAM or Vit B Complex (helpful for nerve palsy) – discussed later
- Antibiotics (Amoxycillin LA, concentration150mg/ ml, dosage 0.1ml/kg SC, second daily; Oxytetracycline LA, concentration 300mg/ml, dosage 0.1ml/kg IM, every 3 days)

Hip Dislocation





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Hip Dislocation

Normal hip location

Hip dislocation - posterior

Hip Dislocation: Types of treatment

- Non-surgical: Closed manoeuvre.
  To keep it in position, <15kg animals, keep in a bag. Traction & counte
  traction then abduction with external rotation then adduction with interr
  rotation. Traction needs to be maintained during the manoeuvre. Can b
  assisted by upward then downward pressure on greater trochanter

- Surgical procedures.

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Lacerations

- Wounds can vary from a wire mark to extensive and deep soft tissue damage, e.g. barbed wire causes severe lacerations and barbs can puncture the joint capsule.

- Wounds always get worse before they begin to heal. There can be tissue necrosis which can cause an unpleasant odour.

- Maggots in wounds are a common problem in wounds in summer. We usually flush the wound with diluted iodine and remove with forceps. Dressings are changed daily until no more maggots are present.

- Suturing is usually not successful because of tissue necrosis at the wound site

- There can be extensive loss of skin with bone exposed on the dorsum of the foot. These wounds heal very well with good dressing changes and DO NOT require skin graft.

In-situ laceration treatment
(Harry)

Harry – six weeks later

Wound Treatment

- Flush wound very well with normal saline (hopefully wound has a dressing from the initial rescue and therefore should not be contaminated).
- Chloramphenicol and Gentamicin compounded gel or either unprocessed or Manuka honey.
- Impregnated gauze (eg jelonet) and NAD.
- Synthetic padding (eg soffban) and vetwrap. Very important to ensure dressing is not too tight. We use rigid sports tape to secure the dressing – prevents contamination of the wound if the dressing comes off.
- Dressing changes twice weekly initially. Once necrotic tissue is removed then once weekly to once fortnightly depending on healing stage

Wound treatment continued

- If wound not healing or animal chewing at wound deeply there could be a piece of necrotic bone preventing healing.
- Sometimes there is no actual laceration, but the skin has been rubbed by the wire. It is a mistake to think these wounds are minor. Within a couple of weeks, the skin will have become necrotic, and a large open wound will develop. Animals with extensive wire rubbing have to come into care.

April
Deep laceration down to the bone. Necrotic bone preventing healing. Loss of large toenail due to ischemic injury. Also had dislocated hip. Released.

Ischaemic damage

The most common sites to be caught in a wire fence are distal to the ankle joint (foot or toe). The degree of ischaemic damage can be mild to severe (see next slide). You can apply some form of external heat to stimulate blood supply to the extremity – especially if the animal is hypothermic and therefore there will be distal vasoconstriction.

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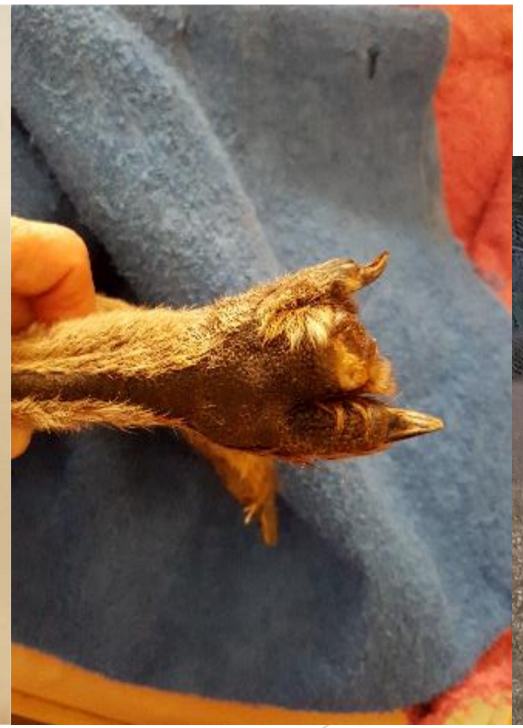
Severe ischaemic damage

- Severe ischaemic damage distal to the metatarsophalangeal joint is not inconsistent with a good outcome This was Sunny's foot a number of years ago as a joey. Essentially, it autoamputated at the metatarsophalangeal joint. He is doing well at the release site and is very large, happy and healthy kangaroo.
- At the release site is also Valley who had an amputation at this joint and she has successfully carried joeys



Valley & Joey at release site

Stress

- Initial assessment: Behaviour (facial, anxiety eg scrambling to escape)
- Other observations: Heart rate, Respiration rate, Temperature can also be stress indicators but vary depending on temperature and hydration status.
- Blood pathology (optional)
  - Cortisol –a hormone released into the blood stream by the adrenal gland in times of stress (serum, faecal).
  - Biochemistry (CK, AST, Urea, Potassium)

- Acute stress and treatment. An anxiolytic medication, e.g. Diazepam (dose variable depending on animal condition and need for sedation) and analgesia, e.g. Painstop (10-15mg paracetamol/kg BD, approx 0.5ml/kg, Tramadol (1mg/kg IM BD). Vit E Selenium 0.05ml/kg IM (if available) or Vit E capsules or liquid or VitE Selenium supplets mixed with pellets.
- On-going stress management
  - Polyvagal (housing, with kin, trust, and almonds)
  - Haloperidol 2mg/kg IM first dose (up to a max first dose of 50mg)

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Pathology variables & observations in fence hangers

- Typically high cortisol (stress)
- High CK and AST/ ALT & Potassium, depends on degree of struggle and consequent muscle damage (exertional rhabdomyolysis)
- Typically high Urea due to dehydration – worse in summer
- Observations such as Respiration Rate, Heart Rate, Blood Pressure are variable depending on temperature, dehydration, medication given at rescue

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Wire Fence Entanglement

Name	Date	CK	CORT	Outcome
Carrie	2/4/19	356540	525	Released
Springer	6/3/22	178210	262	Released
Timon2	5/3/22	22588	230	In-care
Brooks	15/11/21	99774	337	Released
William	16/10/21	3158	202	Released
Bates	18/10/21	79651	295	Released
Cinnamon	23/7/22	57288	125	In-care
Goliath	17/8/21	9398	236	Died
Ginni	15/2/22	102048	588	In-care
George	15/2/22	244716	342	Died
Basil	12/6/23	731850	152	In-care
Diego	16/9/22	122308	233	In-care

CK Normal 203-6868 U/L
CORT Normal < 50nmol

Basil's story

- Markedly elevated CK and Cort levels on rescue from fence entanglement. Caught by both legs.

- After 5 weeks in care, Basil could already get up and stand for long periods. Can get up and stand for long periods. Due for release.

Basil after 5 weeks in care

Carrie's story

- Markedly elevated CK (356540) and Cort (525).

- A fence hanger attacked by a dog while hanging in the fence.

- She had a severe neck wound from the dog attack and broken teeth from hitting the ground when she got her feet caught in the wire fence.
- Released.

Carrie

Ongoing stress and the Polyvagal Theory

- Following the stress of the initial entanglement the animal needs to deal with the stress of being in care

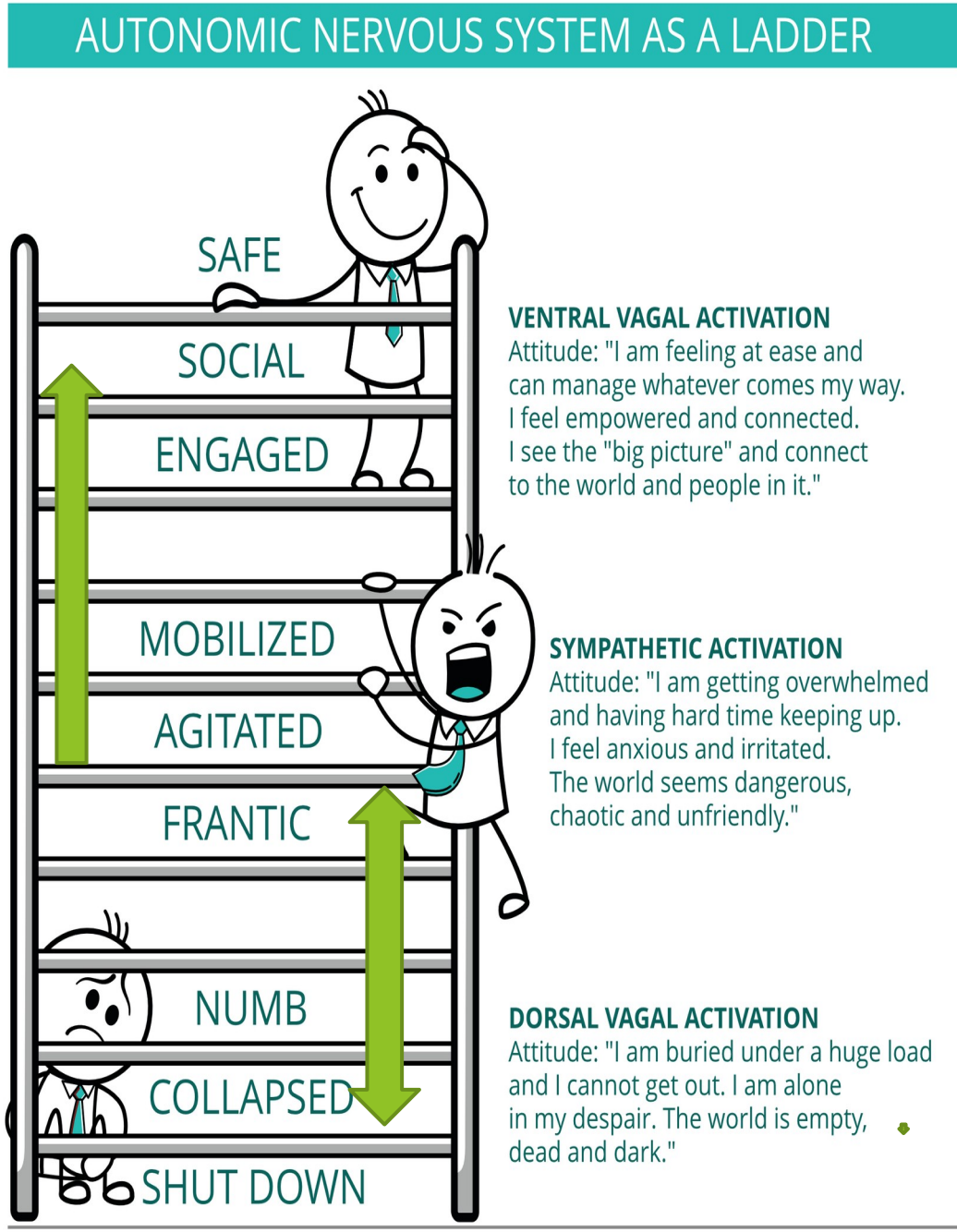
- We have found the polyvagal theory explains our observations over the last 20 years.

Polyvagal Theory

- Stephen Porges (“The Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, Communication & Self-regulation”, 2011)
- Sympathetic nervous system
- Parasympathetic Nervous System
  - Dorsal Vagal nervous system
  - Ventral Vagal nervous system
- Studies with animals

The Polyvagal Theory in Action

- The autonomic nervous system
  - Sympathetic & Parasympathetic nervous systems
- The Vagus nerves of the parasympathetic nervous system
  - Ventral vagus branch -
  - Dorsal vagus branch –
- The Polyvagal Ladder – a continuous loop of emotional & behavioural movement between three states
  - Rest & digest (social engagement & rest)
  - Fight or flight (mobilisation)
  - Shutdown (immobilisation) –trance-like



Adapted from *The Polyvagal Theory in Therapy* by Deb Dana

The rehabilitation challenge

- How to get the fence hanger brought into care from the sympathetic ‘fight or flight’ state to the ventral vagal ‘rest and digest’ state and prevent them from moving into the dorsal vagal ‘shutdown’ state?

- The ANS is a constant surveillance system - always monitoring stimuli and asking the question ‘is this safe?’

- Neuroception – immediate interpretation of safety & risk
  - Neuroception precedes perception.
  - Fence injured macropods – the limited mobility of fence injured macropods always makes them feel vulnerable and impacts on their risk interpretation.

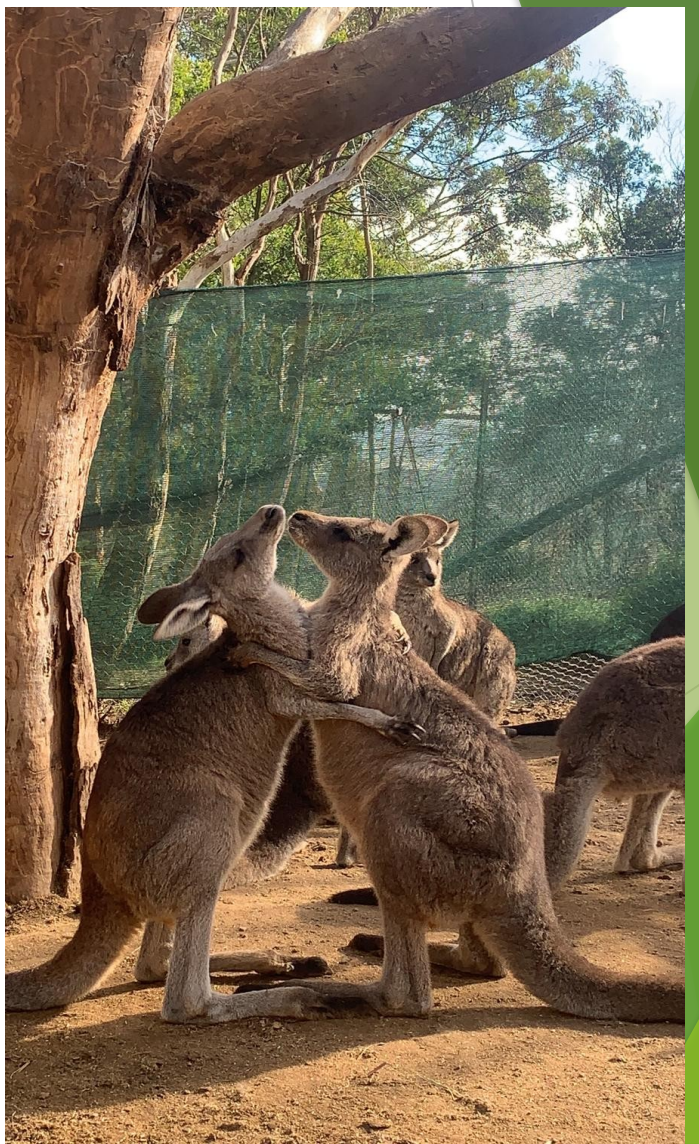
Polyvagal Rehabilitation

- Environmental support
  - housing inside away from external stimuli they interpret as danger,
  - house with other animals with appropriate personality features
- Attachment
  - Maintain constancy of carer contact
- Communication
  - Always talk to the animal, offer a treat (eg almonds), touch (eg ear scratch)
- Medication support
  - For highly anxious animals, haloperidol or diazepam is sometimes used.

Fight or Flight (ready for action) Sympathetic

Luna

Rest & digest (safe, socially engaged)
Parasympathetic - Ventral Vagal



Shutdown
Dorsal Vagal

Mike (CK 2272, CORT 93)

Mary

Neurological injury: Sciatic nerve palsy

- For knuckling strap in dorsiflexed position
- For footdrop will need a splint to prevent ankle ligament injury

Violet.

Unfortunate consequence of foot drop at rescue

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Neurological damage: Obturator nerve palsy

- Causes difficulty with adduction, ie. bringing leg in towards the body
- Can have mildly abnormal hop
- Often misinterpreted as a dislocated hip
- Vit B Complex can help a nerve palsy (can take up to 6 months to settle)

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Fractures & other injuries associated with wire entrapment

- Metatarsal fractures are common
- Ligament damage - ankle & knee
- Animals caught above the ankle often have a poor prognosis.
- The initial hard ground hit and thrashing can cause a foreleg fracture, broken teeth, concussion and spinal injury

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Lizzie.
Four kg when rescued in 2004. Dislocated hip. The foot deformity developed after release likely due to a growth plate injury. A foot deformity is not inconsistent with a long happy life at a safe release site

Recovery: Bedding

- Bedding & pressure sores. The ability to roll over is variable. Some fence hangers cannot roll over when first rescued. These animals are at risk of pressure sores. Roll and provide dry bedding twice daily. Bedding can vary from lounges as shown in the photos to a mattress or straw.

- Can cut an oval foam piece with a hole in the middle like a tyre tube to reduce pressure effect. Can also use egg-carton foam as a mattress.

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Recovery: Physio

Ghia

- Flexing and extending leg at hip and knee joint when animal is lying down.
- Standing practice. Animals recover more quickly when they are cooperative and will stand still without trying to hop. Repetition.
- Next movements gained are hopping, then getting up from a lying position, and lastly punting.
- Use incentives such as almonds to encourage stretching

Recovery: Animal care

- Cleaning ears with a swab or tissue
- Cleaning pouches of females
- Monitor cloaca – particularly in summer where there is the risk of blowflies and maggots. Can use chloramide spray to deter flies

Other fence injuries

- Loose wire eg. old fencing wire left on ground, electric fencing tape, MOPS cutting wire either side of trapped leg.
- Jumping fences awkwardly can cause lower back and pelvic injury.
- Running into a fence can cause a spinal injury.

Andy

Didi

Digby

Thank You

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