



Welcome to the 2016 RWAFF Conference.  
VET STREAM

Welcome to what is now our 14<sup>th</sup> conference. This year we are once again pleased to be able to bring you a variety of lectures all chosen carefully to keep you up to date with the latest research and techniques, and also the workshop sessions that will help you brush up on your practical skills.

We welcome any feedback and any suggestions for next year. We are hugely grateful to our team of Educators today, and as ever, thanks to Burgess Pet Care as our sponsors.

Thanks therefore go to the following people:

**For the workshops:**

Dr Craig Hunt  
Dr Ivan Crotaz  
Dr Richard Saunders  
Dr Elisabetta Mancinelli  
Dr Anne McBride

**For the lectures:**

Dr Craig Hunt  
Dr Jo Hedley  
Dr Rick Sanchez

Thanks also to IM3 for supplying the dental machinery for the dentistry workshops and Vet Instruments for supplying the forceps and rasps, and also to Keith Hinde for chairing the vet stream.

And of course thank you to you for coming along and supporting this event. We hope you have a useful and educational day.

Alan, Emma, Rae, Richard & Ros  
RWAFF Team

Burgess Excel is the UK's No.1 veterinary recommended range of food for rabbits, guinea pigs and chinchillas, specially developed with small animal experts. The Excel Feeding Plan is an easy to follow, 5-a-day guide for complete dental, digestive and emotional health. We are delighted once again to sponsor RWAFF and their annual conference, and we hope you all have an enjoyable day.



## CONTENTS

Topic	Speaker	Page
Biographies		2
Rabbit Radiology (lecture)	Craig Hunt BVetMed CertSAM DZooMed(Reptilian) MRCVS	5
Rabbit Dental Disease and Practical Management (workshop)	Craig Hunt BVetMed CertSAM DZooMed(Reptilian) MRCVS	23
Airway Management Techniques in Rabbits (workshop)	Ivan Crotaz BVetMed MRCVS	28
Behavioural Problems in Practice	Anne McBride BSC, PHD, FRSA	32
The Rabbit friendly Practice	Elisabetta Mancinelli DVM CertZooMed ECZM Dipl. (Small Mammal) MRCVS	33
Parasites	Joanna Hedley BVM&S DZooMed (Reptilian) DipECZM (Herpetology) MRCVS	40
Ophthalmology	Rick F Sanchez BSciBiol, DVM, CertVOphthal, DipECVO, FHEA, MRCVS	42

### **Craig Hunt BVetMed DZooMed Cert Sam RCVS MRCVS**

Craig qualified from the Royal Veterinary College in 1997 and proceeded to work in mixed-species practice in East Sussex for 5 years. A subsequent move to Gloucestershire for 3 years followed, before settling at Chine House Veterinary Hospital in November 2005. He obtained the RCVS Certificate in Small Animal Medicine in 2000 and the RCVS Certificate in Zoological Medicine in 2002. In 2013 he was awarded the RCVS Diploma in Zoo Medicine, one of only a small number of veterinary surgeons to achieve it in this country. In 2014 he was recognised as a specialist by the RCVS..

He is a member of numerous “exotic” animal societies including BVZS, AAV, ARAV and AAZV. His spare time is spent pursuing hobbies in falconry, cooking, scuba diving and looking after a large menagerie at home! More recently he has been helping his partner, Wendy, in promoting the UK’s first pet blood bank with regular blood drives at Chine House

### **Ivan Crotaz BVetMed MRCVS**

Ivan is the Docsinnovent lead veterinary consultant for companion animal anaesthesia. He graduated from the Royal Veterinary College in London in 1999. Ivan is both a general practitioner and also sees second opinion medical and surgical rabbit cases, as well as lecturing on rabbit husbandry, medicine and surgery. He has been the veterinary advisor to Docsinnovent since the start of the v-gel<sup>®</sup> development programme and has provided invaluable insights and contributions in investigating and advising on upper airway anatomy, best anaesthesia practice, post mortem studies, v-gel<sup>®</sup> design and clinical trials. Ivan’s initial cadaver investigation work for v-gels<sup>®</sup> was published in Veterinary Anaesthesia and Analgesia in 2010 and has other work in the process of approval and write-up. He delivers lectures and webinars on airway management including the use of supraglottic devices in companion animal species. Ivan has been involved in all aspects of v-gel<sup>®</sup> development, design and testing for all species and uses his knowledge of alternative airway management techniques to champion the concept of advanced airway management as a way of reducing cross infection, morbidity and mortality in veterinary anaesthesia. - See more at: <http://docsinnovent.com/about/ivan-crotaz-bvetmed-mrcvs#sthash.rinfoX2j.dpuf>

### **Richard Saunders BSc (Hons) BVSc MSB CBIol DZooMed (Mammalian) MRCVS**

Richard qualified from Liverpool University in 1994, obtained his Certificate in Zoological Medicine in 2001 and his Diploma in Zoological Medicine in 2010.

Having previously worked in small animal, avian and exotic first opinion practice, Richard is currently the RWA Senior Clinical Training Scholar in Zoo and Rabbit Medicine at Bristol Zoo and Langford, University of Bristol.

Richard has lectured and written articles on rabbits and exotics, co-authored "Notes on Rabbit Internal Medicine" and has a particular interest in chinchillas, rabbits and birds of prey.

### **Elisabetta Mancinelli DVM CertZooMed Dipl.ECZM (small Mammal) MRCVS**

Elisabetta graduated with honours from the University of Naples "Federico II", Italy in 2002. Her interest in exotics became clear shortly after her graduation concentrating on a career mainly based on non-conventional animal medicine and surgery. After starting in an exotic only private practice in Italy, Elisabetta then completed an externship program at the 'Angell Animal Memorial Hospital' in Boston (USA) focusing on exotic animal medicine and surgery. In 2007 she moved to the UK where she initially worked in private practice and wildlife charities. With the help of the RWA&F (Rabbit Welfare Association & Fund) Elisabetta started the first European College of Zoological Medicine (ECZM) Residency in Small Mammal Medicine, which she completed at The Royal (Dick) School of Veterinary Studies, Edinburgh. In September 2010 she completed the RCVS Certificate in Zoological Medicine. In 2014, she obtained the ECZM Diploma, Specialty 'Small Mammal'. The ECZM Diploma has only been awarded to veterinary surgeons who have achieved a high level of expertise in their field. However, Elisabetta is the first ever ECZM Diplomate, specialty 'Small Mammal', to have gained this title by examination. Elisabetta has a keen interest and a real passion for small furrries. She regularly writes on 'Rabbiting on', 'Small Furry Pets', and 'The Veterinary Times' as well as lecturing in the UK and abroad.

### **Dr Anne McBride BSc, PhD, FRSA**

Dr Anne McBride holds a BSc (Hons) degree in Psychology awarded by University College London in 1978. She was awarded her Doctorate in animal behaviour (Aspects of Social and Parental Behaviour in the European Rabbit) from the same institution in 1986. In 1992 she obtained a Certificate in Conservation and Ecology from Birkbeck College, London. She is a Fellow of the Royal Society of Arts.

Dr McBride has been a practising animal behaviour therapist since 1987 and was head clinician at the Animal Behaviour Clinic at the University of Southampton which was open from 1999-2009. She is a member of the Association of Pet Behaviour Counsellors and an Honorary Member of the The Canine Training and Behaviour Society (formerly the UK Registry of Canine Behaviourists). She lectures nationally and internationally, on various aspects of animal behaviour and the human-animal bond.

She is a Member of Council of the Companion Animal Welfare Council, an independent advisory body under the chairmanship of Lord Soulsby of Swaffham Prior. She is Chair of the Programme Recognition Committee of the Animal Behaviour and Training Council. She is Deputy Chairperson of PATHWAY - a working party looking at pets and housing issues in the UK, chaired by Roger Gale MP.

She is a patron of the Rabbit Welfare Association.

In 2013 she was awarded an Honorary Membership of the British Veterinary Nursing Association for her contribution to the Veterinary Nursing profession

In 2005 she was made an Honorary member of ASETRA – the Italian Veterinary Behaviour Association.

In 2004 she was made an Honorary member of the UK Registry of Canine Behaviourists.

### **Joanna Hedley BVM&S DZooMed(Reptilian) MRCVS**

Joanna is a Lecturer in Exotic Species and Small Mammal Medicine and Surgery at the Royal Veterinary College in Camden.

Joanna qualified from Royal (Dick) School of Veterinary Studies in 2003 and spent time in mixed, small animal, exotic and wildlife practice before undertaking a residency in Exotic Animal and Wildlife medicine back at R(D)SVS where she obtained her RCVS Diploma in Zoological Medicine.

She is currently a RCVS specialist in Zoological and Wildlife medicine and European specialist in herpetological medicine. She joined the Royal Veterinary College in 2014 as Lecturer in Exotic Species and Small Mammal Medicine and Surgery. She is based at the Royal Veterinary College in Camden, where she leads the exotics clinical service and is developing student teaching of exotic species.

### **Mr Rick F Sanchez BSciBiol, DVM, CertVOphthal, DipECVO, FHEA, MRCVS**

Rick is the senior ophthalmologist and a Lecturer of the Ophthalmology Service at the Royal Veterinary College. He is an Editorial Board Member of the Veterinary Ophthalmology Journal, an active member of the ECVO as member and co-founder of the Communication Committee and a mentor of an ECVO approved regular training route residency program at the RVC.

Rick became a Diplomate of the European College of Veterinary Ophthalmologists (DipECVO) in 2007. He is a Spanish national and followed his education in the US and the UK. He obtained a Bachelor's degree in Biology in St. Thomas Aquinas College, in New York in 1994 and a Doctorate in Veterinary Medicine degree (DVM) after attending Ross and Louisiana State Universities in 1999. He commenced his specialty training in the US and later moved to the EU where he attended the Universidad Autónoma de Barcelona (UAB) to obtain his European veterinary qualification in 2002. Since, Rick obtained his RCVS certificate in ophthalmology (UK) and completed his residency training at the University of Glasgow and the Eye Veterinary Clinic, in Herefordshire, England, after which he obtained his DipECVO in 2007. Then, he headed the ophthalmology service in a private practice in England from 2006 until 2011. That same year he joined the Royal Veterinary College of the University of London as a Lecturer to re-launch and lead the new Ophthalmology Service at the Queen Mother Hospital for Animals (QMHA).

# RWAF CONFERENCE 2016

## Radiography & Dental Disease



Craig Hunt BVetMed CertSAM DZooMed MRCVS  
RCVS Recognised Specialist Zoo and Wildlife Medicine  
Chine House Veterinary Hospital

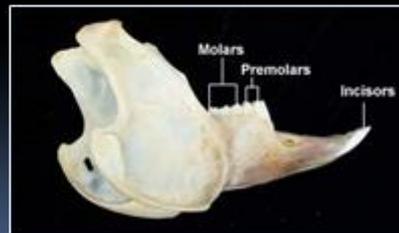
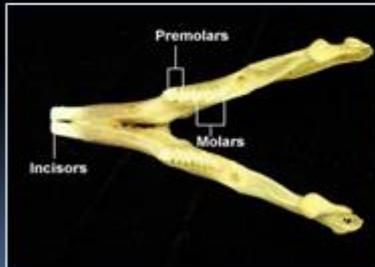
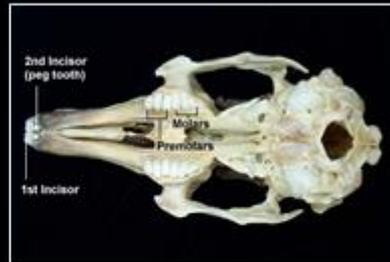
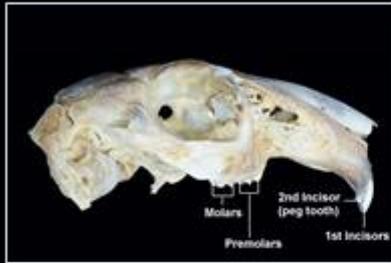
### Anatomy

- Adult Dental formula:

**I: 2/1 C: 0/0 P: 3/2 M: 3/3 = 28**

- Molars and premolars = **Cheek teeth**
- **Aradicular-hypsodont** or **Elodont**: long crown and no anatomical root
- 'Root' = **Reserve crown**

## Anatomy



## Anatomy

- Grow continuously throughout life in healthy individual approximately 10-12cm/year
- Rate of growth increases with increased abrasive food and when teeth out of occlusion
- Enamel ridges on occlusive surfaces of cheek teeth interlock with opposing teeth during mastication

## Anatomy

- Food acquired by lips → cut into small pieces by incisors → manoeuvred by tongue → mastication by molars and swallowed
- Chew on one side of mouth at a time due to mandible arch being narrower than maxillary arch
- Wide lateral excursion of jaw in a unilateral arc
- Mandibular movements are guided by ridges and valleys in the teeth

## Aetiology of Dental Disease

- **Diet** → lack of dental wear and jaw exercise
- **Husbandry** → MBD, chewing cage bars
- **Breed** → skull different shape compared to wild rabbits e.g. Dwarf Breeds
- **Genetics** → Dwarf Lop appears over-represented
- Injury → jaw fractures, foreign bodies...
- Congenital → incisor malocclusion, cleft palate..
- Sex → increased incidence in male rabbits?
- Other...

## Aetiology of Dental Disease



## History

- Husbandry and diet
- Anorexia vs. Dysrexia
- Food selection/preferences (normal/changed)
- Weight loss
- GI stasis
- Change in demeanour and behaviour
- Respiratory disease → sneezing, ocular and/or nasal discharge
- Perineal soiling, caecotroph accumulation, 'diarrhoea'

## Clinical Examination

- **Always examine teeth** during clinical exam and whenever anaesthetised for anything else
- Observe and palpate whole head thoroughly
- Retract lips to examine incisors
- Auroscope cone or speculum to examine molars, tongue, palate and ear canals
- Do not be afraid to advise further exam under sedation/anaesthesia

## Clinical Examination

### Clues to dental disease include:

- Epiphora
- Ptyalism ('Slobbers')
- Nasal discharge
- Unkempt coat
- Ectoparasites
- Caecotroph accumulation
- Asymmetry of face/skull
- Resentment to oral exam (individual variation)
- Saliva, blood +/- discharges on oral exam

## Owner Information

- Teeth grow continuously therefore dental treatment is rarely a one off
- Frequency can be as much as q3 weeks; Average 12-16 weeks
- Welfare of rabbit much improved (and cost much reduced!) if perform dental **before** signs of oral pain
- Euthanasia if owner unable to commit to time and cost of treatment

## Investigation

- Blood and urine tests to assess general health
- **Radiograph skull** (+/- chest and abdomen)
- Oral exam → assess teeth, gingiva, tongue, buccal mucosa, palate and pharynx
- Probe each tooth and gingiva to assess stability
- Palpate skull thoroughly
- Palpate any abnormal swellings and look for sinus tracts into oral cavity, ears, nose and conjunctival sac

## Physical Examination



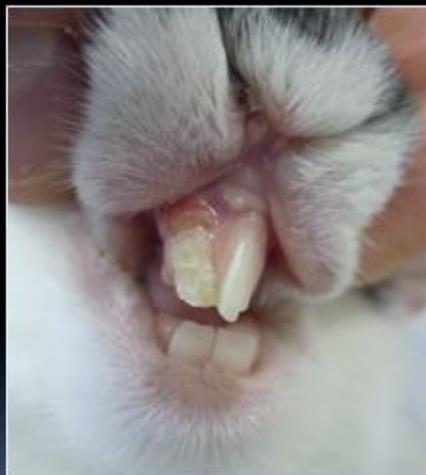
## Physical Examination



## Physical Examination



## Physical Examination



## Physical Examination



## Oral Examination



## Oral Examination



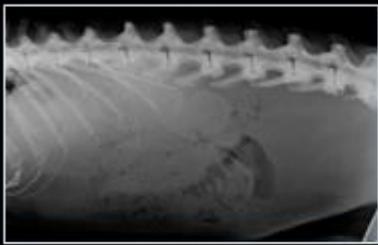
## Oral Examination



## Oral Examination



## Radiography



## Radiography - positioning



Dorso-ventral

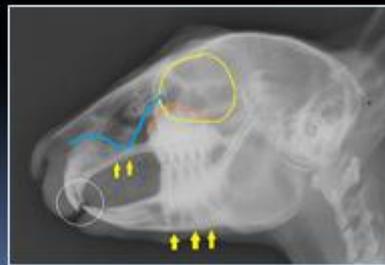


Lateral

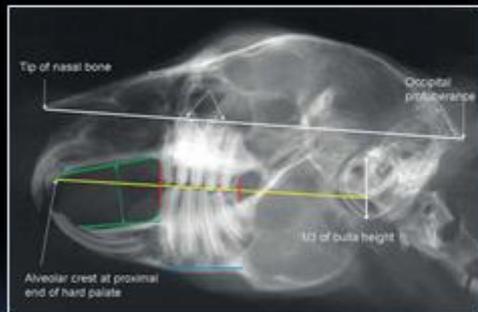


Oblique 20°-40°

## Radiography



## Boehmer & Crossley Lines



From : Dr Estella Böhrmer (2015) Dentistry in Rabbits and Rodents, Wiley Blackwell with permission

## Radiography



## Radiography



## Radiography



## Radiography



## Radiography



## Radiography



## Radiography



## Radiography



## Radiography



## Radiography



Thank You For Listening



## **RABBIT DENTAL DISEASE & PRACTICAL MANAGEMENT**

Craig Hunt BVetMed CertSAM DZooMed(Reptilian) MRCVS, RCVS Recognised Specialist in Zoo and Wildlife Medicine

### **Anatomy**

The dental formula of the adult rabbit is:

**I: 2/1 C: 0/0 P: 3/2 M: 3/3 = 28**

The molars and premolars are grossly similar and may be collectively referred to as **cheek teeth**. Incisors and cheek teeth have a long clinical crown and no anatomical root (**Aradicular-hypsodont** or **Elodont**). The tooth root is referred to as the **reserve crown**

All the teeth grow continuously throughout life in the healthy individual at an approximate rate of 10-12cm/year. The rate of growth increases with increased abrasive food and when teeth are out of occlusion. Enamel ridges on occlusive surfaces of cheek teeth interlock with opposing teeth during mastication.

Food is acquired by lips, cut into small pieces by the incisors and manoeuvred by the tongue to enable mastication by the cheek teeth before being swallowed. Rabbits chew on one side of the mouth at a time due to the mandible arch being narrower than the maxillary arch. During mastication the jaw moves in a wide, unilateral arc and is guided by ridges and valleys in the teeth.

### **Aetiology of Dental Disease**

Dental disease in rabbits most commonly occurs as a result of deficiencies in husbandry and diet. Lack of dental wear (usually a result of being fed excess concentrates and insufficient hay) and metabolic bone disease (poor diet and lack of UVB exposure) are the most common aetiologies. Breeds such as the Dwarf Lop appear over-represented and this may reflect a genetic susceptibility and/or changes in skull morphology compared to the wild rabbit. Injuries to the jaw and skull, commonly a result of a fall, may result in malocclusion and dental disease. Congenital incisor malocclusion is common in the dwarf breeds.

### **History**

Given that the majority of dental diseases in rabbit are at least in part a result of deficiencies in diet and husbandry, it is essential that the husbandry and diet are investigated in detail. The type and quantities of hay, mix, pellets, greens and treats offered **and** eaten should be ascertained. Is the rabbit kept indoors, outside or confined to a hutch and how often is it allowed access to grazing?

Many rabbits with dental disease may have a history of intermittent anorexia and/or GI stasis and may display changes in demeanour and behaviour (e.g. aggressive, less interactive). If painful the rabbit may select food items which require less chewing or which can be swallowed whole. Pain may reduce grooming behaviour and caecotrophy leading to an unkempt coat and perineal soiling respectively. Respiratory disease may occur concurrently as a result of poor husbandry, stress and immune compromise or as a result of tooth roots extending into the orbit or nasal cavity.

### **Clinical Examination**

Given the frequency with which dental disease occurs in rabbits it is essential to **always examine the teeth** during a clinical examination. It is virtually impossible to conduct a complete dental examination in the conscious rabbit and lesions are easily missed. Therefore always examine the oral cavity in all rabbits that are under general anaesthesia for any other reason and do not be afraid to advise further examination under anaesthesia if you suspect dental disease.

Work methodically - observe and palpate the whole head thoroughly looking for any asymmetry, swellings, discharges and abnormal reflexes (e.g. facial nerve paralysis). Retract the lips to examine the incisors for shape and occlusion and for horizontal ridging (in more subtle cases, ridges may be detected by running finger nail over the enamel. An auroscope cone or speculum is used to examine the molar crowns, tongue, palate and ear canals.

The rest of the body should be examined in a logical manner similar to other mammals in order to assess the overall health and the presence of concomitant disease.

During the course of the clinical examination the following clinical signs may alert the clinician to the possibility of dental disease:

- Epiphora
- Ptyalism ('Slobbers')
- Nasal discharge
- Unkempt coat
- Ectoparasites
- Caecotroph accumulation
- Asymmetry of face/skull
- Resentment to oral exam (individual variation)
- Saliva, blood +/- discharges on oral exam

### **Information for the Owner**

It is prudent to discuss a few specific points with the owner to help prevent potential future poor compliance and client discontent which include:

- Treatment for acquired dental disease is rarely a 'one-off procedure' since the teeth (28 in total) grow continuously throughout the rabbit's life. Thus, spikes, spurs and overgrown crowns will tend to reform over a few weeks to months resulting in relapse. The main exception being incisor removal in young rabbit with congenital malocclusion.
- The frequency of dental treatment can be as much as every 3 weeks though the average is about every 12 weeks
- The welfare of the rabbit can be much improved (and the cost reduced!) if dental treatment is performed **before** the rabbit demonstrates signs of oral pain; practically speaking this ideal is achieved over time by judging the treatment interval required for the individual patient based on the severity of dental and soft-tissue pathology at each dental treatment
- **Euthanasia** is the only feasible alternative in most cases if the owner is unable to commit to the time and cost of treatment.

## Investigation

Haematology, serum biochemistry and urinalysis are helpful to assess the general health status of the patient prior to anaesthesia and treatment. Radiography of the skull is essential to help form a prognosis and identify tooth root pathology, tooth occlusion and osteomyelitis; multiple views may be required including straight lateral, left and right lateral-oblique, dorsoventral and rostrocaudal views. Radiography of the chest and abdomen is helpful to screen for concomitant disease

With the patient suitably anaesthetised mouth gags and retractors are used to expose the oral cavity; good illumination is essential. Each tooth is assessed for its occlusion and stability and for the presence of any spurs or decay. The gingiva, buccal mucosa, tongue and palate are examined for the presence of foreign bodies, food impaction, infection and ulceration. The skull is palpated thoroughly and any abnormal swellings are palpated and probed whilst looking for sinus tracts into the oral cavity, ears, nose and conjunctival sac (usually identified by the presence of pus).

## Dental Equipment

The basic dental kit would include a mouth gag, cheek dilators, tongue depressor, molar cutters and a diamond rasp (the latter is not ideal; see later)

Additional equipment may include molar and incisor elevators, sinus rongeurs, slow speed dental handpiece with straight nosecone and burrs to burr molars (diamond disc with shield to trim incisors) and a high speed dental handpiece with cutting bur or diamond disc to trim the incisors. A variety of burrs are available - a cross-cutting burr and a diamond coated burr are most useful.

## Treatment – Incisors

Incisors are best trimmed using a cutting burr or disc attached to a motorised dental handpiece. **Clippers are not an acceptable method** due to a significant risk of splitting the tooth, causing at the very least pain, at worst a root abscess. Maloccluded incisors generally require trimming every 3-6 weeks; Sedation may be required.

Incisor extraction is generally preferred over trimming. However, if malocclusion has been long standing extraction may be difficult due to malformation of the roots.

## Treatment – Molars

Anaesthesia is ESSENTIAL, though clients will often ask whether treatment can be performed conscious.

Molar spurs, if small, may be removed using molar clippers or rongeurs though there is a risk of iatrogenic tooth fractures if performed incorrectly (usually trying to remove too-large a piece). For most spurs a burr attached to the straight cone of a slow-speed dental handpiece is preferable, taking great care to prevent soft tissue damage. Hand held rasps are not ideal as they may loosen teeth further, and there is an increased risk of causing soft-tissue trauma and haemorrhage from tearing the inferior alveolar vessels.

There is some argument as to how much crown should be removed. Some advocate removal of points and spurs only whereas others advocate reducing all crowns down to the

gingiva. Either may be suitable depending on the individual case. Radiography of the skull is essential if contemplating reducing crown heights; it is important to ascertain tooth growth is not arrested before reduce crown height. Burring of crowns removes the enamel ridges and therefore reduces the ability to chew effectively **BUT** reducing crown height may alleviate pressure on nerve when chewing and therefore reduce pain. Ultimately, the aim of treatment is to eliminate pain and restore normal function though restoration of perfect anatomy is rarely possible.

### **Molar Extraction**

The main indications for molar extractions are loose crowns and root infection/abscessation. Removal of a tooth with a spur with the aim of preventing spurs is not often indicated as acquired dental disease tends to affect all the teeth and removal of one or two teeth rarely solves the problem.

The **intraoral approach** to molar extraction is probably best reserved for molars which are already significantly loose or in which the root has been resorbed. A rabbit molar elevator may be used or an elevator may be fashioned from an 18G hypodermic needle. Molar extraction forceps are available to enable removal from the oral cavity.

The **extraoral approach** is more suitable where molars are fully formed, which are not very loose and/or have malformed roots and/or are abscessed. The root may be identified using palpation and radiography. The skin overlying the root is incised and a dental burr or rongeurs used to remove bone overlying the root. Elevate the root using 18G needle or small feline elevator. Note – mandibular molars are generally much easier to approach and extract than are maxillary molars.

### **Molar Root Apicoectomy**

Apicoectomy may be appropriate in selected cases to prevent regrowth of molar spurs. The procedure is relatively easy to perform on the mandibular molars but access to apices of the maxillary roots is technically demanding and potentially excessively traumatic to the patient. The affected mandibular tooth root is generally easily palpated as a firm swelling on the ventral aspect of the mandible. Following routine surgical skin preparation the skin and periosteum are incised over the swelling ventrally. Where mandibular bone is still present it may be removed using a small rongeur, dental elevator or 18G hypodermic needle taking great care to avoid iatrogenic jaw fracture. The germinal epithelium of the affected molar is then gently removed using the tip of a hypodermic needle and the tooth and wound flushed with saline prior to routine closure. The procedure, if performed correctly prevents further growth of the molar which over time wears away and may even loosen and fall out.

In the short to medium term appropriately selected rabbits seem to benefit from the procedure mainly due to reduced frequency of dental procedures though in the long term there may be complications due to difficulty masticating food and there may be a predisposition to periapical infection and abscessation.

### **Perioperative Care**

- Hospitalise in quiet area out of sight and sound of dogs and cats
- **Analgesia** → Buprenorphine, NSAID, local nerve block(s), topical (Bonjela, Orabase)
- **Fluid therapy** → maintenance 100ml/kg
- **Prokinetics** → ranitidine, metoclopramide, cisapride

- **Assist feeding** → syringe/hand feeding, lots of fresh hay, grass and leafy vegetables and weeds
- Clean any discharges especially around nares

## AIRWAY MANAGEMENT TECHNIQUES IN RABBITS

Ivan Crotaz BVetMed MRCVS

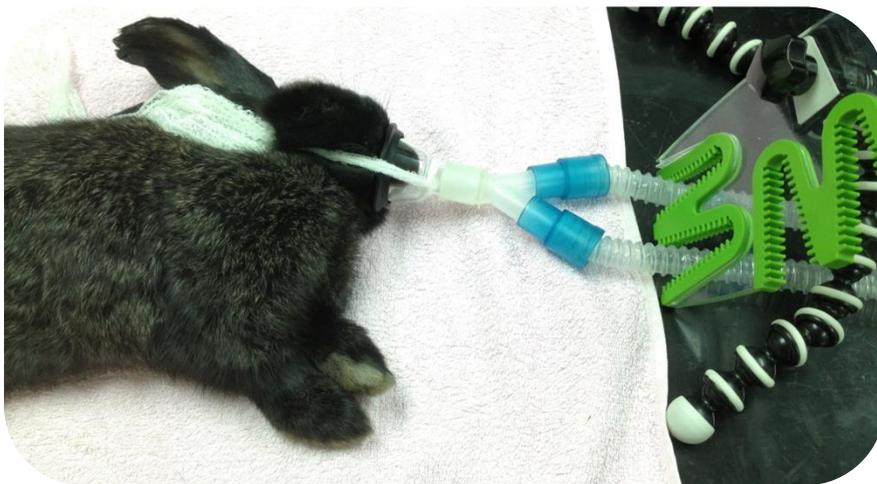
### Overview

For some time, it has been known that the death rates in rabbit anaesthesia are much higher than in other common companion animals. This can be attributed to many factors, including lack of experience with the species, lack of appropriate monitoring and most commonly the difficulty of establishing and maintaining an airway during anaesthesia. Rapidly establishing, maintaining and monitoring an airway should reduce serious respiratory complications – these complications are implicated in the majority of rabbit anaesthetic deaths.

3 major options are available for rabbit airway management:

#### **Face masks:**

- Useful for preoxygenation and short procedures.
- Rapid
- Minimal equipment
- Poor facial access
- Difficult to use with capnography
- Less controlled, higher risk anaesthesia
- Significant gas leakage, health and safety risks to staff



The best in the author's experience are the clear masks with a silicone or rubber diaphragm. The small/extra small sizes are suitable for the majority of rabbits. Care needs to be taken to make sure that the rubber diaphragm does not rub and cause corneal trauma. Masks should either be held firmly in place or preferably tied in place with a length of gauze/bandage tie. The mask should be supported so that it follows the orientation of the maxilla as shown in the photograph. This minimises leakage and reduces the risk of corneal damage

#### **Supraglottic airway devices (v-gels):**

- These devices are anatomically designed to fit the rabbit upper airway and sit over the glottis forming a soft pharyngeal seal and allowing ventilation.
- Very rapid placement and technique is easy to learn.
- Wide airway does not increase airway resistance and work of breathing
- Autoclavable and re-usable (40 times)
- Cost per use approximately the same as single used endotracheal tubes

- Appropriate for majority of surgical procedures and many dental procedures
- Good access to incisors/rostral molars but poor access to caudal mouth and pharynx.
- Poor technique can result in displacement from the glottis. Procedures such as incisor removals can displace the epiglottis within the v-gel, requiring a small corrective movement.
- Capnography is important to identify correct placement and maintain high quality monitoring

Supraglottic airway devices sit in the pharynx and open an airway over the glottis allowing ventilation through the glottis and trachea without actually performing intubation. When correctly designed, they provide a wide airway of the same diameter as the trachea (hence no increase in airway resistance). They are constructed from soft materials and are much more comfortable and less traumatic to the tissues of the upper airway. v-gel devices were designed specifically to fit rabbit upper airway anatomy (most other supraglottic devices were designed for humans and give poor results in rabbits).

Once the rabbit has been anaesthetised, the pharynx should be checked for foreign material and cleared if necessary. Lidocaine spray should be applied to the larynx and the rabbit should be preoxygenated using a face mask (it is likely that 4-5 breaths of 100% oxygen should be sufficient in a healthy rabbit). The v-gel is then inserted into the mouth, following the midline until the tip enters the pharynx. At this point it will elevate the soft palate, allowing the epiglottis to fold and drop into the airway channel. Further insertion allows the v-gel to drop over the base of the tongue at which point the airway channel should line up with the glottis, the epiglottis should unfold inside the v-gel and the tip enters the epiglottis (giving a low pressure gas seal). With experience, this position can be easily felt, but the easiest way to check correct insertion is to connect the v-gel to a capnograph and look for CO<sub>2</sub> traces. Normal v-gel insertion should take 10-30 seconds and is considerably faster than intubation.



#### **Endotracheal intubation:**

- Good oral and pharyngeal access
- Relatively hard to displace from position (although if poor technique is used tubes are easily pulled out)
- Use new tubes every time– New endotracheal tubes are very cheap but they harden quickly after washing, making intubation difficult and increasing trauma risk. Check pharynx before intubation and remove food material, desensitise the larynx prior to intubation.
- Disinfection of used tubes creates risk of chemical mucosal trauma on the next use
- Severe increase in airway resistance and increase in work of breathing.
- Tracheal and laryngeal trauma risk
- Practiced technique +/- extra equipment needed to perform intubation
- Capnography is important to identify correct placement and maintain high quality monitoring

If the diameter of an endotracheal tube is halved, the airway resistance of the tube goes up by 16 times. A normal rabbit trachea is about 5mm diameter – therefore using a 2.5mm endotracheal tube increases the resistance to breathing and thus the workload of the patient by 16 times. It is very important to use a capnograph for intubated rabbit patients and most

patients will benefit from active ventilation during anaesthesia (ventilator or manual IPPV). Iatrogenic laryngeal trauma is reported in rabbits. It is difficult to know how common this is in practice as few post-anaesthetic mortality cases have proper post mortem examinations. It is likely however that given the blind intubation technique that most clinicians use, intubation trauma is at least as common in rabbits as in cats.

However, there are good indications for endotracheal tube use in rabbits – in detailed oral surgery a small tube allows good surgical access.

3 intubation techniques exist. In all three techniques, a new endotracheal tube should always be used. This allows maximum flexibility and softness to reduce trauma risk and ensures that there will be no cross infection. The tubes should be lubricated with a water based lubricant, making sure that the lubricant cannot block the airway.

All rabbits should be fully anaesthetised making sure that there are no cough or swallow reflexes. Coughing is a response to laryngeal and tracheal trauma or pain and should not be part of a 'normal' anaesthetic. Coughing on insertion is often recommended as a guide to correct placement but observing traces on a capnograph is safer and more effective.

**Blind insertion method** – The tube is gently advanced past the incisors in the midline and over the base of the tongue into the pharynx. The tip is guided slightly laterally to downfold the epiglottis and then centrally again to pass through the glottis. Some authors recommend holding the end of the tube next to your cheek to feel exhaled breath, confirming the proximity of the glottis, prior to full insertion. No more than 3 placement attempts should be made in order to reduce trauma risk. This technique is best practiced on cadavers prior to live patients and presents the highest trauma risk of all three techniques.

**Guided insertion method** – either a straight bladed laryngoscope (such as the Flecknell laryngoscope) or an otoscope can be used. The laryngoscope or otoscope cone is used to elevate the soft palate and disengage the epiglottis into a ventral position on the floor of the pharynx. With a laryngoscope, the tube is gently fed forwards aiming for the centre line of the epiglottis. With an otoscope cone, it is best to feed a flexible stylet through the cone and into the trachea. The catheter is retained in place while the cone is removed and then an endotracheal tube is fed over the catheter and into place in the trachea.

**Endoscopic guided technique** – Either a straight or flexible endoscope can be used (the technique is easier with a flexible scope). The endoscope is used to elevate the soft palate and disengage the epiglottis as above. The endotracheal tube is then fed into the pharynx under direct visualisation. The endoscope tip needs to be slightly proximal to the glottis and the endotracheal tube can be fed down the trachea when the arytenoid cartilages open.

In conclusion, it can be seen that the ability to intubate every patient does not make you a good rabbit anaesthetist, and indeed in some situations, intubation actually increases the risk of complications significantly. The safest situation is that in which the anaesthetist chooses an appropriate management method for the patient and procedure and monitors the airway and respiration carefully throughout the anaesthetic and recovery period.

**Take home points:**

1. Face masks should be as small as possible and always tied in place to achieve a better seal.
2. Capnography is essential and will massively improve your standard of anaesthesia.
3. Almost all rabbits hypoventilate. Accept that IPPV is a normal 'default' procedure for a rabbit anaesthetic.
4. Balance the pros and cons of all airway management techniques to give the best outcome for your patient. The new supraglottic devices allow very rapid

establishment of an airway and are appropriate for many routine and emergency procedures.

## Veterinary Stream Workshop: Practical Tips for Common Problems.

Dr Anne McBride

This session will comprise with a short presentation and an interactive discussion / group work aspect. The presentation will report the results of a recent survey of veterinary surgeons and veterinary nurses in UK practices regarding the types of behaviour problems that are presented by rabbit clients and the approaches taken by respondents to resolve such issues. The aim of the survey was to identify the problems that owners have with their rabbit's behaviour for which they seek help from their veterinary surgeon and to indicate some of the methods veterinary surgeons employ in working with such cases. This will form the basis of consideration of the veterinary role in detecting where behaviour problems may be occurring, aetiology and routes to prevention, diagnosis and resolution.

Real cases will be used to illustrate issues, possible causes for development and potential modification programmes. Understanding how behaviours develop can give insight into both preventative measures that can be taken by suppliers and owners, and steps that can be taken to modify problematic behaviour once it has developed. Modification of any problematic behaviour needs to take in to account the individual animal and its social and physical environment, as well as owner abilities, motivation and time constraints. These means there has to be a degree of flexibility and creativity in problem solving. Thus, I intend for the session to be interactive and to thereby draw on the variety of experiences of the audience and to discuss the pros and cons of different approaches.

I am happy to consider specific cases that audience members may have as illustrative cases, so long as these are supplied to me before the event. Basic information, including relevant veterinary history, should be sent to me at [amcb@soton.ac.uk](mailto:amcb@soton.ac.uk), or feel free to contact me on 07771 625419 in the first instance. Please be assured client confidentiality will be maintained.

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## **The rabbit friendly practice**

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There are an estimated 1.3 million rabbits being kept as pets in the UK making them the 3<sup>rd</sup> most common mammalian pet after dogs and cats. Provision of adequate rabbit care is therefore essential to meet an increased demand from owners requiring the best treatment for their beloved pets. Rabbits are notoriously prey species and masters at disguising signs of disease. They are stressed very easily and even the simplest disruption to their routine can result in significant stress. Often pet owners feel their rabbit fears the car ride, the veterinary waiting room, the consult room and even the veterinary staff. This is one of the most common reasons for which asking advice to pet shops, groomers, breeders, rabbit forums or even trusting Dr. Google is preferred before even thinking of considering a trip to the vet. However, it is important to reverse this trend as vets can be a precious source of information to owners and their pets. It becomes essential to educate ourselves and our clients as well as to address this anxiety/stress factor. Health and welfare need to be a priority in the veterinary surgeon's every day job. This applies to any aspect of the clinician's work, from advising owner over the phone, receiving clients and their pets in our clinic, to keeping rabbits into the hospital in a way that is suitable to treat their condition to the best standard possible, to discharging the animal making sure that the return into the home environment is smooth. The aim is to make sure the whole encounter with the veterinary world is the least stressful and the most positive experience possible.

### **The reception and the waiting area**

The first impression is usually the most important. The first contact the rabbit owner has with a veterinary practice starts with the reception area and its staff. Training in answering basic rabbit related enquiries and recognising common emergencies is essential for whoever is answering the phone. Common questions a receptionist should ask include: is the rabbit eating? Is the rabbit passing faeces? How long has the rabbit not been eating and/or passing faeces for? Is the rabbit showing any of the following: diarrhea, bloated abdomen, respiratory signs, head tilt, seizures, paresis/paralysis, collapse, bleeding, trauma?

Depending on the answer the rabbit may need to be booked in immediately and the person answering the phone must be able to recognise when this is the case. Owners may call to ask if their rabbit needs to be starved overnight before a surgical procedure, if a rabbit needs routine vaccinations and/or worming. Receptionists should be trained to be able to answer these simple questions. Advice on how to safely take the rabbit to the vet surgery so that the animal's stress is reduced to a minimum need to be provided (secure carrier with hay at the bottom, ideally with some rabbit's own faeces, food, water, companion if present, with

consideration of excessively high temperatures in warm weather conditions). The receptionist may suggest the owner to cover the carrier with a towel during the journey to the clinic or ask the owner to do so during their wait in the sitting area. It may even be considerate to ask owners to wait in the car with their pets till they're called in by the vet/nurse (not in warm weather). A dedicated area where rabbits and other exotic pets can sit away from cats or barking dogs (even simply using different sides of the waiting area may help) should be present in the waiting room. Sometimes, it may help to schedule appointments so that the rabbit does not have to wait for long in the waiting area. Some owners are aware of the fact that the visit can be stressful to their pets but they do appreciate if the veterinary staff acknowledges this and makes effort to minimise their stress. Keep a selection of rabbit high quality food (hay, pellets and high fibre treats) and other products (magazines, books, posters, leaflets) for show (and for sale) in the waiting room. This is an excellent way of demonstrating a rabbit's owner the care and interest the practice is willing to show towards them. They may also prompt questions which may be a good starting point for educating the client!

### **The veterinary staff**

The nursing staff needs to be trained and be able to give advice on the basics of rabbit husbandry, diet, medical care, neutering as well as being able to triage if required and support the veterinary staff. Nurses working with these pets must be able to correctly and safely handle and restraint rabbits. Further qualification are available (e.g. Certificate in Veterinary Nursing of Exotic Species) if nurses want to seek further training on these matter. Vets dealing with rabbits must keep themselves up to date with basic rabbit medicine and surgery matters, nutrition, reproduction and other facts. A large array of information can be found on specific and reputable websites. Dedicated rabbit textbooks are also widely available as well as webinars, CPD and lectures specifically targeting the general practitioner. In the past decade peer reviewed publications have exponentially increased demonstrating the effort and interest the veterinary profession is putting into understanding this unique species and its needs. Further qualifications can be obtained in Small Mammal Medicine for those with a strong and specific interest.

### **The consultation room**

Ideally, a separate room should be available for rabbit patients to be seen. If this is not possible an effort should be made to avoid examining a prey species immediately after a predator species has been in the room (especially ferrets and birds of prey). Washing hands after having handled a predator species and cleaning the room before allowing in and touching a rabbit is mandatory. Changing the scrub top may be necessary in some cases. Specific posters and/or skull radiographs may be displayed in the room or a board with some more in depth rabbit info may be placed on the wall.

A tailored Rabbit History

form is useful as a guide for the important questions that cannot be missed. These history sheets can be sourced from the web or they can be personalised to the clinician's wish.

### **Handling and examination**

Animals respond to stress by activating a wide array of behavioral and physiological responses that are collectively referred to as the stress response. A cascade of events initiates that culminate in the release of glucocorticoids from the adrenal cortex (Smith and Vale 2006). If exposure to glucocorticoids is prolonged, a variety of pathological outcomes becomes more likely and adverse effects such as altered physiological and endocrinological function, immune system suppression, reproductive impairment, hyperglycaemia, insulin resistance, altered carbohydrate metabolism eventually leading to hepatic lipidosis, hypertension, reduced renal blood flow, cardiac failure, and even pathological lesions may result (Goldkuhl *et al* 2010). Furthermore, stress is a common cause of reduced gut motility leading to altered gut function and stasis in rabbits (Varga 2014a). All these issues may be potentially life threatening to the patient. Rabbits are considered catecholamine driven prey animals, very prone to stress and with a high metabolic demand. If handled too roughly, stress induced catecholamine and endogenous corticosteroid release, can result in tachycardia, hypertension, reduced renal perfusion and hyperglycaemia. If a rabbit is already ill, this process can worsen dramatically its clinical conditions, resulting, in extreme cases, in cardiac failure and death due to stimulation of the sympathetic nervous system. Therefore any attempt must be made to reduce stress, including provision of adequate pain relief at an appropriate time (e.g. pre-emptive analgesia may help reduce pain and post-operative stress) (Page *et al* 1998).

A correct, safe and adequate handling technique is essential. There are still too many reports of spinal fractures/luxations resulting from improper handling during the visit to the vet. Rabbits have a relatively delicate skeleton that accounts for 7-8% of their total body weight but they have strong and well developed muscles. Appropriate technique, gentle and calm handling are extremely important to avoid spinal and long bones injuries. The rabbit should be examined on a skid-free surface, wrapped in a towel when too panicky and always keeping a hand to support the back. If allowed free in the room, placing towels on the floor may help the rabbit to hop without slipping. This can be done while taking the history allowing the clinician to assess his demeanor and attitude (Varga 2014 b). Always remember that rabbits have prominent eyes positioned laterally. This feature gives them a field of vision close to 360° for quick and effective detection of predators coming from any directions around the entire horizon but with a blind spot beneath their eyes and caudal aspect of their head (Williams 2012). When the rabbit is approached around these areas with no warning, it may be startled. Different handling techniques may be adopted, depending on the situation or procedure to be performed. Simply covering the eyes with a hand may be useful in many

situations to calm the rabbit down. Rabbits should never be scruffed or picked up by their delicate ears. Always make sure the equipment required for examination (e.g. towel, stethoscope, otoscope with cones of different sizes, thermometer, scale, nail clippers) is ready before starting so that handling time and stress are reduced to a minimum. A preventative healthcare plan specifically designed rabbits (including neutering, vaccinations, ectoparasite treatment and prevention, *E. cuniculi* prevention) should be in place in the rabbit-friendly clinic and should be discussed during routine consultations.

### **The hospital environment**

Hospital admission may be required in order to be able to perform a thorough diagnostic plan and/or to receive appropriate treatment. Remember that there are very few drugs licensed for use in exotic species, and often use of drugs licensed for other veterinary species or humans may be required. The owner informed consent for the off-label use of drugs in an exotic species (including rabbits) must be obtained in all cases. Ideally, prey species should be hospitalised in a stress free environment. Predators should be kept away from the sight, smell and auditory field of rabbits. Common rabbit's predators include dogs, cats, ferrets and birds of prey. Often this is not practically achievable therefore a quiet corner, or simply covering the rabbit's cage with a towel may be a short term solution. A basic cage set up would include newspaper used at the bottom of the cage and a large amount of hay/straw as bedding material. Blankets, towels or soft bedding may be required in specific cases (e.g. to avoid soiling of a wound or to avoid trauma when a rabbit is presented with head tilt, rolling and unable to maintain its balance). Some rabbits tend to chew newspaper and blankets so attention must always be paid to these cases. A hide box should be provided for the rabbit to have a secure place where to sit comfortably and undisturbed (its carrier box may be a more familiar place but a cardboard box of adequate size may be used). A litter tray may be placed in the opposite corner. Hay and/or a combination of shredded paper or recycled paper pellets may be used in the litter tray and changed when soaked. Some rabbits like to eat while in the litter tray so a hay rack can be placed nearby. Rabbits can show reduced appetite when the environmental temperature rises above 22°C and may develop heat stress for temperature above 27°C (Varga 2014 b). The ideal temperature should be maintained between 17° and 21°C (Cervera and Fernandez Carmona 2010). Always consider the possibility of having a rabbit's bonded companion hospitalised at the same time. This reduces stress, helps with recovery and avoids fighting when the rabbit is reintroduced in the home environment. Rabbits can become bored and frustrated if they have nothing to do. Especially when the hospital stay is long, safe rabbit toys and other objects can be used to enrich their environment (e.g. ask the owner to bring familiar toys). Always have a selection of common rabbits food in the hospital to avoid changing the patient's diet while the animal is hospitalised. Alternatively, just ask the

owner to bring a lunch box with their rabbit's favourite food (the hospitalization period is not the right time to start changing the diet). Fresh food needs to be always available, even if the rabbit is not eating on his own, as it can stimulate appetite. Make sure to ask whether the rabbit is drinking from a bowl or a bottle. It has been shown that, given the option, rabbits prefer drinking from large open dishes (Tschudin and others 2011). Many rabbits, not used to use the bottle at home, may not drink if not given an alternative to it while in the hospital. Exercise outside the cage may be helpful in some cases. It can stimulate gut motility and relieve boredom. If a small and secure garden is not available in the hospital, a short and supervised period outside the cage into the ward may be provided daily. Make sure the rabbit does not chew on cables or does not get into troubles. During the hospitalisation period, rabbits should be assessed daily (or more frequently in critical cases) and food and water intake, faecal and urinary output as well as the body weight should be recorded daily. Specific hospital sheet may be used for this purpose.

Zoonotic risks should always be assessed. Infections that can be transmitted from an infected rabbit to another in hospital may include: myxomatosis, rabbit viral haemorrhagic disease, encephalitozoonosis, pasteurellosis, coccidiosis, acariasis, dermatophytosis, fleas. If guinea pigs are hospitalized also consider the potential spread of *Bordetella* from rabbits (Varga 2014 b).

### **Equipment and clinical procedures**

Many rabbits are admitted to the hospital to receive medical treatment or to undergo a surgical or other procedures. Planning surgeries early during the day is useful to reduce stress and allow plenty of time for the rabbit to recover from an anesthetic and to be monitored. It is essential to be prepared and have all the equipment needed for any planned procedure laid out and ready before taking the rabbit out of its cage to reduce handling and stress. If the rabbit is going to be anaesthetised, the rabbit's weight should be taken and the correct dose calculated for every drug that will be administered in the peri-operative period. Emergency drug doses should be calculated and the drugs should be kept close ready to be drawn up should an emergency occur. A recent study found that the perioperative mortality is highest in rabbits within three hours post anaesthesia (Brodgelt and others 2008). Close post-operative monitoring is therefore essential to avoid complications.

Specific equipment required in rabbit medicine may include the following: dental equipment, digital radiography or mammography films, US, lonestar retractor, exotic surgical kit with micro instruments, magnification and lighting (e.g. for dentals). Investing in anaesthetic monitoring equipment is also highly recommended: ET tubes of different sizes, V-gel, Doppler, capnograph, pulse oximeter, ventilator, micro infusion pump, ECG.

Specific clinical procedures and equipment use will be discussed during the masterclass.

### **Discharge**

The discharge appointment should be considered as an opportunity to discuss clearly with the rabbit's owner the findings of the diagnostic procedures performed, to show x-rays or other images available, or to discuss the surgery. It is important to explain everything correctly and to show how to administer all the medication prescribed as this strengthens the trust the owner has with the vet. If supportive feeding is required at home, showing clearly the quantity of feeding formula the rabbit will need and waiting to administer the last feed in front of the owner is often much appreciated. Writing instructions on a discharge sheet and explaining it step by step is usually very helpful. An emergency number should be provided at this stage for any concern and a recheck appointment scheduled whenever required. Caresheets can be given to clients to summarise husbandry requirements or explain specific diseases in clear terms.

### **Referrals**

Referrals may be considered when a procedure or the care of a rabbit is out of the practice area of competence. This should not be considered as a failure. On the contrary demonstrates provision of the best care possible for the rabbit patient. Having a contact number readily available is always useful and asking advice at any time point should not be feared. This is always the best choice when there are doubts.

### **Communication**

Good communication with other members of staff and owners is always the key for success. Explaining what procedures are going to be performed clearly and why these are going to be done. Many owners are emotionally very attached to their pets and may be very pleased to have updates and information about their pets while they are in hospital.

### **Social media**

Many practices now have websites and a facebook page and/or a Twitter account with a dedicated section for rabbits/exotics. This may be a further incentive for pet owners to seek specific advice on transport, surgery, first aid or general care. It is obviously essential to make sure the page is scientifically correct but at the same time appealing and easy to understand for owners.

### **Advertising the Rabbit friendly practice**

Different forms of marketing communication can be used to promote a service, including social media, evening talks for owner and vets, leaflets to distribute to local rescues and pet shop. These will be explored during the masterclass.

### **Insurance**

Unfortunately there is no health service provided for rabbits. Many pets may develop long term illnesses which may require a long term treatment. A pet insurance would take the financial strain of this off owner's shoulders should illness or trauma occur and should therefore be suggested and supported.

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## Rabbit parasites

A variety of internal and external parasites are commonly found in both wild and pet rabbits. In low numbers they often appear to cause no obvious problems. In a confined captive situation however, animals may be under stress and immunosuppressed, especially if overcrowded, hygiene is poor or husbandry is inappropriate. In this situation, parasites can multiply rapidly and start to cause disease. Some of the parasites which may be encountered are listed below;

### ECTOPARASITES

#### Mites

- *Cheyletiella parasitovorax* – may cause no clinical signs or crusting and scaling may be seen, especially along the dorsum.
- *Listrophorus (Leporacarus) gibbus* – occasionally causes hair loss but rarely a clinical problem.
- *Psoroptes cuniculi* – thick crusty deposits may be seen within the external ear canal, headshaking and scratching are common.

#### Ticks

- *Haemaphysalis leporis-palustris* – the most common tick species affecting rabbits although other types may occur. Anaemia can be seen with heavy infestations.

#### Lice

- *Haemodipsus ventricosus* – rarely seen, but can result in anaemia and pruritus.

#### Fleas

- *Spilopsyllus cuniculi* - found on wild rabbits and a vector for myxomatosis.
- *Ctenocephalides felis* - transmitted from cats and dogs.

#### Flies

- *Lucilia spp* – lay eggs especially around the perineum, which can rapidly develop into maggots within 3-4 days. Significant tissue damage and secondary infection may occur and toxin release can be fatal. Flies are usually attracted due to an underlying disease problem, such as dental disease, arthritis, urinary problems or obesity resulting in a failure to groom.

Diagnosis of an ectoparasite infection is usually relatively straightforward. However, it is always important to look for any predisposing factors which might have allowed these parasites to multiply to a significant level.

A variety of ectoparasite treatments are available both in pet shops and veterinary practices. These include two licensed spot-on flea products for rabbits containing imidacloprid and several ivermectin spot-on treatments. Alternatively, a course of ivermectin injections (usually 3 injections 7-14 days apart) may be preferred for more severe cases. Those flea treatments containing fipronil should be avoided due to reports of adverse effects in several cases.

Flystrike infestation will require more intensive supportive treatment (such as fluid therapy, analgesia and antibiotics for secondary infection) in addition to removal of maggots and topical treatments. Systemic ivermectin may also be indicated to kill any remaining maggots. Good owner education is vital to prevent disease and both measures to repel flies and application of cyromazine (an insect growth regulator) should be considered, especially for outdoor rabbits in the summer months.

### ENDOPARASITES

#### Nematodes

- *Passalurus ambiguus* – the rabbit pinworm rarely causes any clinical problems, although could potentially be a contributory factor in enteritis and diarrhoea seen around weaning.

#### Cestodes

- *Taenia serialis*, *T. pisiformis* and *Echinococcus granulosus* – rabbits act as the intermediate host for these parasites, but clinical problems are usually seen in dogs or foxes. The parasite may potentially however, migrate through the body in rabbits resulting in large space-occupying cysts.

#### Coccidia

- *Eimeria* spp. – both intestinal and hepatic coccidiosis may be seen and a variety of *Eimeria* spp can be involved. Clinical problems commonly affect groups of rabbits, usually associated with overcrowding and poor hygiene. Weight loss, diarrhoea and lethargy may be seen and disease may be fatal especially in young rabbits.

Intestinal parasites can usually be identified on faecal analysis, but further diagnostics may be required to establish extent of disease in some cases.

There are various formulations of fenbendazole available for treatment of nematodes and a rabbit-licensed trimethoprim-sulphonamide for treatment of coccidia. However, as with ectoparasites, it is always important to look for any predisposing factors which might have allowed parasites to multiply to a significant level. Tapeworm cysts may need to be drained or surgically excised.

In addition to specific treatments for the individual rabbit, it is also important to consider other in-contact animals and the environment. If treatment is considered necessary for one individual, treatment should usually be initiated for all in-contacts to prevent immediate re-infection. Good environmental hygiene is also advised; for an indoor enclosure this may involve a complete change of substrate and disinfection of enclosure and furniture. It should be noted however, that most disinfectants have not been proven to have a direct effect on parasites, so the procedure of thorough cleaning and removal of faeces may be more important than the disinfectant chosen. Supportive treatment may also be necessary for the debilitated individual and any obvious problems in husbandry or diet should be corrected.

In summary, parasites are commonly seen in rabbits and may not always be associated with any health concerns. Treatment is only advised if numbers are high or associated with any clinical problems.

## Cataracts and cataract surgery in companion rabbits

By Rick F Sanchez BSciBiol, DVM, CertVOphthal, DipECVO, FHEA, MRCVS

Attitudes towards pet rabbits have changed greatly since the 1980s. Their popularity as house pets has increased, as has demand for rabbit health insurance (McBride, E.A et al 2004).

Cataracts are a welfare concern for companion animals because they can lead to blindness, which affects the quality of life of the pet, but also because they can lead lens induced uveitis, lens luxation, secondary glaucoma and, in some cases, lens rupture (Wilkie DA, Colitz CM 2009). Surgical removal of cataracts in dogs restores vision and can resolve, delay or prevent secondary problems associated with cataract development. Moreover, the implantation of a posterior chamber intraocular lens (IOL) in dogs that undergo phacoemulsification is considered standard of care (Davidson MG et al 1993, Gaiddon J et al 1996).

There are many reports that describe how numerous laboratory rabbits have undergone sham phacoemulsification for the study of IOL implantation meant for use in humans. However, there are no reports in the veterinary literature of IOL fitting in pet rabbits with naturally occurring cataracts. Yet, rabbit cataracts have been described in association with Encephalitozoon cuniculi (Felchle LM and Sigler RL 2002, Giordano C et al 2005, Künzel F and Joachim A 2005), and at least one study indicates that age related cataracts might also develop in rabbits due to inbreeding (Peng X et al 2015). Although cataract removal via phacoemulsification has been described before in a pet rabbit (Felchle LM and Sigler RL 2002), the appropriate size and dioptric power of an IOL for use in rabbits has not been previously investigated and reported.

Intraocular lens implants with a fixed dioptric power are commercially available for dogs (+41D in a 14mm in diameter IOL), cats (+53.5D in a 14mm in diameter IOL) and horses (+14D), and the use of IOLs is considered the standard of care in dogs (Davidson MG et al 1993, Gaiddon J et al 1996). Due to the size of the rabbit eye being smaller than that of a dog or a cat (Samuelson DA 2013, Williams DL 2013), and how optics of a smaller eye affect the IOL power required for that eye, it was thought that the IOL power required to reach emmetropia in an adult rabbit should be larger than that required in adult dogs and a cats, although the size of the implant would have to be slightly smaller.

The aims of a recent IOL study (Sanchez RF, unpublished data) were to develop a rabbit IOL with a dioptric power that led to emmetropia (perfectly focused vision) in rabbits as measured through retinoscopy, to report the ideal IOL size for use in rabbits, and to report the retinoscopy results of a healthy, adult rabbit population, which would serve as a comparison to the retinoscopy results of adult rabbits fitted with the prototype rabbit IOL. Lastly, the study aimed at reporting the dioptric power of an aphakic rabbit eye after cataract surgery (e.g. an eye that has undergone cataract surgery but has not had an IOL implant).

The study found that a 13mm in diameter IOL of +58D dioptric power fitted all seven rabbits implanted, and also resulted in emmetropia (OD mean, with a range that varied between -1.5D to +1D). This was very close to the refraction range of 10 adult, healthy rabbits, which was a mean of +0.125D (with a range of -2.5D to +1D). In addition, it found that rabbits that underwent cataract surgery but did not have an implant had a very far-sighted eye of more than +14D (the maximum that we could detect using retinoscopy).

To date, a total of 13 rabbits have undergone cataract surgery. A total of 10 rabbits had bilateral cataracts and no abscess and a total of 3 had a unilateral cataract and an abscess. All the cases with the abscess were *E. cuniculi* positive on PCR of the lens material (sent to the laboratory of the Veterinary School of Vienna, in Austria), but all the others were *E. cuniculi* PCR negative on their lens material. The commonest problem with the abscessed eyes was posterior synechiae formation and uveitis, in some cases leading to hyphema (e.g. intraocular bleeding) and even secondary glaucoma with a moderate but important increase in intraocular pressure. One of the three rabbits with an abscess could not have an implant secondary to the excessive secondary changes in the eye, which impeded good enough visualization to implant the IOL although cataract removal was possible. All the rabbits with bilateral cataracts except one, had mature cataracts, and the behavior of these rabbits had changed significantly since losing sight as reported by the owners (e.g. less interactive with owners and other animals, and in some cases, less interested in food). The behavior reversed to normal after cataract surgery. The commonest problem with rabbits with bilateral cataracts was lens subluxation or luxation. One case had clear signs of subluxation before surgery and another developed signs of luxation intraoperatively. In both cases the cataracts had been there for some time (undetermined) and were mature. One eye was lost due to severe intraocular bleeding (aka sudden expulsive choroidal hemorrhage) and this eye was enucleated at the time of surgery. All eyes did well postoperatively.

General anesthetic was challenging in some cases. This was mainly due to intubation. One case had a difficult recovery but had no problems afterwards and one rabbit that had an uneventful anesthetic and bilateral surgery, died suddenly after being extubated. All other rabbits recovered well after surgery and had no problems afterwards.

One of the main problems of performing cataract surgery is having access to a cataract surgeon with enough experience to perform the surgery in rabbits. The surgeon must have access to an anesthetist that is experienced and comfortable with rabbit anesthesia, and the owner must be aware of the risks associated with anesthesia in rabbits, such as anesthetic death. Cataract surgery in rabbits has an acceptably good prognosis, though it is costly. In addition to access to a surgeon and an anesthetist, a special 'adjusted' price for cataract surgery in rabbits should be made available in referral hospitals offering cataract surgery, so as to increase the access to the procedure to more rabbit owners with rabbits that have cataracts.

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