Ileus and related gastrointestinal problems in pet rabbits

Ileus and gastrointestinal disease in rabbits can present frequently in practice. With a basic knowledge of the gastrointestinal tract's function and a practical protocol, they can be successfully treated, writes Livia Benato DVM MSc CertZooMed Dip ECZM (Small Mammals) MRCVS

Figure 1: Hard pellets are round, dry, and of a brown colour while caecotrophs are small, wet and dark brown.

INTRODUCTION

Rabbits are small mammals belonging to the order *Lagomorpha* and as pets they are growing in popularity. In these animals ileus and other gastrointestinal problems are common presentations, and a practical approach is necessary for a successful outcome. In order to provide the best treatment, it is important to understand the complexity of their digestive tract and its physiology. Rabbits are hindgut-fermenting herbivores and the caecal microflora alters the digesta and makes it available to be re-ingested by caecotrophy (ingestion of the soft faeces), an essential part of the rabbit's normal digestive process.[1] Imbalance of this specific microbial population can have direct effects on the animal's health. Promoting and maintaining the wellbeing of these pets will prevent gastrointestinal diseases. This article provides an overview of the rabbit gastrointestinal tract and the most common gastrointestinal presentations and how to treat and prevent them.

OVERVIEW OF THE RABBIT GASTROINTESTINAL TRACT

A rabbit's gastrointestinal tract consists of a simple large stomach, pancreas, small intestine, a large and well-developed caecum and a large intestine divided into proximal and distal colon. The caecum plays an important role in the digestion of food and contains a well-established population of different types of bacteria, such as *Bacteroides* spp, *Fumigatus* spp, *Bacillus* spp and *Enterococcus* spp. This specific microflora breaks down cellulose and ferments starch and proteins, producing volatile fatty acids (VFA) and ammonia. The chemical and microbiological composition of the caecal content has direct influence on the efficiency of the rabbit gastrointestinal tract to digest and absorb nutrients. Rabbits also possess three unique anatomic structures that are found only in this species: the sacculus rotundus, the caecal appendix and the fusus coli. The sacculus rotundus is a rounded structure made of lymphoid tissue,[2] found at the ileocaecocolic junction. It works as a valve and prevents the food from moving from the large intestine into the small intestine. The caecal appendix is a very long structure with a vermiform shape that is found at the end of the caecum. It is also made of lymphoid tissue. The secretions of the caecal appendix are rich in bicarbonate and water and it is believed their main function is to regulate the caecal pH.[2] The fusus coli is a muscular structure, highly innervated and vascularised, which is found between the proximal and the distal colon. It acts as a pacemaker for peristaltic movements of the large intestine, under the influence of aldosterone and prostaglandins.[3]

CAECOTROPHY

Rabbits produce two types of faecal pellets: hard pellets and soft pellets, also called caecotrophs. The fusus coli is responsible for the formation of these two types of faeces. The formation of hard pellets and caecotrophs occurs in the colon where the contractions separate the ingesta into small particles, long particles and liquid contents.[3] While the long particles are excreted and lost as hard faecal pellets, small particles and the liquid contents are moved back to the caecum for further fermentation via antiperistaltic movements. They are then excreted as caecotrophs during the night or the early hours of the morning. Once excreted, they are re-ingested directly from the anus, swallowed without being chewed and stored in the fundic region of the stomach[4] for three to six hours. The caecotrophs supply vitamins, essential amino acids and bacteria for further gastric fermentation and maximise the digestibility of nutrients.[4,5]

ILEUS AND RELATED GASTROINTESTINAL PROBLEMS

Ileus

Ileus, or reduced gut motility, is the most common presentation in pet rabbits. It is caused by several factors such as pain, stress, change of environment, poor diet, chronic disease and lack of exercise. Prolonged ileus can lead to alteration of the gastrointestinal microflora (dysbiosis) leading to proliferation of pathogens such as *Clostridia* spp and enterotoxaemia. The main clinical signs are anorexia, reduced or absent faecal pellets, lethargy, hunched position and tooth grinding. At physical examination the rabbit shows tachypnoea, tachycardia, dehydration and reduced gut sounds. History and physical examination can lead to a presumptive diagnosis. However, further investigations are necessary to confirm severity and concurrent problems such as obstructions. Haematology and biochemistry can be performed to assess the general health of the animal. Blood samples can be taken via several veins such as the jugular and the cephalic vein. However, the saphenous vein can be considered the best one when the animal is well handled (Table 1).

Radiographic examination under sedation (Table 2), once the rabbit has been stabilised, can show increased gastrointestinal gas and dilated stomach. Faecal pellets can be noticed in the distal colon if the episode is acute while in the case of chronic presentation they will not be present. Ultrasonography is of limited use due to reverberation artefacts caused by increased gas, however, it can be useful to assess the intestinal peristalsis. Once the diagnosis has been made, medical treatment consists of addressing the cause and supportive treatment consists of fluid therapy, analgesia, administration of prokinetic drugs and assist feeding. Fluid therapy is important in order to restore hydration and to prevent gastric and caecal impaction and it can be given intravenously or subcutaneously. In severe cases, the intraosseous route using the tibia or the femur is preferable to the intraperitoneal route that can increase the risk of caecal damage. Intravenous catheters can be placed into the marginal ear vein, the cephalic vein and the saphenous vein. The marginal ear vein is considered the easiest one, even in small animals. Isotonic crystalloids can be given depending on the dehydration status, starting with a maintenance rate of 100ml/kg/day. Analgesia is provided, administering a combination of opioids such as buprenorphine (0.05mg/kg q 6 hours) or butorphanol (0.1-0.5mg/kg q 2-4 hours), and non-steroidal anti-inflammatory drugs (NSAIDs) such as meloxicam (0.6mg/kg *sid* or *bid*) or carprofen (4mg/kg *sid*). NSAIDs can be given if the renal function has not been compromised and once the animal has been rehydrated. Assist feeding is necessary to maintain an adequate nutritional intake, to promote gut motility, and to prevent hepatic lipidosis (Table 3). Prokinetics such as metoclopramide (0.5-1mg/kg *bid*) and cisapride (0.5mg/kg *bid*) are then administered to promote gut motility and prevent dysbiosis. Ranitidine (2-4mg/kg *bid*) is also administered to prevent gastric ulcers. The rabbit should be hospitalised in a quiet room, far from predators such as cats and dogs, and hay should be offered *ad libitum*. During the 24-48 hours following presentation, it is important to monitor the animal's appetite and faecal output. If the cause of ileus is a poor diet, once the animal has been discharged, the owner should gradually correct the diet. A rabbit's diet consists of *ad libitum* hay, with fresh hay added daily, a small amount of greens and a small handful of pellets offered once or twice daily. Cereal mix should be gradually discontinued and carrots and apples should be offered only occasionally as a treat.

Table 1: Blood sample technique from saphenous vein.

- The rabbit is placed in lateral recumbency with one hand around the chest to support the animal;
- The other hand is placed around the thigh to control hind legs and raise the saphenous vein;
- Once the area has been clipped and disinfected, a small needle or a butterfly cannula attached to a syringe can be used to withdraw blood sample;
- Heparin and EDTA tubes can be used;
- The significance of blood results is similar to that of small animals.

HEPATIC LIPIDOSIS

Hepatic lipidosis is a disease that develops in anorexic animals and it has a rapid onset (24-48 hours), especially in pregnant and obese animals. When a rabbit becomes anorexic, hypoglycaemia stimulates mobilisation of free fatty acids from adipose tissue that are transported to the liver, causing fat accumulation in the hepatocytes. The animal becomes lethargic and quiet and passes a small quantity of faeces. In acute, more severe presentations the rabbit can also develop depression, liver failure and convulsions. Also, due to the accumulation of fat, the liver becomes friable and bleeding can occur in case of abdominal trauma. At physical examination, the animal is

overweight and dehydrated and gut sounds are decreased. Diagnosis is suspected from the history and can be confirmed with ultrasonographic evaluation. Haematology will show increased packed cell volume (PCV) due to dehydration, while biochemistry will show increased bile acids and hypoglycaemia (hyperglaecemia is seen with the progression of the disease). The presence of ketones will be noticed during urinalysis. The cause of anorexia must be addressed and hepatic lipidosis must be prevented or treated depending on the duration of the clinical signs. Treatment consists of fluid therapy using lactated ringer's solution and 5% dextrose solution and nutritional support with assist feeding. The animal is hospitalised until it exhibits good appetite and normal faecal output. Levels of ketones can also be monitored in the urine.
Hepatic lipidosis is prevented by starting nutritional support and fluid therapy as soon as the animal becomes anorexic. At home, it can be prevented avoiding stressors, and gradually reducing the animal's body weight (monitoring diet and increasing exercise).

Table 2: Sedation.
Sedation is advocated in order to perform a quick medical procedure or for diagnostic investigation. This reduces the length of the procedure and the stress associated with it.

Protocols:
- Triple combination using ketamine (5-15mg/kg), medetomidine (0.1-0.2mg/kg) and buprenorphine (0.05mg/kg) or butorphanol (0.1-0.5mg/kg) either IM or SQ. Meditomidine is reversed with atipamazole at the same dose (ml);
- Combination of buprenorphine (0.05mg/kg) and midazolam (0.25-0.5mg/kg) either IM or SQ.

GASTRIC ULCERS

Gastric ulcers are erosions of the gastric mucosa and develop due to irritation and ischaemia secondary to stress, that can increase gastric acidity, hypovolaemic shock and gastric impaction. In mild cases, the rabbit shows no obvious clinical signs while in more severe cases the animal presents reduced appetite and teeth grinding and can also develop shock and peritonitis. This problem is generally underestimated and mainly diagnosed at post mortem evaluation. However, when an animal is treated for painful or chronic conditions or it needs to be hospitalised for a long time, development of gastric ulcers should be considered and prevented. Treatment consists of addressing the cause, giving fluid therapy to treat hydration or stabilise the animal due to hypovolaemic shock. Antibiotics such as trimethoprim sulphonamide (30mg/kg *bid*) or enrofloxacin (10-25mg/kg *sid*) should also be administered. Gastric acidity is reduced using ranitidine (2-4mg/kg *bid*). In case of peritonitis the prognosis is considered poor.

Table 3: Assist feeding technique.

- Assist feeding is given using a 60ml syringe with a large nozzle;
- The rabbit is placed in sternal recumbency on a table, tackled against the body and with the head facing away;
- The head is controlled with one hand and the syringe is placed into the mouth through the diastema;
- Once the syringe is inserted, a small amount of food is offered and the syringe is then removed;
- The animal is allowed to chew and once has swallowed, more food can be given;
- For those animals in more severe conditions, a naso-gastric cannula, using a 6-8 Fr tube, can be placed and glued or stitched on the head between the eyes. In this case, a fine critical care formula must be used to prevent blockage of the cannula;
- The general rule is to give 10ml per kg of body weight of a critical care formula for herbivores, several times daily; and
- The amount should be increased if the rabbit is not maintaining the body weight.

Table 4: Monitoring during hospitalisation.

- TPR. Respiratory rate should be taken before starting to handle the rabbit. This is because the respiratory rate will markedly increase as soon as the rabbit gets stressed. Gut sounds should also be assessed at the time of TPR;
- Faecal output is a useful indicator of the GIT motility and it should start within eight hours of the start of the treatment. Both quantity and size of faecal pellets must be monitored: hard pellets are round, dry, and of a brown colour while caecotrophs are small, wet, and dark brown. Soft faeces, however, are ingested by the rabbit as part of the normal digestive system and should not be found in the cage unless the animal is in pain or unable to move properly. Caecotrophs should be differentiated from diarrhoea that is generally a sign of hypomotility and bacterial infection;
- Rabbits should start to exhibit good appetite during hospitalisation and the cage should be provided with water and food such as hay and, when possible, pelleted food and vegetables that are familiar to the rabbit (the owner can be asked to bring some of the food that the rabbit normally eats at home);
- Demeanour will indicate the animal's response to the surrounding environment and to sources of pain and discomfort;
- It is difficult to assess pain in prey species; individual rabbits vary greatly in their response to pain. They can be reluctant to move and to eat. Respiratory and cardiac rates increase and teeth grinding and biting can be noticed also.

GASTRIC AND CEACAL IMPACTION

Gastric and ceacal impactions are secondary to gastrointestinal hypomotility due to stress, pain or a diet poor in fibres. They have a slow onset. The gastrointestinal contents lose liquid by intestinal absorption resulting in dehydrated compact masses that are difficult to pass

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and that can be considered as a foreign body. The clinical signs are similar to ileus with anorexia and reduced faecal output. At physical examination the gut sounds are reduced and the stomach and the caecum can feel doughy, firm or hard, depending on the severity. Abdominal discomfort and dehydration are also noticed. At radiographic examination the stomach and caecal contents are hyperechoic with a visible halo around them. The treatment consists of re-hydrating the gastric and the caecal contents via fluid therapy and supporting the animal with analgesia and assist feeding. If gastric or caecal impaction are suspected, prokinetics should be administered only once the impaction has been reduced and there are no risks of gastrointestinal damage.

ENTEROTOXAEMIA

Enterotoxaemia is caused by alteration of the gastrointestinal microflora (dysbiosis) leading to proliferation of *Clostridia* spp and *Escherichia coli*. This is caused by gut hypomotility or administration of antibiotics such as lincosamide antibiotics and penicillins that alter the balance of the gut healthy bacteria. The main clinical signs are anorexia, diarrhoea and dehydration and, in severe cases, collapse and death. Emergency treatment is necessary and prevention is advocated.

CONCLUSION

Rabbits are becoming very popular pets and owners are keen to seek vet advice to treat their animals. Ileus and gastrointestinal disease can be common presentations and, with a basic knowledge of the gastrointestinal tract's function and a practical protocol, they can be successfully treated. However, these diseases can also be easily prevented with optimal management of the rabbit and education of the owner.

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FURTHER READING

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Lord M, Lord B. BSAVA Manual of Rabbit Medicine. BSAVA, 2014

Reader Questions and Answers

1: IN WHICH PART OF THE GASTROINTESTINAL TRACT IS THE FUSUS COLI FOUND?

A: In the stomach
B: In the pancreas
C: In the jejunum
D: In the caecum
E: In the colon

2: WHICH OF THE FOLLOWING STATEMENTS ABOUT CAECOTROPHS IS CORRECT?

A: Coecotrophs are excreted during the day
B: Caecotrophs are round and dry
C: Caecotrophs are re-ingested
D: Caecotrophs are hard faeces
E: Caecotrophs consist of long particles

3: WHICH OF THE FOLLOWING ANTIBIOTICS CAN CAUSE ENTEROTOXAEMIA?

A: Enrofloxacin
B: Lyncomycin
C: Doxycycline
D: Metronidazole
E: Trimethoprim sulphanomide

4: A RABBIT'S DIET CONSISTS OF:

A: Ad libitum hay, a small amount of greens and a handful of pellets
B: Ad libitum greens, a small amount of hay and a handful of fruits
C: Ad libitum cereal mix, a small amount of pellets and a handful of hay
D: Ad libitum pellets, a small amount of cereal mix and a handful of fruits
E: Ad libitum fruits, a small amount of greens and a handful of cereal mix

5: WHICH OF THE FOLLOWING STATEMENTS IS FALSE?

A: Enterotoxaemia is caused by alteration of the gastrointestinal microflora
B: Ileus is caused by several factors such as pain, stress and chronic diseases
C: Gastric impaction is a consequence of gastrointestinal hypomotility
D: Hepatic lipidosis is a disease that develops only in pregnant animals
E: Gastric ulcers develop due to irritation and ischaemia of the gastric mucosa

6: WHAT TRIGGERS HEPATIC LIPIDOSIS IN RABBITS?

A: Hypoglycaemia
B: Hypomagnaesemia
C: Hypocalcaemia
D: Hypokalaemia
E: Hyponatraemia

ANSWERS: 1: E, 2: C, 3: B, 4: A, 5: D, 6: A