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GASTROINTESTINAL DISEASE IN THE RABBIT

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**Normal gastrointestinal function**

Rabbits are hind-gut fermenters, adapted to digest a low quality, high fibre diet consisting mainly of grass. Gut transit time is rapid and eliminates fibre from the digestive tract as soon as possible. The stomach is thin-walled, and poorly distensible with a well-developed cardia and pylorus. Vomiting is not possible.

Food, caecal pellets and ingested hair are normally present in the stomach, in a loose latticework. Stomach pH is 1-2 in the adult, and ingesta is effectively sterilised. Pre-weaned rabbits have a stomach pH of 5-6.5, which allows bacteria to be introduced and establish in the gastrointestinal (GI) tract. Weaning is a critical time and can often be associated with GI disease. The colon is succulated and banded. Colonic contractions separate fibrous from non-fibrous particles, and fibre moves rapidly through the centre of the colonic lumen for excretion as hard faecal pellets. Antiperistaltic waves move fluid and non-fibrous particles back along the luminal walls within the sacculations into the caecum for bacterial fermentation. Three to eight hours after eating, soft mucus-covered caecal pellets (caecotrophs) are expelled and eaten directly from the anus. Arrival of the caecotrophs at the anus triggers a reflex licking of the anus and ingestion of the caecotrophs, which are swallowed whole and not chewed. The mucus covering protects the caecal pellet bacteria from the low stomach pH. Caecotrophs remain in the stomach for up to six hours with continued bacterial synthesis, and eventually the mucus layer dissolves and the bacteria are killed. This process allows absorption of nutrients and bacterial fermentation products (amino acids, volatile fatty acids and vitamins B and K), and the digestion of previously undigested food. A food item can thus pass twice through the digestive tract in 24 hours. A muscular band of richly innervated tissue with a thickened mucosa, the fusus coli, lies at the end of the transverse colon and acts to regulate colonic contractions and controls production of the two types of pellets. Stressors will affect this neurological control of GI function and motility.

**Motility disorders**

Food intake and GI motility are co-dependent; thus anorexia will cause hypomotility, and hypomotility will cause anorexia. Many factors lead to reduced GI motility in the rabbit including:

- Lack of dietary fibre
- Anorexia
- Chronic dehydration
- Environmental stressors:
  - Proximity of predators
  - Proximity of a dominant/competitive rabbit
  - Change/destabilisation of group hierarchy
  - Sudden change of diet
  - Change of housing
  - Transport
  - Extremes of weather/temperature
  - Loss of a companion
- Pain
- Post-surgical adhesions
- Ingestion of toxins (eg lead)
- Foreign body

**Gastric stasis**

Reduced gut motility leads to dehydration of gut contents, which decreases motility further. Gastric stasis leads to dehydration and impaction of the normal stomach contents, which include hair (hairball, trichobezoar). The impacted material can be palpated and seen radiographically as a gastric mass surrounded by a halo of gas. True 'hairballs' can be found in long-haired rabbits such as Angoras, which can ingest excessive amounts of long hair.

Clinical signs associated with gastric stasis are:

- Gradual reduction in appetite over days/weeks,
- Decreased output and size of faecal pellets,
- Initially bright but progression to depression, lethargy, dehydration

**Non obstructive ileus**

This will follow on from untreated gastric stasis and is a continuation of the same process. In practice the two conditions usually present together. Clinical signs are similar, but with ileus, pain is a prominent feature, manifest as tooth-grinding, a hunched posture and reluctance to move. The rabbit is anorexic and faecal output stops.

**Obstructive ileus**

This is an emergency, and it can sometimes be difficult to distinguish between obstructive and non-obstructive ileus (Table 1). Rabbits will develop true obstructions with dried ingesta and hair (‘trichobezoars’), and ingested foreign materials such as carpet, rubber, plastic. The most common sites are the pylorus, proximal duodenum and ileocaecocolic region. Occasionally just the caecum can be obstructed. Rarely, neoplasia, abscesses or surgical adhesions can cause obstruction.
Table 1: Differentiation of non-obstructive and obstructive ileus

<table>
<thead>
<tr>
<th>Non-obstructive ileus</th>
<th>Obstructive ileus</th>
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<tbody>
<tr>
<td><strong>Clinical signs:</strong></td>
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<tr>
<td>Gradual onset (days to weeks)</td>
<td>Sudden onset (24-48 hours)</td>
</tr>
<tr>
<td>Gradual reduction in faecal size and output</td>
<td>Faecal output stops suddenly</td>
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<tr>
<td>Crave fibre</td>
<td>Severe depression</td>
</tr>
<tr>
<td>Initially bright, gradual onset of depression and abdominal pain</td>
<td>Abdominal pain</td>
</tr>
<tr>
<td>Mild to moderate dehydration</td>
<td>Reluctance to move</td>
</tr>
<tr>
<td><strong>Radiographic findings:</strong></td>
<td>Shock - slow CRT, pale mucous membranes</td>
</tr>
<tr>
<td>Compacted material in stomach and sometimes caecum, often with halo of gas.</td>
<td>Severe dehydration</td>
</tr>
<tr>
<td>As symptoms progress, entire GI tract gas-filled. Stomach usually last to bloat. Fluid only present late in disease</td>
<td>Death in 24-48 hours</td>
</tr>
<tr>
<td><strong>Radiographic findings:</strong></td>
<td><strong>Fluid and gas present cranial to obstruction</strong></td>
</tr>
<tr>
<td>Fluid and gas present cranial to obstruction</td>
<td>Bubbles of gas in stomach, not halo</td>
</tr>
<tr>
<td>If caecal obstruction get fluid and bubbles of air in caecum</td>
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**Treatment of gastric stasis and non-obstructive ileus**

Treatment is aimed at supporting the rabbit and restoring normal motility. Rabbits should be hospitalised in quiet surroundings away from potential predators to minimise stress. Treatment consists of:

- Fluid therapy - to maintain circulation and rehydrate GI contents. In mild cases, oral fluids may be all that is required, but in more severe cases intravenous fluids are indicated. Maintenance volumes are 100 ml/kg/day.
- Analgesia - buprenorphine 0.01 - 0.05 mg/kg sc/iv tid, butorphanol 0.1-0.5 mg/kg sc/iv every 2-4 hrs, carprofen 2-4 mg/kg sc/iv sid
- Motility modifiers - metaclopramide 0.5 mg/kg sc bid, cisapride 0.5 mg/kg po bid, ranitidine 2-5 mg/kg po bid
- Assisted feeding - commercially available high fibre herbivore recovery diets, slurries of ground rabbit pellets, vegetable baby foods. Always offer hay
- Exercise - helps to stimulate GI motility
- Simethicone at 20-40 mg/kg po qid may be useful if large amounts of gas are present
- Verapamil at 200 µg/kg p.o every 8 hours for 9 doses.

It may take up to three days or more for faecal output to resume. The author does not advocate the use of antibiotics in uncomplicated gastric stasis/non-obstructive ileus. The use of enzymatic products (e.g. papain) to digest trichobezoars is controversial - these products do not actually digest hair (keratin) but may help to break down the matrix holding the material together. Pineapple juice is often advocated as it contains the enzyme bromelin (and papaya for papain), but these are high in simple sugars which may promote caecal dysbiosis and clostridial overgrowth.

**Treatment of obstructive ileus**

This is a surgical emergency. The rabbit should be stabilised first with fluid therapy, warmth and analgesia. Prokinetics are contraindicated prior to surgery, but are useful post-operatively to stimulate gut motility. Post-surgical adhesions can be minimised by the use of verapamil at 200 µg/kg p.o every 8 hours for 9 doses. Post-operative analgesia, fluid and nutritional support are vital to maximise the chance of success.

**Mucoid enteropathy**

The term ‘mucoid enteropathy’ describes a condition in 4-14 week old rabbits, where thick gelatinous colonic mucus is either passed or causes constipation. Diarrhoea or soft stools may also be present. Affected animals are depressed, dehydrated and exhibit abdominal pain. The caecal contents become dehydrated and impacted. Caecal hyperacidity and dysbiosis, reduced motility due to low fibre intake and other factors are involved. The feeding of plenty of good quality hay and little concentrates in weaning rabbits is preventive. This condition can therefore be considered as a variant of non-obstructive ileus and treatment is similar.

**Dysautonomia**

Dysautonomia in rabbits has been reported, causing caecal impaction, anorexia, depression and death in weanlings. Mesenteric autonomic ganglia showed chromatolysis-like degenerative changes and neuronal vacuolation, similar to the picture in equine grass sickness. Clinical signs include reduced appetite, bilateral mydriasis, dryness of mucous membranes and conjunctiva, loss of anal tone, bradycardia, urinary incontinence, proprioceptive defects, caecal impaction and abdominal bloat. Response to supportive treatment is generally poor.

**Megaocolon**

Megaocolon has been reported in the rabbit which is likely to be due to neurological impairment.

**Epizootic Rabbit Enterocolitis**

Epizootic rabbit enterocolitis (ERE) is a serious gastrointestinal syndrome which first appeared in rabbit breeding colonies in France in 1996. Since then it has rapidly spread across the rest of France, into Belgium, Spain and the Netherlands. There have been reports of a similar syndrome occurring in the UK but these cases have not been confirmed as ERE. All cases have occurred in rabbit farming establishments. It has not been reported in pet or wild rabbits. ERE generally affects...
animals between the ages of 6 and 14 wks and mortality is 30–80%. The distinguishing features are pronounced distension of the abdomen and mild watery diarrhoea. A viral cause is suspected and research is ongoing.

Diarrhoea

True diarrhoea is less common in rabbits than motility disorders, and it can often be difficult to establish a definitive cause. It is most frequently seen in young animals. Many cases of apparent diarrhoea are in fact accumulated caecotrophs that have not been ingested. The rabbit’s digestive physiology means that significant changes in gut microflora, pH, or motility can lead to diarrhoea. Stress and dietary causes are common, such as movement and a sudden change in diet, the feeding of lawn-mower clippings, mouldy or frosted food. Overgrowth of clostridial species in the gut (Cl. spiriforme) leads to the release of an iota-toxin and an enterotoxaemia. This overgrowth is often iatrogenic, caused by the inappropriate use of certain antibiotics such as penicillin, ampicillin, amoxycillin, clindamycin, lincomycin, cephalosporins and erythromycin, which kill the normal microbial flora and allow clostridia to proliferate.

Bacterial enteritis due to enterotoxic E.Coli and Staphylococcus (rare) does occur in neonatal and young weaner rabbits. Clostridium piliforme (Tyzzer’s disease), Salmonella typhimurium, Pseudomonas aeruginosa and Campylobacter-like species have also been implicated in outbreaks of diarrhoea in rabbits. A rabbit rotavirus and coronavirus can cause mild enteritis in 3-10 week old rabbits and is generally an endemic colony problem. Eimeria species commonly cause enteric disease in large groups of rabbits, especially in young animals. Hepatic coccidiosis caused by E. steidiae is also common. Diagnosis is based on the detection of oocysts in the faeces and prevention and treatment is achieved with sulpha drugs or toltrazuril, and good hygiene. Treatment with sulpha drugs limits multiplication of the organism until immunity develops.

In practice a specific diagnosis is often not reached, at least in the first instance, and treatment of diarrhoea is largely supportive. Antibiotics are generally only indicated for colibacillosis or another specific bacterial enteritis. Aggressive fluid therapy is vital, plus hand-feeding with baby food or soaked grass pellets, the provision of hay, and multivitamins if coprophagy is absent. Analgesia should be given if there is evidence of abdominal pain. Motility modifiers such as metoclopramide and cisapride are extremely useful and seem to act synergistically when used together. The use of probiotics does seem to have a beneficial effect. Lactobacilli are not normal intestinal inhabitants of the rabbit, but can compete with pathogenic bacteria for mucosal attachment. Commercial probiotic products are advised, especially those with additional bacterial species as well as lactobacilli. Transfaunation of caecal pellets from a healthy rabbit (collected by placing an Elizabethan collar overnight) does seem to be of use in re-establishing gut flora, as the bacteria are protected by the mucous covering of the caecotrophs. The use of cholestyramine resin to absorb clostridial toxins can be of benefit in enterotoxaemia.

References and further reading