Clinical Approach to Ileus in Rabbits and Guinea Pigs

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Outline
• Review of GI anatomy and physiology
• Basic nutrition
• Ileus
  – Pathophysiology
  – Diagnostic testing
  – Treatment

Gastrointestinal Anatomy and Physiology

Rabbits (Oryctolagus cuniculus)
• Lagamorphs…not rodents!
• Monogastric, hindgut-fermenting herbivores
• All teeth are open-rooted (i.e. continuously growing)

Rabbit GIT
• GI transit = 19 hrs
• Simple stomach
  – 15% of GI volume
  – Well-developed cardiac sphincter
    • Should not be able to vomit
  – Adult gastric pH varies from 1.5-2.2
    • “Sterilizes” ingesta

Small Intestines
• Primary site of amino acid, lipid, monosaccharide, and electrolyte absorption
• Important immune function
  – Peyer’s patches throughout especially in distal jejunum and terminal ileum (sacculus rotundus)
Proximal Colon

• Separates ingesta into digestible and indigestible fractions
  – Digestible pieces and bacteria settle out and are propelled into cecum by retroperistalsis with a fluid component
    • “Wash-back” strategy
  – Indigestible particles form hard fecal pellets
    • This fraction is imperative for normal cell function, secretion, digestion, absorption, peristalsis, and excretion

Cecum

• 10x capacity of stomach, 40% of total ingesta
• Fermentation vat
  – Breakdown of digestible fiber and starch
  – Anaerobic, gram-negative Bacteroides are most common bacteria
  – Large ciliated protozoa are also present

Cecum

• Contents have a semifluid consistency
• Direct absorption of nutrients and production of cecotrophs that are reingested

Cecotrophy

• Lagamorphs and hystricomorph rodents
• Cecotrophs (“night feces”) eaten from anus
• Soft, mucus coated pellets
• Important source of nutrients (AA, VFA, vitamins B and K) and bacterial flora

Colon

• Fusus coli
  – Muscular junction of proximal and distal colon
  – Controls colonic motility and squeezes water and electrolytes from feces
  – Innervated by autonomic nerves and influenced by aldosterone, catecholamines, and prostaglandins
• Distal colon
  – Reabsorption of water and solutes
**Guinea Pigs** *(Cavia porcellus)*

- Hystricomorph rodents, like chinchillas
- Monogastric, hindgut-fermenting herbivores
- All teeth are open rooted
- GI transit = 20 hrs

**Guinea pig GIT**

- Strong cardiac sphincter
- Proximal colon
  - Mucus in a deep longitudinal furrow traps bacteria and transports it by anti-peristalsis back to cecum
  - "Mucus trap" strategy
  - Less efficient than rabbit’s strategy

**Guinea pig GIT**

- Cecum contains 65% of GI contents
- Coprophagic
  - May be source of vit B and help to optimize protein utilization
  - True nutritional function poorly defined

**Nutrition and Feeding**

**Rabbits**

- Poor nutrition can contribute to
  - Dental disease
  - Behavioral disorders
  - Gastrointestinal disease
- Appropriate diet should be available at all times
  - Eat approx. 30 x/ day (2-8g per feeding) over 4-6 minute periods

**Rabbits**

- Suggested adult pet rabbit requirements:
  - Crude protein: 12-16%
  - Fat: 2-4%
  - Crude fiber: >18%
    - Dietary fiber stimulates gut motility!
  - Indigestible fiber: >12.5%
  - Calcium: 0.6-1%
Rabbits

• High quality grass hay ad lib
  – Timothy, Orchard grass
  – Alfalfa for growth, lactation, and pregnancy

• Fresh dark leafy greens
  – 1c per 2lb of rabbit

• Limited fruit and treats

• Rabbit pellets
  – < ¼ cup for every 4lb of rabbit
  – Beware of pellet mixes
  – Alfalfa-based pellets are high in calcium (approx. 1.5%)

• Fresh water ad lib
  – Offer water in recognized manner (bottle vs. bowl)

Hypercalciuria and Urolithiasis

• Rabbits possess unique calcium metabolism
  – Blood calcium levels are higher than most mammals and vary substantially with dietary calcium
  – Absorb nearly all calcium ingested and excrete the excess by means of the kidneys

Feeding Guinea Pigs

• High quality grass (Timothy, orchard grass, etc.) hay ad lib

• Guinea pig pellets
  – Crude protein 18-20%
  – Crude fiber 16%

• Fresh vegetables

• Grains and fruits should be offered only as treats

• Fresh water ad lib

Vitamin C Supplementation

• Lack L-gulonolactone oxidase = can’t synthesize own vitamin C

• Need 15-25mg/day

• Methods of delivery:
  – Water - degrades within 24 hours
  – Pellets - degrades in < 90 days post-milling
  – Produce

• Deficiency (scurvy)
  – Can develop within 2 weeks
  – Lethargy, hyporexia, weight loss, rough coat, lameness, gingival bleeding

My rabbit/guinea pig is...
not eating as much/at all, not pooping as much/at all, has diarrhea, is painful, etc.
An Emergency!

Ileus

- Reduction in GI motility and lengthened GI transit time
- Also known as:
  - Gut stasis
  - Gastrointestinal hypomotility
  - Gastric stasis syndrome
  - Gastrointestinal syndrome

Gastrointestinal Disease in Rabbits

Multiple Inciting Causes

Can Result In...

- Gastric dilation/impaction
- Gastric ulceration
- Trichobezoar formation
- Alterations in water/electrolyte secretion and absorption
- Dehydration and hypovolemia
- Dysbiosis and enterotoxemia
- Pain
- Death
# History and Clinical Signs

- No known breed, age, or sex predilection
- Acute or chronic onset
- Hyporexia or anorexia
- Decreased fecal production
- Abnormal appearance to fecal pellets
  - Smaller, firmer, or diarrhea

- Weight loss
- Lethargy
- “Painful appearance”
  - Hunched posture
  - Unwilling to move
  - Failure to groom
  - Eyes are dull, staring into space, lids partially closed
  - Bruxism
  - Abnormal vocalization

# Exam Findings

- Vary based on inciting cause, duration, and severity
- Dehydration
  - Prolonged skin tent and sunken eyes
- Abdominal palpation
  - Dilated stomach
  - Firm or doughy stomach or cecum
  - Gastric tympany
  - Pain elicited
- Reduced borborigmi on auscultation
  - 1-2 sounds per minute is normal

- In very severe cases there can be signs consistent with hypovolemic shock
  - Hypothermic (<97°F)
  - Pale mucus membranes
  - Decreased CRT
  - Altered mentation
  - Bradycardic (<180 bpm)
  - Hypotensive (<90 mm Hg)

# Complete Dental Exam is Imperative!

- Awake exam is limited
  - Otoscope cone or speculum
  - Rinse G. pig mouth with a little water (through 3-6ml syringe)
- Full visual exam requires sedation or anesthesia

# Diagnostic Testing

- May be necessary to postpone any additional diagnostics until patient is stable
- CBC, chemistry panel, and UA
  - Results often WNL
  - Helps to guide therapy (esp. fluid therapy)
  - Identify underlying diseases and metabolic complications
    - Ketoacidosis
    - Hepatic lipidosis

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*Courtesy of David Vella, BSc, BVSc (Hons), DABVP (ECM)*
Diagnostic Testing

- Radiographs
  - Whole body
  - +/- Skull views
- +/- Ultrasound
  - Gas interference
  - May be beneficial for suspected fb, intussusception, neoplasia, or diagnosis of non-GI associated disease
- Contrast radiographs are possible but difficult to interpret

Whole Body Radiographs

- 2 views
  - Right lateral
  - V/D
- Ideally collimated on region of interest
- Proper positioning usually requires sedation or anesthesia
Air and Ingesta

- Stomach and small intestines normally contain small amounts of gas.
- Stomachs are never empty
  - Ingesta, hair, fluid
  - Even after 24 hours of anorexia
- How to distinguish trichobezoar from ingesta?
  - Striated appearance, often surrounded by gas

Dental Imaging

- Indicated if dental disease is suspected
- Skull radiographs
  - 5 standard projections = lateral, V/D, 2 oblique laterals, rostrocaudal
  - Normal anatomy varies significantly with species
- Computed tomography (CT)

Dental Disease

Medical Management

- Often necessary to initiate therapy before complete diagnostics are performed
- Hospitalization in a warm (<80°F), dark, quiet space
- Identify and treat any underlying causes
Medical Management

- Fluid therapy
- Nutritional support
- Analgesics
- +/- prokinetics

Rehydrate!!

- Parenteral and enteral fluids
- Isotonic crystalloids +/- colloids (usually hetastarch)
- Fluids should be warmed
- Dehydration + maintenance + ongoing losses
  - Corrected over 24 hours

Rehydrate!!

- Rates
  - Rabbits 100-150ml/kg/day
  - Rodents 50-100ml/kg/day
- Routes
  - Ideally IV (cephalic or saphenous) or IO (tibia or femur)
  - SQ
  - PO not indicated in obstructive cases

Nutritional Support

- Usually need to assist feed in addition to offering an appropriate diet
- Syringe feeding most common
- Nasogastric tubes well tolerated in rabbits
- Assist feeding formulas
  - Need fiber!
  - Soaked, blenderized pellets
  - Emerald Herbivore
  - Oxbow Herbivore Critical Care
  - Fine grind - can fit through 5 Fr NG tube
### Nutritional Support

- **Vitamin supplementation**
  - Esp. Vitamin C in guinea pigs

- **Probiotics**
  - Need to be appropriate population for species
  - Insure cecotrophy (possible transfaunation)

### Analgesia

- **On going pain can perpetuate ileus**

- **Non-steroidal anti-inflammatories**
  - Only in patients that are euhydrated with no indications of renal compromise
  - Thus, often not indicated on initial presentation
  - **Meloxicam**
    - 0.5 mg/kg PO, SC q24h for gp
    - 0.2-0.3 mg/kg PO, SC q24h for rabbits

### Analgesia

- **Opioids**
  - Use is controversial due to potential to decrease gut motility
  - **Buprenorphine**
    - 0.05-0.1 mg/kg SC q6-12h for gp
    - 0.01-0.05 mg/kg SC, IV q6-12h for rabbits
  - **Butorphanol**
    - 0.2-2 mg/kg SC, IM q2-4h for gp
    - 0.1-0.5mg/kg SC, IM q4h for rabbits

### Prokinetics

- **Contraindicated until it is confirmed that patient is not obstructed**

- **Cisapride**
  - Promotes gastric emptying and increases GI motility in rabbits
  - Oral solution can be compounded
  - 0.5 mg/kg PO q8-12h
  - Questionable whether metoclopramide works similarly

### Other Medications

- **Simethicone**
  - Anti-foaming inert surface active agent
  - Efficacy unknown
  - 65-130 mg/animal PO q1h x 2-3 treatments for rabbits
  - 70 mg PO PRN for gp

- **Ranitidine**
  - Reduces gastric acid secretion
  - May stimulate GI motility by inhibiting anticholinesterase
  - 2-5 mg/kg PO q12h in rabbits

### Other Medications

- **Cholestyramine**
  - Ion-exchange resin that binds clostridial toxins
  - Used in treating/preventing enterotoxemia
  - 2 g in 20 ml PO q24h for rabbits

- **Appetite stimulants**
  - Benzodiazepines, cyproheptadine, vitamin B-complex, etc.
  - Limited evidence of efficacy

- **Laxatives and prophylactic antibiotics**
  - Not recommended
**Additional Management**

- Promote exercising
- +/- Abdominal massage

**Surgery**
- Very rarely indicated
- True obstruction, gastrointestinal foreign bodies, neoplastic mass resection
- Can perpetuate hypomotility
- Fair to poor prognosis (40% survival in report of 76 rabbits with pre-op evidence of GI obstruction undergoing ex-lap)

**Monitoring**

- Serial physical exams
  - Return of normal appetite and droppings
  - Maintaining normal hydration
  - Normal behavior
  - Normal abdominal palpation

- Serial imaging
  - Reduction and change in shape of gas accumulations
  - Formed stool in colon
  - Decreased in gastric distension

- Prognosis depends on inciting cause and severity of signs

**Questions?**