Nutritional Support of the Patient with Canine Parvovirus Enteritis

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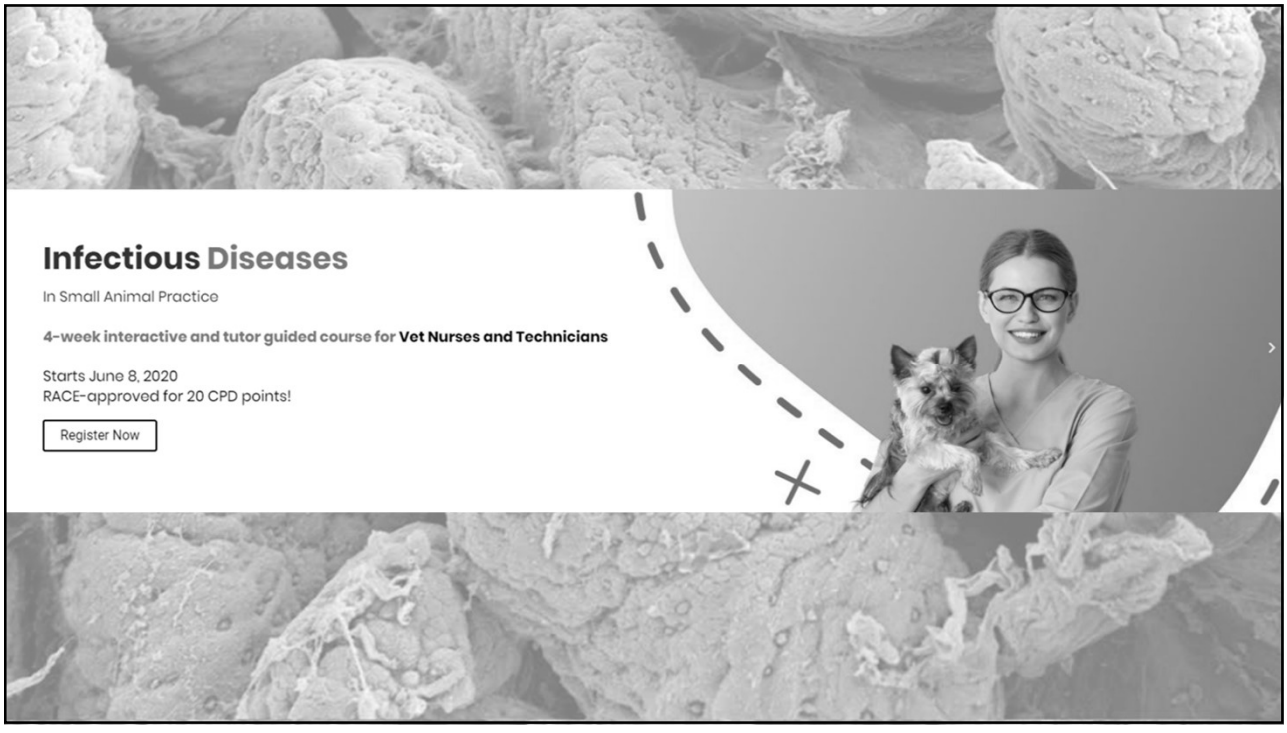
Infectious Diseases in Small Animal Practice



The Problems - Clinical

- Anorexia

The Problems - Clinical

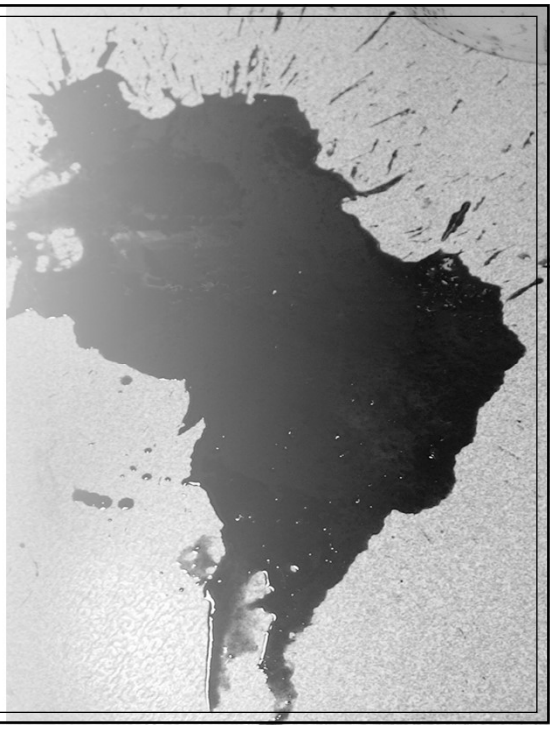
- Vomiting

The Problems - Clinical

- +/- Oesophagitis

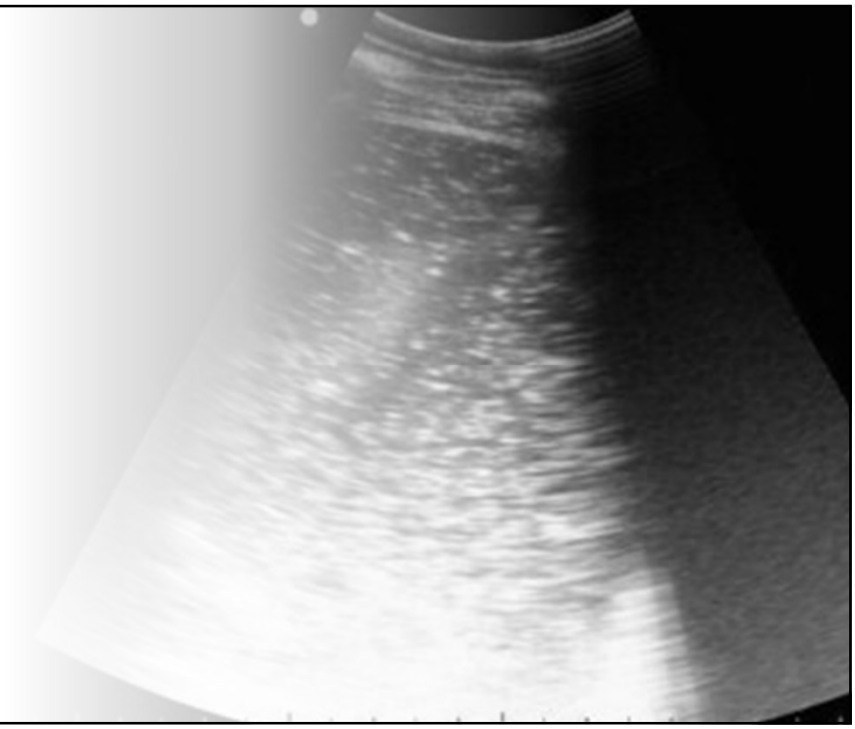
The Problems - Clinical

- Diarrhoea



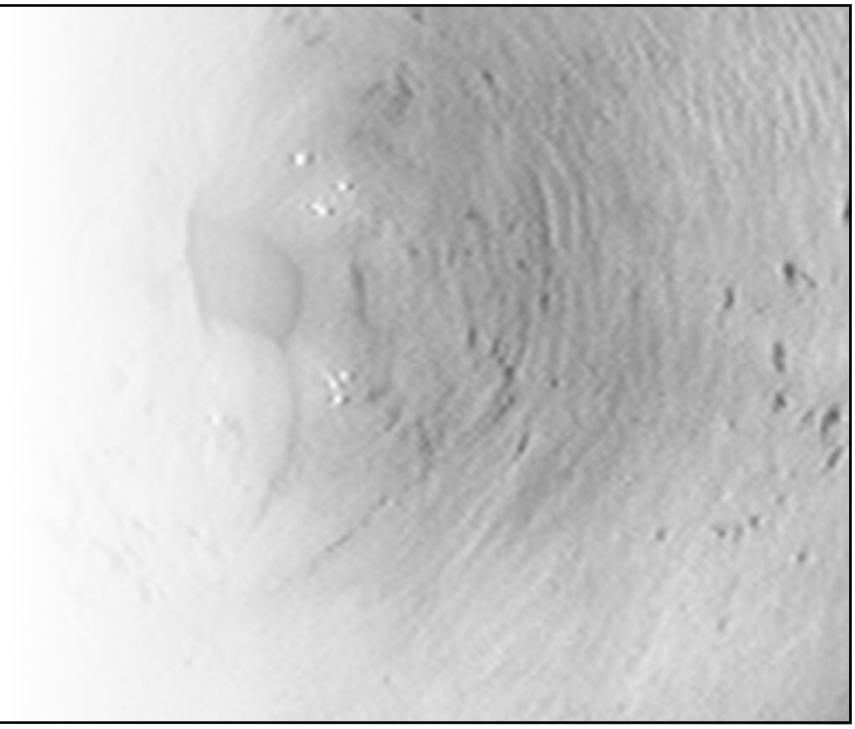
The Problems – In the Gut

- Gastric stasis



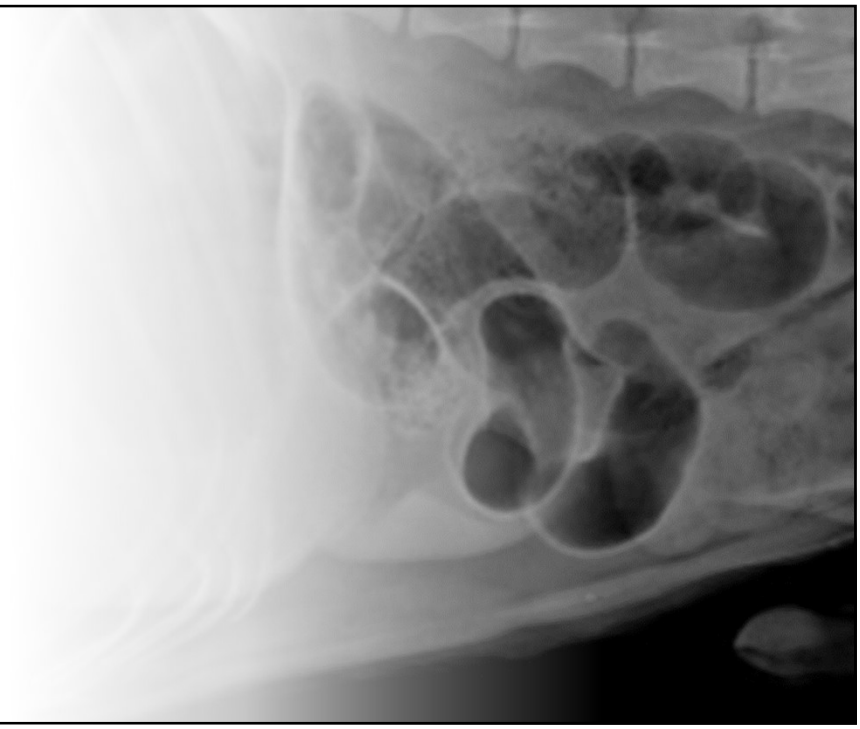
The Problems – In the Gut

- Gastrocyte injury



The Problems – In the Gut

- Intestinal stasis

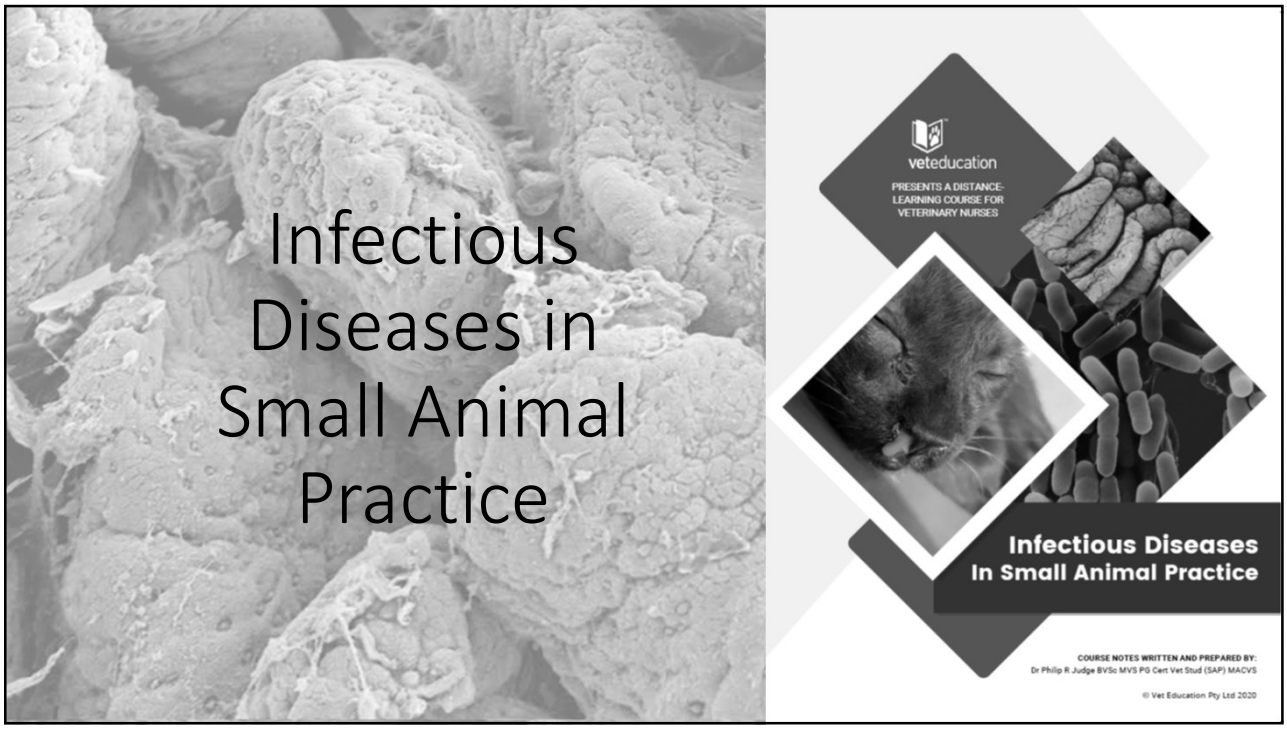


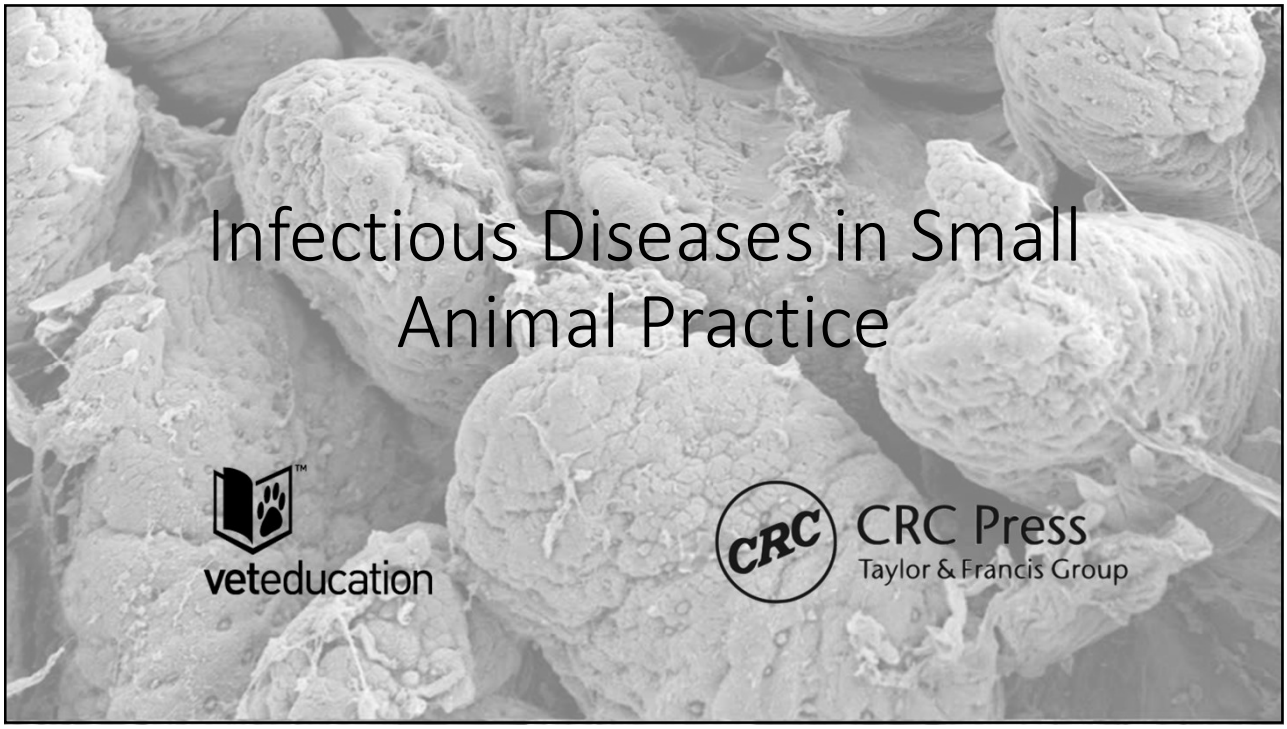
The Problems – In the Gut

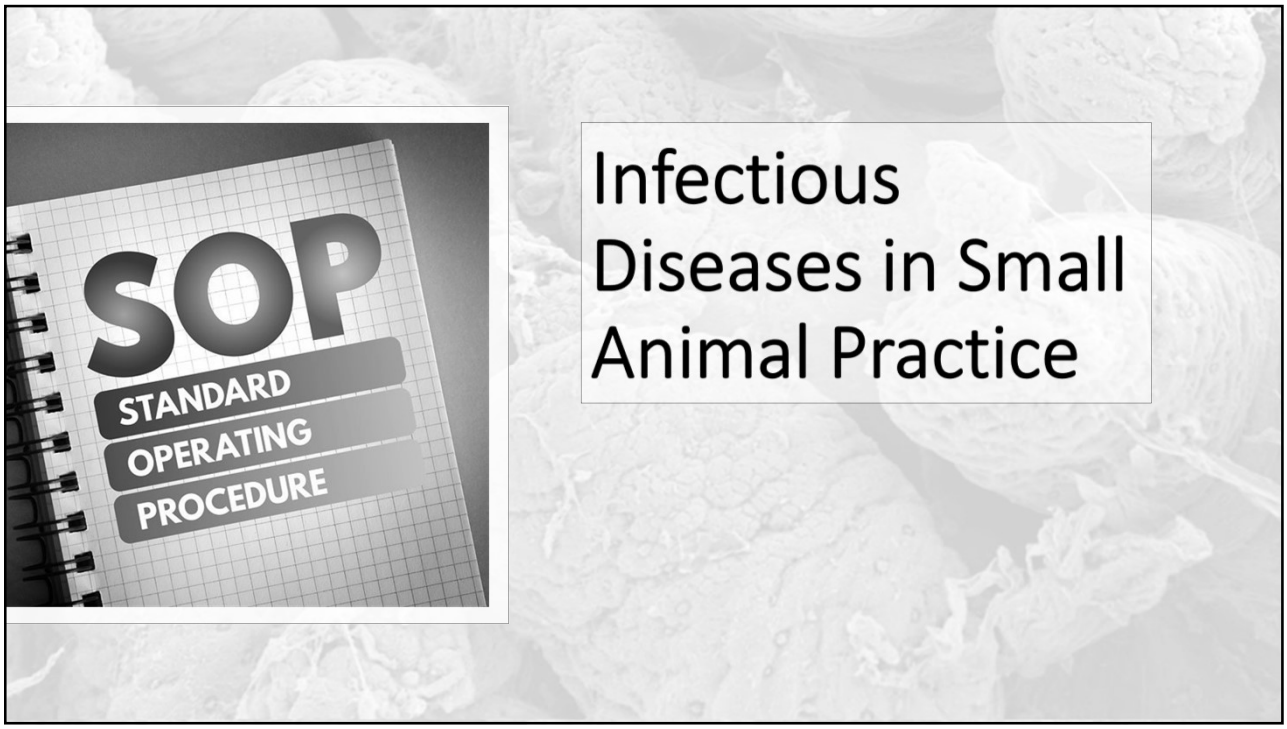
- Bacterial overgrowth

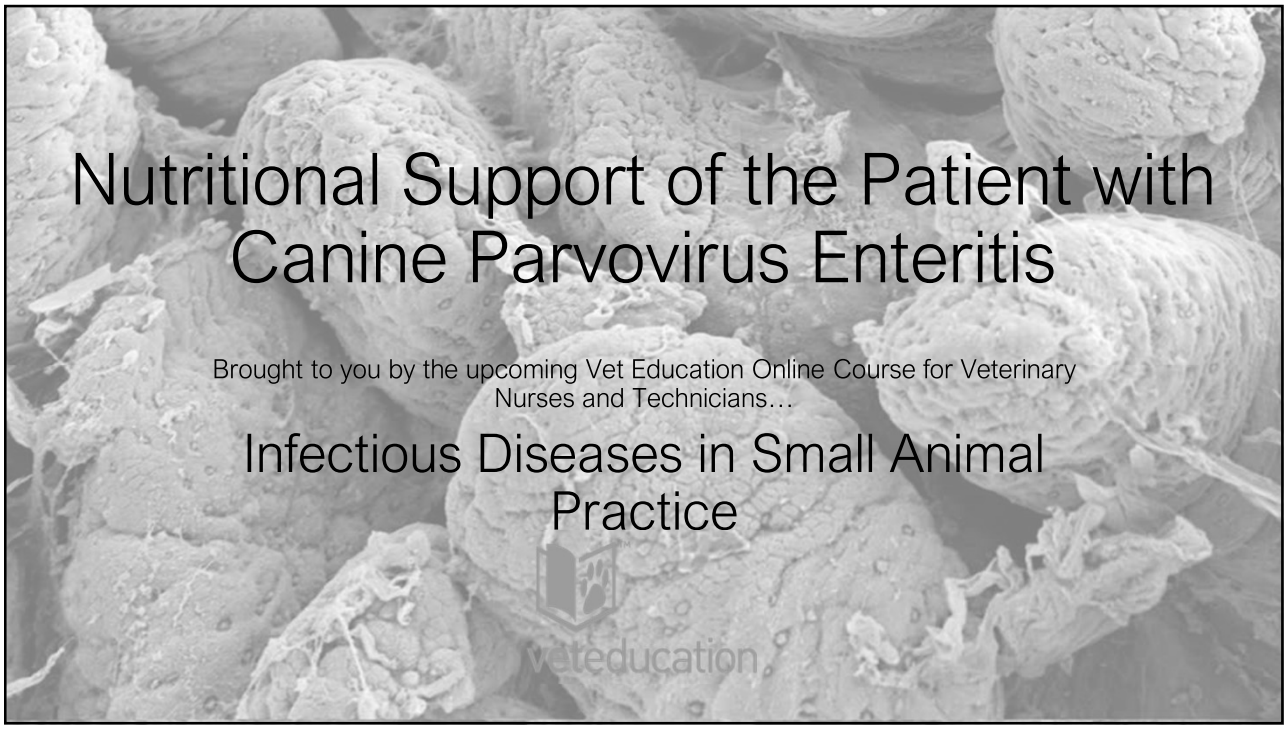
The Problems – In the Gut

- Villous atrophy





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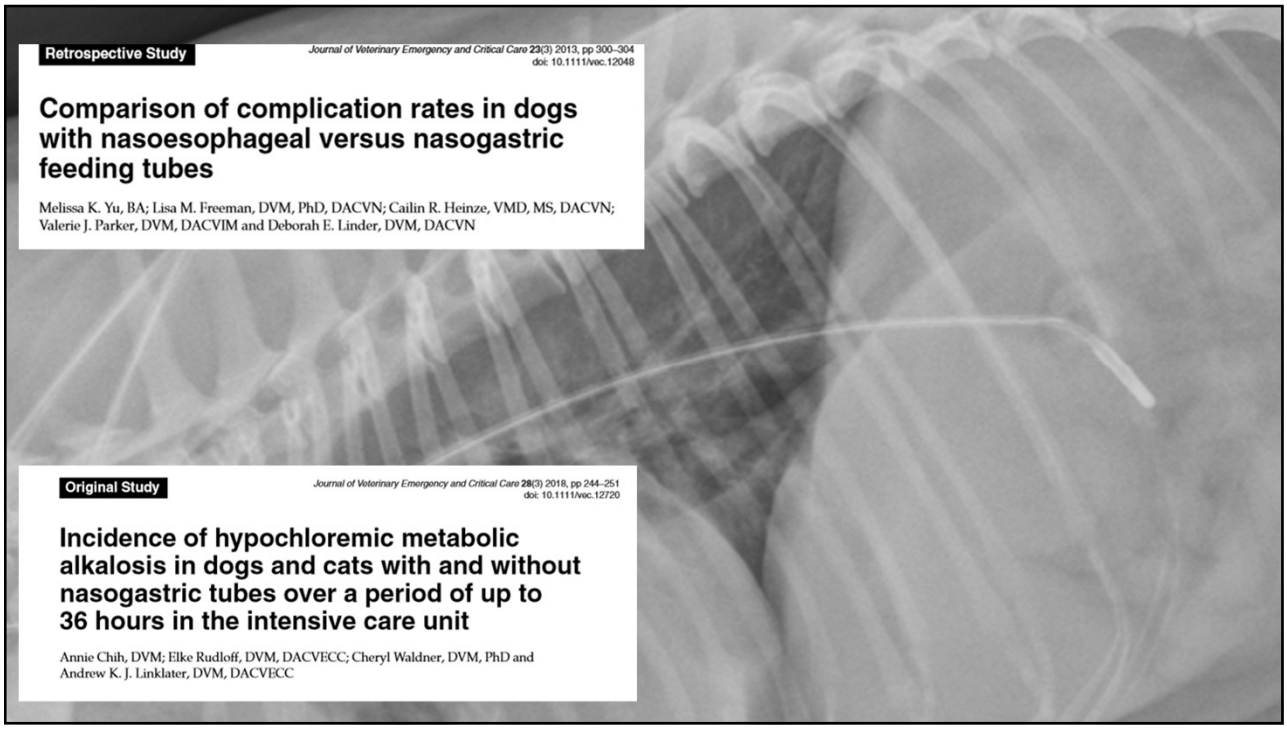
The Solutions
-
Therapeutics
• Nasogastric suctioning
• Anti-emetics
• Gut protectants?
• Antibiotics?



Retrospective Study

Journal of Veterinary Emergency and Critical Care 23(3) 2013, pp 300–304
doi: 10.1111/vec.12048

Comparison of complication rates in dogs with nasoesophageal versus nasogastric feeding tubes

Melissa K. Yu, BA; Lisa M. Freeman, DVM, PhD, DACVN; Cailin R. Heinze, VMD, MS, DACVN; Valerie J. Parker, DVM, DACVIM and Deborah E. Linder, DVM, DACVN

Original Study

Journal of Veterinary Emergency and Critical Care 28(3) 2018, pp 244–251
doi: 10.1111/vec.12720

Incidence of hypochloremic metabolic alkalosis in dogs and cats with and without nasogastric tubes over a period of up to 36 hours in the intensive care unit

Annie Chih, DVM; Elke Rudloff, DVM, DACVECC; Cheryl Waldner, DVM, PhD and Andrew K. J. Linklater, DVM, DACVECC

JOURNAL OF Veterinary Emergency AND Critical Care

Brief Clinical Communication

Journal of Veterinary Emergency and Critical Care 26(4) 2016, pp 593–597
doi: 10.1111/vec.12474

A novel placement technique for nasogastric and nasoesophageal tubes

Jennifer M. Herring, DVM, MS, DACVECC

Abstract

Background – Early enteral nutrition in dogs and cats can have significant benefit in the therapeutic management of critical illness. Blind placement of nasogastric or nasoesophageal feeding tubes to accomplish this goal has become standard practice. However, complications from tube misdirection into the tracheobronchial tree can lead to significant patient morbidity and mortality. Safe and consistent alternatives are desirable to minimize these risks.

Key Concepts – A modified method for placement of nasoenteric tubes is described. The main variation from standard procedure involves a second tube measurement, with the distal tip of the tube positioned at the thoracic inlet and measured to the nostril. The tube is advanced to this level and tested for negative pressure using a 12 mL syringe attached to the end of the feeding tube. This improves confidence in esophageal positioning before complete advancement of the tube to its distal endpoint.

Significance – This procedural adaptation to feeding tube placement has the potential to reduce bronchopulmonary trauma from intratracheal misdirection by providing an early safety check to identify malpositioning. Prospective validation studies are needed to support its advantages over standard tube placement techniques.

(J Vet Emerg Crit Care 2016; 26(4): 593–597) doi: 10.1111/vec.12474

Keywords: enteral nutrition, feeding tubes, nutritional support

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Veterinary Emergency
AND Critical Care

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A novel placement technique for nasogastric and nasoesophageal tubes

Jennifer M. Herring, DVM, MS, DACVECC

- Technique describing placement of nasogastric or naso-esophageal tubes, designed to reduce complications
  - Tracheal or bronchial rupture
  - Pulmonary tears
  - Pneumothorax
  - Pleural effusion
- Involves placing a mark on the tube from nares to thoracic inlet
  - Aspiration of air at this level should prompt tube re-direction
  - Confirmation with radiography still recommended
  - Minimises risk to distal pulmonary structures

Original Study

Journal of Veterinary Emergency and Critical Care **12**(4) 2002, pp 227–233

Capnographic documentation of nasoesophageal and nasogastric feeding tube placement in dogs

Paula A. Johnson, DVM, F. A. Mann, DVM, MS, DACVS, DACVECC, John Dodam, DVM, MS, PhD, DACVA, Keith Branson, DVM, MS, DACVA, Colette Wagner-Mann, DVM, PhD, Mark A. Brady, DVM and Elizabeth Dunphy, DVM

Abstract

Objective: To evaluate the ability of capnography to document proper placement of nasoesophageal (NE) and nasogastric (NG) feeding tubes. This study was conducted in 3 phases. Phase I of this study was designed in order to test the efficacy of capnography to distinguish placement of a feeding tube in the alimentary tract versus the respiratory tract. Phase II was designed in order to document that carbon dioxide (CO_2) could be measured through a polyvinyl chloride (PVC) feeding tube. Phase III was performed in order to evaluate the technique of continuous monitoring during insertion of the feeding tube into the esophagus and stomach as would be performed during a clinical-tube placement.
Design: Prospective study.
Setting: Research laboratory.
Animals: 24 adult dogs.
Interventions: In Phase I, sedated dogs were instrumented with an intratracheal catheter and an 8 French feeding tube placed nasally into the distal esophagus and later advanced into the stomach. In Phase II, dogs were anesthetized and an 8 French feeding tube was placed down the endotracheal tube, then into the esophagus and later advanced into the stomach. In Phase III, sedated dogs were instrumented with an 8 French feeding tube inserted intranasally and then advanced to the level of the nasopharynx, distal esophagus and, lastly, the stomach. Fluoroscopy was used in order to determine location of the feeding tube.
Measurements and main results: Phase I measurements included respiratory rate and CO_2 from the trachea, esophagus, and stomach and pH of gastric fluid sample. Phase II measurements included respiratory rate and CO_2 from the endotracheal tube, feeding tube in the endotracheal tube, feeding tube in the distal esophagus, and feeding tube in the stomach. Phase III data collection included respiratory rate and CO_2 as the tube was passed through the nasal cavity, nasopharynx, esophagus and stomach. Phase I fluid samples were collected from 5 of the 9 dogs and had pH values from 1.68 to 4.20. In both phases, values for the respiratory rate and CO_2 from the esophagus and stomach were 0 ± 0, significantly lower ($P < 0.001$) than the values from the trachea. In Phase II, there was no significant difference between the respiratory rates ($P = 0.886$) and CO_2 ($P = 0.705$) readings obtained from the endotracheal tube compared to readings from the feeding tube in the endotracheal tube. In Phase III, there was a significant difference ($P < 0.001$) between the respiratory rates and CO_2 readings obtained from the nasal cavity and the nasopharynx when compared to those readings obtained from the esophagus and stomach. Measurement of CO_2 and respiratory rate resulted in a reading of 0 every time the feeding tube was in the esophagus or stomach.

Original Study

Journal of Veterinary Emergency and Critical Care 12(4) 2002, pp 227–233

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- Prospective study
  - N = 24 adult dogs
  - 8 Fr nasogastric tube inserted under fluoroscopic guidance
  - Capnography measured at
    - Pharynx
    - Oesophagus
    - Stomach
- Results
  - When tube in oesophagus or stomach:
    - Respiratory rate = 0
    - Capnography = 0

JOURNAL OF Veterinary Emergency AND Critical Care

Original Study

Journal of Veterinary Emergency and Critical Care 28(3) 2018, pp 244–251
doi: 10.1111/vec.12720

Incidence of hypochloremic metabolic alkalosis in dogs and cats with and without nasogastric tubes over a period of up to 36 hours in the intensive care unit

Annie Chih, DVM; Elke Rudloff, DVM, DACVECC; Cheryl Waldner, DVM, PhD and Andrew K. J. Linklater, DVM, DACVECC

Abstract

Objective – To evaluate the incidence of hypochloremic metabolic alkalosis (HCMA) in dogs and cats in the ICU that had intermittent nasogastric tube (NGT) aspiration for up to 36 hours.
Design – Prospective cohort study (December 2013 to October 2014).
Setting – Privately owned emergency and referral teaching hospital.
Animals – Forty-nine client-owned dogs and 16 client-owned cats.
Interventions – Patients wherein NGT placement was recommended and client consent was obtained were included in the interventional group. Those with an NGT placed (NGT group) had the NGT aspirated every 4 hours. Patients for whom placement of a NGT was declined by the owner served as a reference group (NoNGT). Venous blood gas and electrolyte values were obtained every 12 hours.
Measurements and Main Results – Thirty-five dogs and cats had an NGT placed. Thirty dogs and cats did not have an NGT placed. The serum venous blood gas and electrolyte changes were compared over time within the NGT group and between the NGT and NoNGT groups. No cases developed HCMA. In the NGT group, blood pH increased over time. There was no significant difference between the NGT and the NoNGT group in the average value of pH, HCO_3^-, base excess, chloride, or corrected chloride. Serum venous blood gas, chloride, and corrected chloride changes were not associated with the volumes of gastric fluid aspirated over time.
Conclusions – In this small population of dogs and cats, intermittent NGT aspiration was not associated with the development of HCMA over a period of up to 36 hours after NGT placement.

(J Vet Emerg Crit Care 2018; 28(3): 244–251) doi: 10.1111/vec.12720

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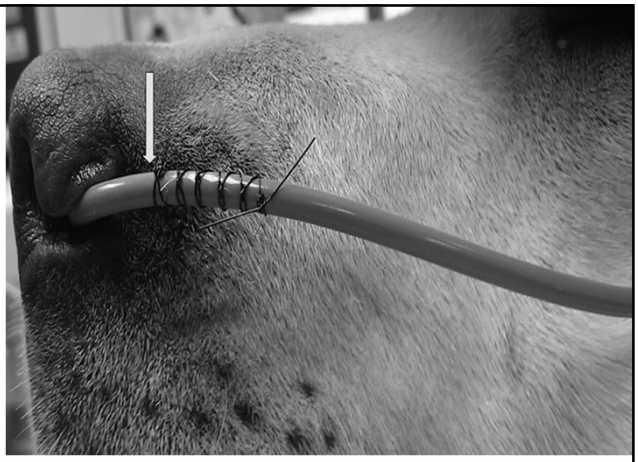
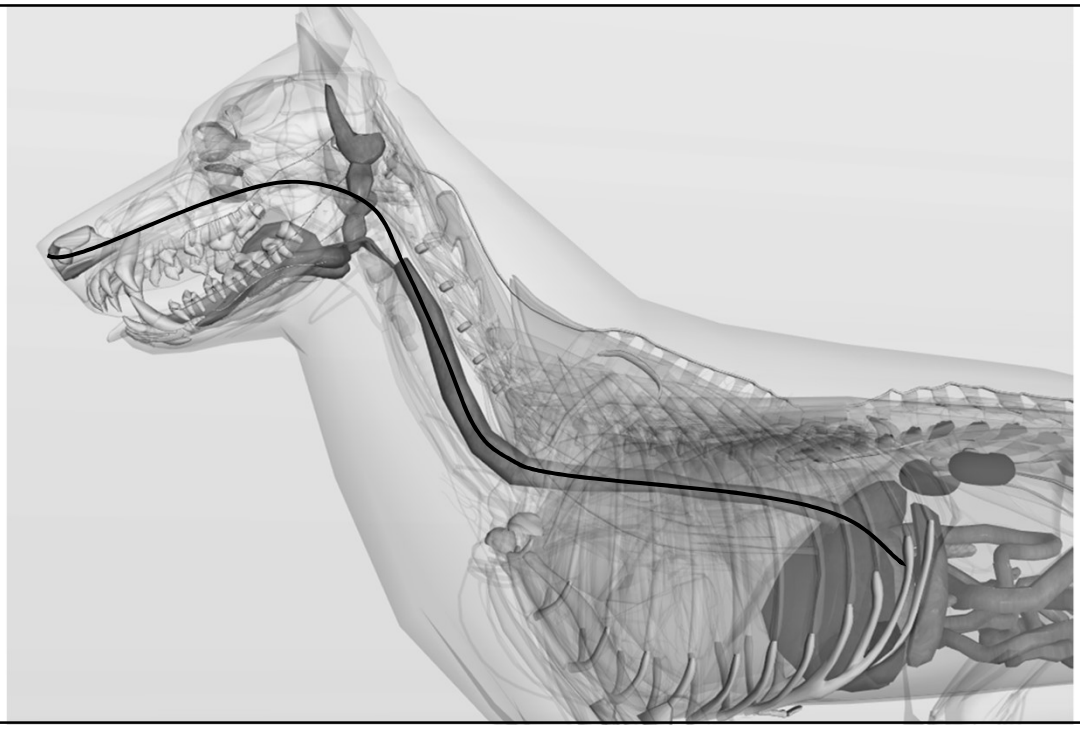
Annie Chih, DVM; Elke Rudloff, DVM, DACVECC; Cheryl Waldner, DVM, PhD and Andrew K. J. Linklater, DVM, DACVECC

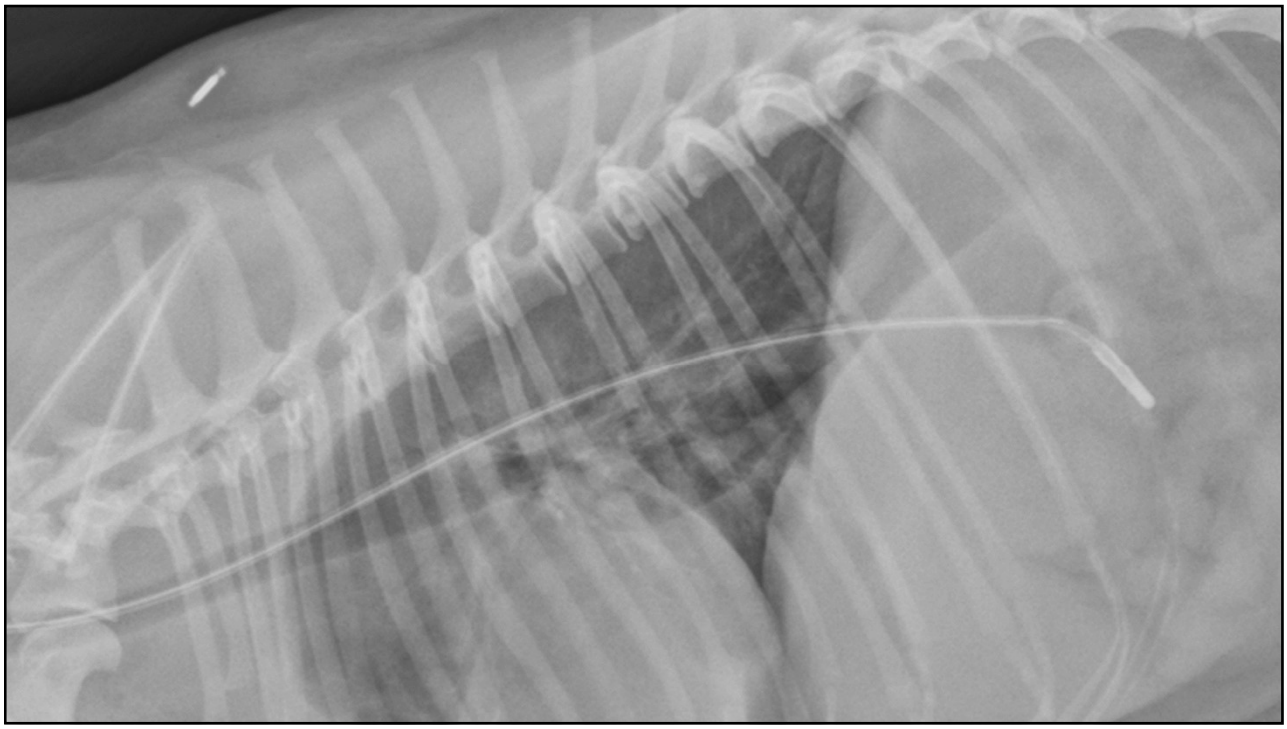
- Prospective study
  - 49 dogs
  - 16 cats
  - Diseases: pancreatitis, enterotomy, GDV, and other conditions
  - 35 with nasogastric tubes placed (23 dogs; 12 cats); 30 without
  - Nasogastric tubes suctioned q 4 hrs, with suctioned fluid discarded
  - Venous blood samples collected at baseline, and every 12 hrs until 36 hrs
    - pH
    - Co2
    - BE
    - Sodium
    - Chloride
    - Bicarbonate
- Results:
  - No patient developed hypochloraemic metabolic alkalosis
  - No significant differences in pH, BE chloride or bicarbonate concentration between groups
  - Short-term nasogastric suctioning was not associated with HCMA



Nasogastric Suctioning

Suction residual gastric volume q 1-2 hrs.





Anti-Emetics

First-Line Anti-Emetics

- Maropitant
  - 1 mg/kg SC (IV) SQ q 24 hrs.
- Metoclopramide
  - 0.2-0.5 mg/kg slow IV q 6-8 hrs.
  - CRI: 0.4 mg/kg loading dose; then 0.3-0.5 mg/kg/hr
- Ondansetron
  - 0.1-0.2 mg/kg slow IV q 12-24 hrs. Can increase to 0.5 mg/kg

Anti-Emetics

Adjunctive Therapy

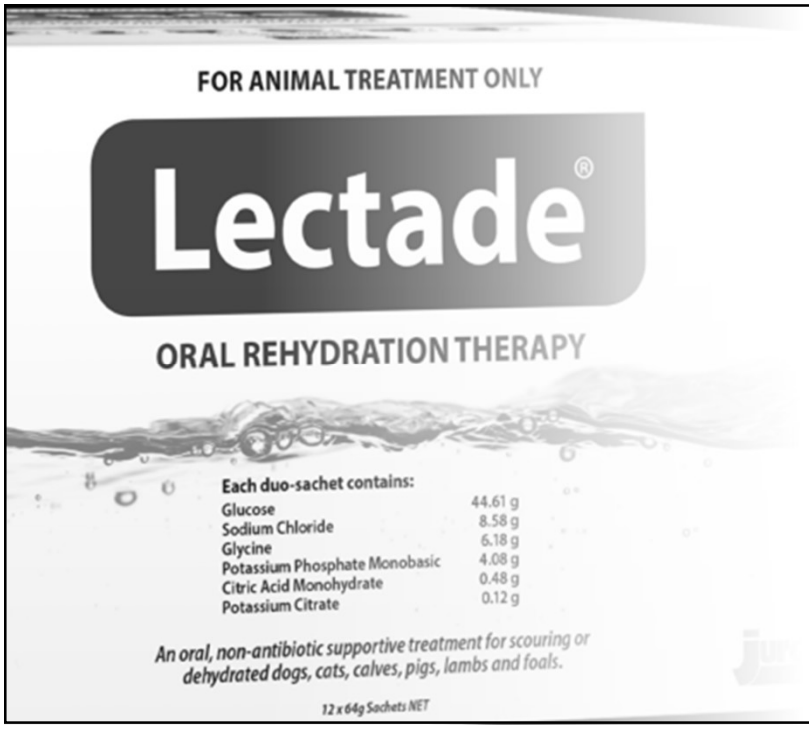
- Butorphanol
  - 0.1 mg/kg/hr CRI
- Ranitidine
  - 0.5-2 mg/kg IV q 8-12 hrs.

Antibiotics

Recommended in leukopaenic patients

Recommended in patients with SIRS or sepsis

Beta-lactam +/- metronidazole



Micro-Enteral Nutrition

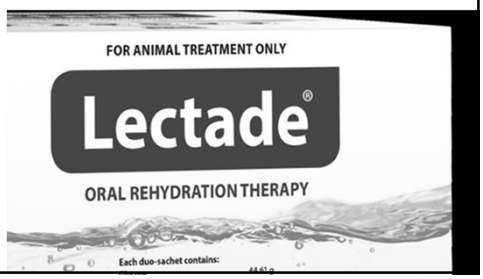
- Aids in preservation of blood flow to the gastric mucosa
- Improves tolerance of administered diets
- Increases gastric mucus production
- Improves gastric motility

Micro-Enteral Nutrition

- Indications
  - Patient unable to tolerate complete enteral diets
  - All patients following injury or illness
  - Severe gastrointestinal disease
  - Patients receiving PPN or TPN to aid in preserving gut integrity and function

Micro-Enteral Nutrition

- Solutions
  - Vytrate or Lectade
    - Balanced electrolyte and glucose solutions
    - Discard solutions made up after 12 hours
  - Lactated Ringers Solution Spiked with Glucose to make up 2.5% solution
    - Sterile
    - Able to be kept for up to 1 week after being made up
  - Addition of Potassium chloride, Amino Acids, Glycine and Glutamine may improve effectiveness



Micro-Enteral Nutrition

- How Much to Give
  - 0. 5-2 ml/kg/hr initially
  - Increase by 0.2-0.5 ml/kg/hr every 6-8 hours if patient tolerates nutrition

Beyond Micro-Enteral Nutrition

- 6-12 hrs. following admission
- Feed more complex nutrition
- Continue micro-enteral nutrition @ 1-2 ml/kg/hr

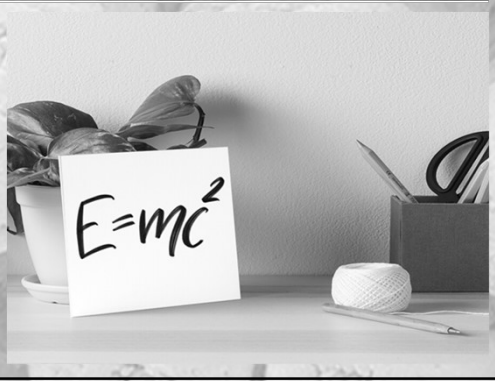
Beyond Micro-Enteral Nutrition

- Calculate Energy Requirements
- Calculate Daily Fluid Requirements
- Calculate Daily Protein Requirements
- Supplement Essential vitamins and nutrients
- Begin Feeding the appropriate diet

Beyond Micro-Enteral Nutrition

- Resting Energy Requirements

- RER = BWt x 30 + 70 (dog)
- RER = BWt x 40 (cat)
- RER = BWt x 70 (small dog)



Beyond Micro-Enteral Nutrition

- Normal Daily Fluid Requirements
  - 40-80 ml/kg/day
- Normal Daily Protein Requirements
  - 16% calories (Dogs)
  - 24% calories (Cats)

Feed the Patient!

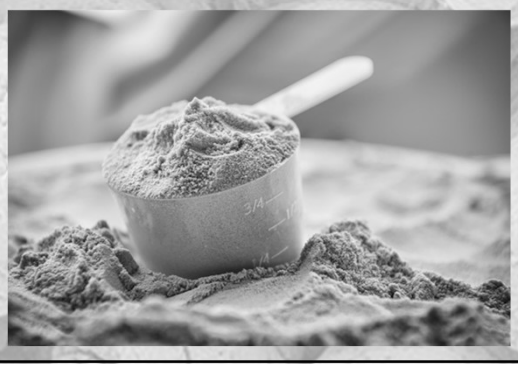
- Begin feeding small quantities initially of a hydrolyzed, bland, low fat diet
- Examples of appropriate diets are
  - Vital HN
- If patient tolerates this diet, feed a non-hydrolyzed diet, bland, low fat
- Examples of appropriate diets are
  - Hills i/d Diet – blenderized
  - Ensure, Jevity

Liquid Enteral Diets

- Liquid enteral diets may be adequate
- However…
  - Jevity
    - Digestible protein: 16.7%
    - Fat: 29%
    - Carbohydrate: 54%
    - Too low in protein for cats, or recovery
    - Too high in simple carbohydrates

Jevity Plus

- Add a whey protein isolate (free of lactose), and a multi-mineral/vitamin
- 4.6kJ (1.2kcal) / mL
  - Protein: 26%
  - Fat 26%
  - Carbohydrate 48%
- The product contains an adequate quantity of soy fibre. This diet will flow easily through a 5Fr feeding tube



Feed the Patient!

- Bolus vs. CRI
  - Bolus feeding is preferred if gastric route of nutrition
  - CRI feeding is essential if jejunostomy feeding
- Suction tubes before feeding to assess residual volumes of food in the intestine or stomach – adjust administered volume, or dilute the food if the patient has high residual volumes

Feeding schedule

- No advantage of continuous feeding over bolus feeding
- Bolus / meal feeding *may* normalise intestinal motility
- Give several small meals
- Initial capacity 5 to 10 ml/kg body weight
- Maximum normal capacity up to 45 to 90 ml/kg
- Always incline the thoracic oesophagus
- Small boluses to stimulate peristalsis

Feed the Patient!

- Day 1
  - feed ¼ to 1/3 caloric requirements
- Day 2
  - feed ½ to 2/3 caloric requirements
- Day 3
  - feed entire daily caloric requirements

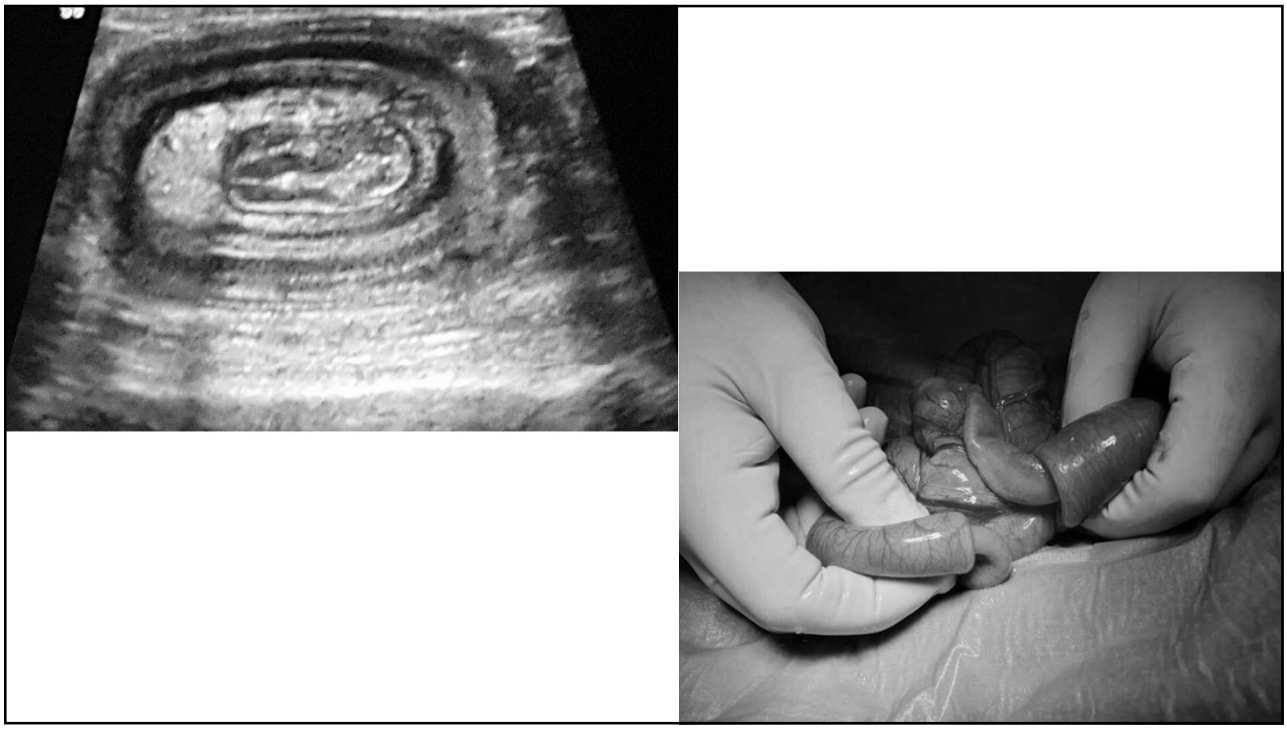
Complications of Nutrition

- Intolerance of feeding tube
- Intolerance of the diet
  - Vomiting
  - Hyperglycemia
  - Hyperammonaemia
- Re-feeding syndrome
  - Occurs when shrunken body mass receives fluid and nutrition
  - Results in hypo-phosphataemia, hypomagnesemia, hypokalemia
  - Hemolytic anemia, cardiac arrhythmias, and poor gut motility are often observed

Complications of Nutrition

- Hypo-vitaminosis B
- Diarrhea, vomiting, poor gut motility
- Electrolyte imbalances

Just Before We Go…

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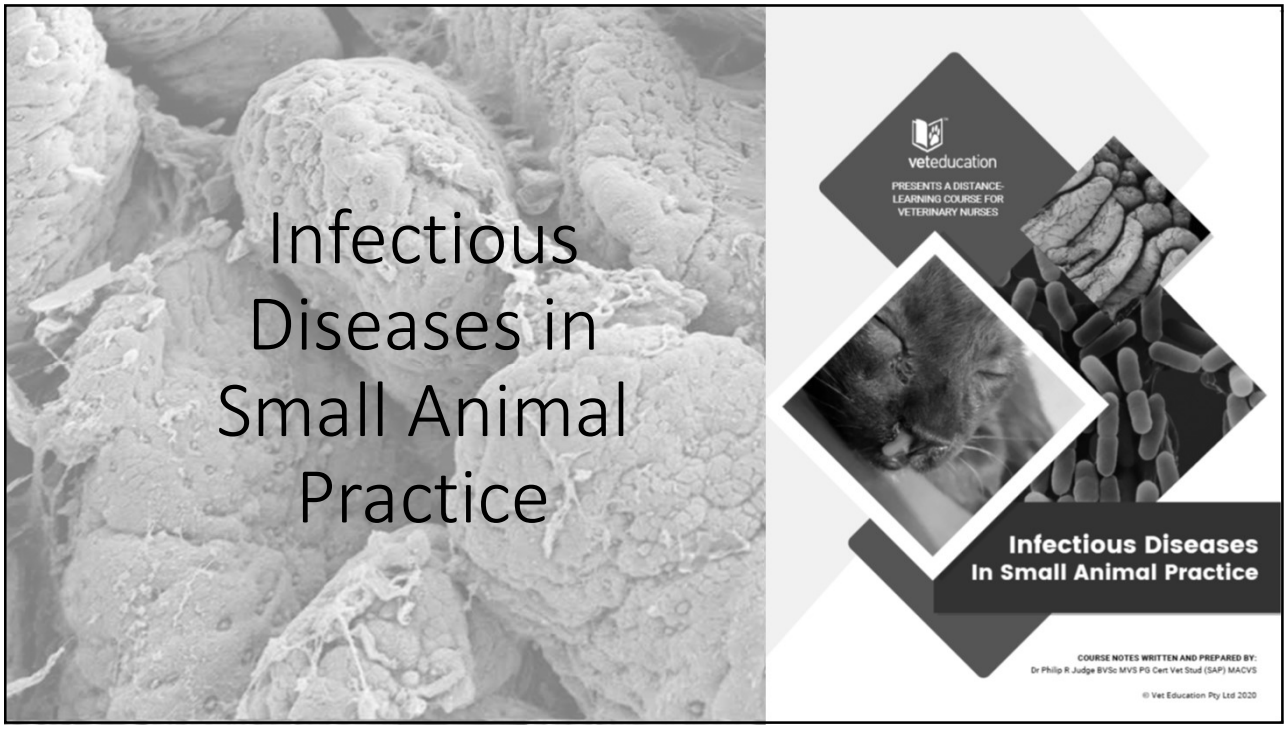
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Infectious Diseases In Small Animal Practice
COURSE NOTES WRITTEN AND PREPARED BY:
Dr Philip R Judge BVSc MVS PG Cert Vet Stud (SAP) MACVS
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Infectious Diseases in Small Animal Practice

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CRC Press
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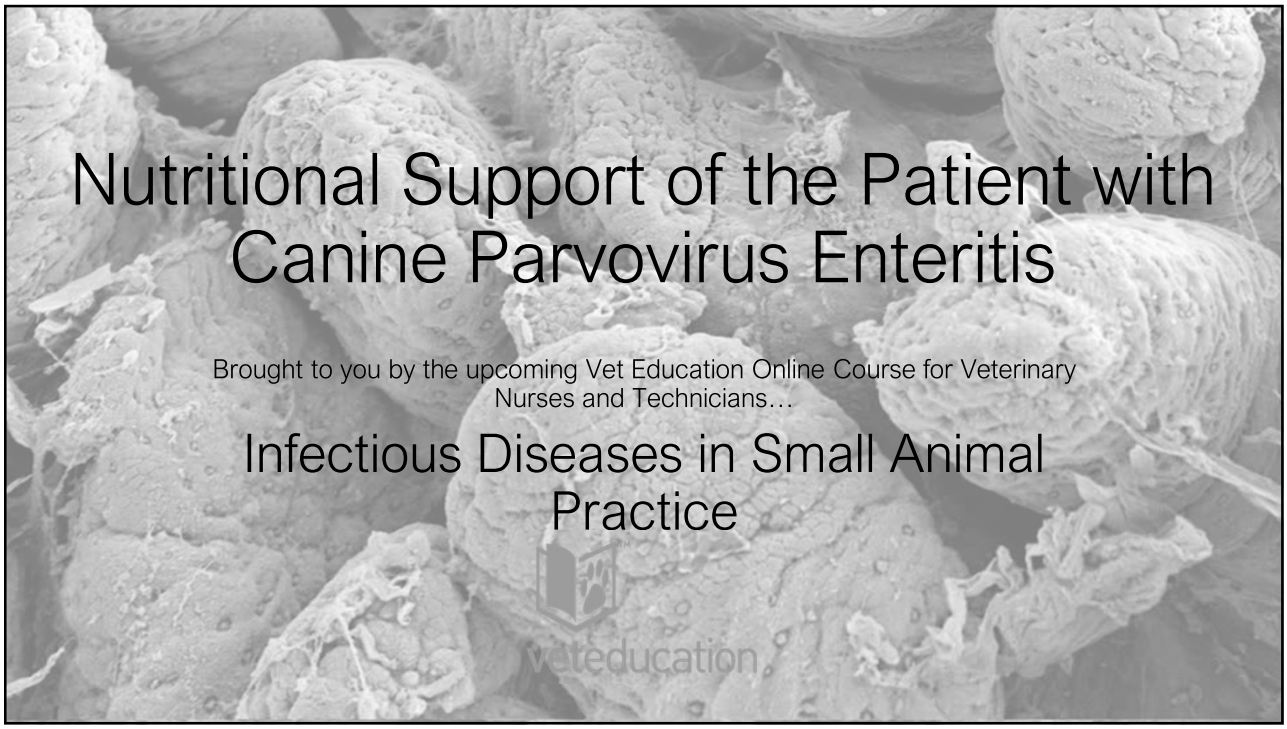
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