Metabolic diseases in small mammals

• Endocrinopathies
• Hypovitaminosis/Hypervitaminosis
• Starving/Obezity
• Ketosis
• Liver failure
• Kidney failure
• Mineral metabolism disorders

Endocrinopathies

• Ferrets
  Hyperestrogenism/prolonged oestrus
  Hyperadrenocorticism
  Inzulinoma
  (Diabetes mellitus)
• Rabbits
  Hyperadrenocorticism
  Sexual hormone disorders
• Guinea pigs
  Hyperadrenocorticism
  Hyperthyreosis

Endocrinopathies

• Chinchillas, degus
  Diabetes mellitus
• Rats
  Secretion of adenohypophyseal hormones
• Hamsters
  Hyperadrenocorticism
Endocrinopathies - ferrets

- Hyperestrogenism
- Hyperadrenocorticism

Pancreas

- Elongated "V"-shaped organ
- Pink colour
- Two limbs (right and left) united by body
- Common pancreatic duct
  - papilla duodeni major
- Vascular supply
  - Cranial and caudal pancreaticoduodenal arteries
  - Pancreatic branch of splenic artery
  - Satellite veins

Topography

- Topography

**PREOPERATIVE CONSIDERATIONS**

- History
- Clinical examination
- Haematology, plasma chemistry
- Insulin levels

**PREOPERATIVE CONSIDERATIONS**

- Immediate glucose measurement

**PREOPERATIVE CONSIDERATIONS**

- Thoracic (abdominal) radiography
- ECG, echocardiography

**ANESTHESIA**

- IV access
- Premedication and induction
  - Butorphanol 0.1 mg/kg
  - Medetomidin 0.02 mg/kg
  - Ketamin 1 mg/kg
  - Midazolam 0.1 mg/kg
- Isoflurane (intubation)
**Anesthesia**
- Continual perioperative infusions
- Monitoring

**Insulinoma**
- Islet cell neoplasia of the pancreas
- Derived from beta cells
- Autonomous insulin secretion
- Very common in older ferrets
- Benign or malignant
  - Metastases - lymph nodes, spleen, liver, kidneys

**Insulinoma**
- Neuroglucopenic signs
  - Mental dullness
  - Lethargy, episodic weakness
  - Hindlimb paraparesis
  - Weight loss
  - Nausea (ptyalism)
  - Seizures, coma
  - Permanent neurological damage
**INZULINOMA**
- Adrenergic manifestation
  - rapid decrease in blood glucose level
  - tachycardia
  - tremors
  - irritability

**DIAGNOSTICS**
- Clinical signs
- Hypoglycaemia
  - normal range 3.5 – 7.4 mmol/l
- Elevated or normal insulin levels
  - up to 35 mIU/l; normal range 4.9-34.8 mIU/l
- Glucose measurement
  - after 3 hours of starvation
  - “fasted blood glucose concentration”

**THERAPY**
- Conservative
  - only palliative
  - prednisone 0.5-2 mg/kg PO q12h
  - diazoxide 5-10 mg/kg PO q12h
  - dietary management
    - frequent feeding
  - vitamins (B and C) supplementation
- Dietary Management
  - Frequent feeding
  - Vitamins (B and C) supplementation
THERAPY

- Surgery
  - the best long-term survival and disease-free interval
  - partial pancreatectomy
  - nodulectomy
  - nodules
    - raised areas
    - red in color
    - firmer on palpation

SURGERY

THE "SUTURE FRACTURE TECHNIQUE"

COMPLICATIONS

- Alopecia
**COMPLICATIONS**

- Alopecia
- Bleeding
- High glucose – temporary DM
- Synechias
- Intestinal necrosis
- Pancreatitis (very rare)
- Inzulinoma was not found
- Metastazes

**Hyperadrenocorticism in guinea pigs**

- Alopecia – nonpruritic, symmetric
- Apathy
- Weight loss
- PU/PD

ACTH dependent

**Diagnostics**

- Ultrasonography
- Urine corticoid/creatinine

Cortizol (interpretation ?)
- Corticosteron – final metabolism
Hyperadrenocorticism in guinea pigs

- Therapy
  - Trilostan 2 mg/kg q12h (inhibitor 3β-hydroxysteroid dehydrogenázy)
  - Ketokonazole 25–30 mg/kg q12h

Hyperthyreosis in guinea pigs

- Clinical signs and clinical examination
  - PU/PD
  - very active
  - polyphagia
  - weight loss
  - hyperestesia
  - nervousness
  - thyroid gland enlargement
  - high temperature intolerance

- Diagnostics
Hyperthyreosis in guinea pigs

- **Diagnostics**
  - Haematology and plasma chemistry
  - Ultrasonography
  - TT4, TSH test
  - Radiography – neck and chest (FNAB)
  - CT
  - MRI
  - Nuclear scintigraphy

- **Therapy**
  - Metimazol 0.5-1.0 mg/kg q12-24h
  - Radioactive iodine ¹³¹I
  - Thyroidectomy

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Diabetes mellitus in degus (chinchillas)

- Specific glucose/insulin metabolism
- ↑ glu .... could lead to hyperinsulinémia
- ↑ aldosa reductase activity in lens
  - Glucose – sorbitol – ↑ water influx

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Diabetes mellitus in degus (chinchillas)

- Diagnostics
  - hyperglycaemia
  - glycosuria
  - diabetic ketoacidosis

Differential diagnosis
- pancreatitis
- stress hyperglycaemia

Hypovitaminosis/hypervitaminosis

- Guinea pigs
- Rabbits (degus, guinea pigs)

Hypovitaminosis C in guinea pigs

- Daily requirements 5 mg/kg
- Lactation, convalescence 15-35 mg/kg
- Collagen synthesis
**Hypovitaminosis C in guinea pigs**

- Clinical signs
  - Bleeding
  - Periodontal problems
  - Limbing
  - Matted fur
  - Impact on immunity
  - Prolonged wound healing
  - Foetal death

**Hypovitaminosis C in guinea pigs**

- Therapy
  - Diet
    - Broccoli
    - Pepper
    - Celery – haulm
    - Parsley – haulm
    - Cabbage
  - Parenteral vitamin C administration
  - Analgesia (NSAIDs)

**Hypervitaminosis D in rabbits**

- Specific calcium metabolism
- Calcium absorption – passive diffusion
- Excretion via kidneys
- Parenteral (peroral) vitamin D administration
  - iatrogenic hypervitaminosis
Hypervitaminosis D in rabbits

- Ectopic calcifications
- Bone calcifications
- Skeletal demineralization – less common
- Chronic kidney failure

Diagnostics

- History
- Haematology and plasma chemistry
- Radiography
- Dietary vitamin D level

Therapy

- Diet change
- Supportive care
- Fluid therapy

Mineral metabolism disorders

- Syndrome of dental disease
- Fibrous osteodystrophy
- Hypocalcaemia in peri-parturition period
Syndrome of dental disease

- Rabbits
- Guinea pigs
- Chinchillas
- Degus
- Strictly herbivores

ANATOMY - RABBIT

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<th>Rezáky</th>
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<th>Premoláry</th>
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<td>Maxila</td>
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ANATOMY AND PHYSIOLOGY

- Continual eruption
  - Incisors: 2-4 mm/week
  - Cheek teeth: 2-4 mm/month
ANATOMY AND PHYSIOLOGY

- Continual wear
tooth – tooth tooth – food - tooth

- Činčila, osmák - horizontální okluze P+M
- Morče - šíkmá okluze P+M
Dental Disease - Aetiology

- Neoplasia
- Infection
- Trauma
- Osteodystrophy
- Hypovitaminosis C
- Iatrogenic
- Syndrome of dental disease

Aetiology

- Osteodystrophy in guinea pigs
  - Congenital clinical signs in different age
  - Bone decalcification

Aetiology

- Iatrogenic (30%) do not use pliers, scissors, etc.

Aetiology and Pathophysiology

- Syndrome of dental disease
  - Multifactorial disease
    - Inefficient attrition
    - Metabolic bone disease
**Aetiology and Pathophysiology**

- "Different kind of diet"
  Mixtures
  Different nutritional content

### Mixtures

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<td>alfa-alfa</td>
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<tr>
<td>sunflower</td>
<td>1:3</td>
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<tr>
<td>wheat</td>
<td>1:7</td>
</tr>
<tr>
<td>banana</td>
<td>1:36</td>
</tr>
<tr>
<td>hay</td>
<td>2:1 - 1:3</td>
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**Aetiology and Pathophysiology**

- Diet different from natural one
  - Selective feeding
    - ↓ chewing cycles
    - ↓ feed abrasivity

- NSHP (Hypovitaminosis D) (Hypocalcaemia)
AETIOLOGY AND PATOPHYSIOLOGY

- Selective feeding
  - Alveolar bone loss
  - Crown elongation
    - coronal
    - apical
- Pain
- Spikes and soft tissue injury

AETIOLOGY AND PATOPHYSIOLOGY

- Selective feeding
  - Alveolar bone loss
  - Crown elongation
    - coronal + apical
  - Pain
  - Spikes and soft tissue injury

  - Abnormal chewing patterns
  - Preference of soft food
AETIOLOGY AND PATHOPHYSIOLOGY

- Dysplastic changes - germinative tissue
  Enamel depigmentation, rough surface

AETIOLOGY AND PATHOPHYSIOLOGY

ANOREXIA

- Painful Abdomen
- PARALYTIC ILEUS
  - Dystosis
  - Immobility
- METEORISM
  - No caecotrophes

CLINICAL SIGNS

- Anorexia
- Preference of soft food
- Softer and smaller amount of faeces
- Matted fur
- Weigh loss
**Clinical Signs**

- Excess salivation
- Halitosis
- Epiphora
- Exophtalmosmus

**Diagnostics**

- Clinical examination
- Imaging methods
- Further laboratory analysis
  - Blood sampling
  - Urinalysis

**Clinical Examination**

- Adspection
CLINICAL EXAMINATION

- Facial symmetry
- Jaw palpation
**EXAMINATION - ANAESTHESIA**

- Butorfanol + Isofluran
  - 0.3 mg/kg
- Midazolam + ketamin + isofluran
  - 0.3 mg/kg + 2 mg/kg
- Midazolam + medetomidin + ketamin
  - 0.3-0.5 + 0.01-0.05 + 5-15 mg/kg

**EXAMINATION - ANAESTHESIA**

- Midazolam IV
  - 0.05-0.2 mg/kg
- Ketamin IV
  - 1-3 mg/kg
• Extraoral
  5 views - DV, LL, oblique, RC
• Intraoral

RADIOGRAPHY

RADIOGRAPHY

RADIOGRAPHY

RADIOGRAPHY
• Aim – optimal occlusion

Mostly palliative

• Incisor crown size and occlusal surface adjustment

• Cheek teeth

• Patient stabilization
  Analgesia – NSAID + opioids
  Fluid loss replacement
  Prokinetics
  Force-feeding
THERAPY

- Diet change
  - complete pelleted diet
  - hay
  - grass
  - fruit, vegetables

SUMMARY

- Optimal diagnostics
- Exact diagnosis/diagnoses
- Therapy
  - do not use pliers or scissors
- Diagnostics of secondary diseases
- Prognosis

THANK YOU FOR YOUR ATTENTION

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