Rodent Oncology: Diseases, Diagnostics, and Therapeutics
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Rats (Rattus norvegicus)

Tumors of the Skin and Subcutis
- Zymbal’s gland tumors
- Mammary gland neoplasia
- Pituitary tumors

Tumors of the Skin and Subcutis
- Zymbal’s gland tumors
  - Accessory structure of rodent ear (= sense organ), ventral to the orifice of the external ear
  - Modified sebaceous gland

Tumors of the Skin and Subcutis
- Subcutaneous mass below the ear +/- ulceration
- Malignant carcinoma
- Slow to metastasize
- Incisional/excisional biopsy
- Surgical excision

Tumors of the Mammary Gland
- 6 pairs of mammary glands
  - Neck to the inguinal region (3 thoracic, 1 abdominal, 2 inguinal)
  - Can ulcerate when large, cause impaired ambulation and mobility

Photo courtesy of David Eshar
Tumors of the Mammary Gland

- Recent retrospective:
  - Mammary fibroadenomas 53%
  - Mammary adenocarcinomas 12%
  - 25% malignant masses
  - Previous fibroadenomas (80-90%) vs. adenocarcinomas

Tumors of the Mammary Gland

- FNA + cytology – challenging
  - poorly exfoliative, inflammatory cell component

Tumors of the Mammary Gland

- Surgical excision with histopathology – common for new tumors to arise in previously unaffected mammary tissue
- Tamoxifen
- I-CARE 2015
  - Elective ovariohysterectomy/castration 90-180 days
    - Intact males and females 24.8%
    - Spayed females and castrated males 6.2%

Tumors of the Mammary Gland

- Removal of ovaries before ~5-7 months of age – reduced development by 95%
- Tumor incidence reduced by 73.8 to 5.3%

Tumors of the Mammary Gland

- Deslorelin implant
  - Does not prevent recurrence
  - New masses occur more slowly
  - Link to prolactin-secreting pituitary tumor?

Tumors of the Endocrine System

- Pituitary tumors
  - Common
  - Most are prolactin-secreting chromophobic adenomas
  - Lower incidence in ovariectomized rats?
Tumors of the Endocrine System

- Pituitary tumors
  - Central vestibular disease, visual deficits, behavioral changes
  - Ultrasound, MRI, CT
  - Cabergoline (dopamine agonist)
  - 0.6 mg/kg PO q72h

Mice (Mus musculus)

- Mammary gland tumor
- Pulmonary tumors
- Hepato cellular carcinoma
- Lymphoproliferative diseases
- Fibrosarcoma
- Sebaceous adenoma
- Thyroid adenoma
- Histocytic lymphoma

Tumors of the Mammary Gland

- Incidence range: 30-70%
- Typically malignant and highly metastatic
- Mass anywhere from neck to inguinal region (usually on ventrum or flank)

- Incision and drainage
- Biopsy + histopathology
- Surgical excision – however, often highly vascular
- Liposomal doxorubicin

Hamsters

- Pancreatic islet cell tumors
- Hepatocellular carcinoma
- Cholangioma
- Splenic fibrosarcoma
- Hemangiosarcoma
- Sebaceous adenoma
- Thyroid adenoma
- Intraocular teratoma
- Adrenal tumors
- Lymphoma
- Cutaneous melanoma
- Atypical fibroma/fibrosarcoma
- Mammary gland tumor
- Trichoepithelioma
- Ovarian and uterine neoplasia
- Adrenal tumors
- Lymphoma
- Malignant basal cell tumor
- Cutaneous plasmacytoma
- Medullary thyroid carcinoma
- Parathyroid tumor
- Pheochromocytoma
- Pancreatic carcinoma
- Small intestinal adenocarcinoma
- Hepatocellular carcinoma
- Cholangioma
Tumors of the Skin and Subcutis

- Most common site for tumors in Djungarian hamsters
- Atypical fibroma > papilloma > SCC
- Mast cell tumors (mastocytomas)
  - Head, neck
  - Suspected benign
  - FNA + cytology
  - Incisional or excisional biopsy
  - Surgical excision

- Cutaneous melanomas
  - Flank organ
  - 10:1 male:female
  - Staging recommended due to metastasis
  - Surgical removal

- Atypical fibromas and fibrosarcomas
  - Older hamsters
  - FNA + cytology
  - Surgical excision
  - Characteristic immunohistochemical feature: concomitant vimentin and androgen receptor expression

- Trichoepitheliomas
  - Common in enzootic populations infected with hamster polyomavirus (HaPV)
  - More susceptible to tumor development

- Granulosa cell tumor, thecal cell tumor
- Leiomyosarcoma, leiomyoma, adenocarcinoma
- Anorexia, lethargy, abdominal distension, vaginal discharge
- Imaging
- FNA + cytology
- Surgical excision
Tumors of the Endocrine System

- Adrenal tumors
  - Demodex common
  - Rare in pets
  - Pituitary dependent or adrenal dependent
  - Bilaterally symmetric hair loss over flank, hyperpigmentation, thinning of skin, abdominal distension, PU/PD
  - Endocrine testing, imaging
  - Treatment challenging

Tumors of the Hematopoietic System

- Lymphoma – one of the most common tumors in hamsters
  - 3 forms:
    1. Multicentric lymphoma
       - Induced by hamster polyomavirus
       - Young, naïve hamsters affecting mesentery and disseminating to kidney, liver, thymus
    2. Multicentric lymphoma
       - Involves lymph nodes and visceral organs
       - Older hamsters
    3. Epitheliotropic lymphoma
       - T-cell immunophenotype

Tumors of the Skin and Subcutis

- Large ventral abdominal scent gland often mistaken for a tumor
- More common in males
- Neoplasia of the gland: adenoma, SCC, basal cell carcinoma
- Can become infected – sample for cytology and bacteriology
- Surgical excision + castration recommended

Mongolian Gerbils

(Meriones unguiculatus)

- Lymphoma
  - Anorexia, lethargy, ataxia, dyspnea, enlarged PLN, palpable abdominal masses, cutaneous lesions (T-cell)
  - FNA + cytology
  - Biopsy + histopathology
  - No treatment reported
  - Rapid clinical course
  - Grave prognosis

Tumors of the Reproductive System

- Males – testicular teratoma, prostatic adenocarcinoma
- Females – ovarian tumor most common tumors
- Most common: incipient granulosa cell tumors
- Other tumors: uterine adenocarcinoma, leiomyosarcoma, leiomysarcoma, ovarian teratoma, ovarian leiomyoma
- Vaginal discharge, abdominal distention, lethargy, anorexia
- Imaging with FNA and cytology
- Ovariectomy or ovariohysterectomy
Tumors of the Skin and Subcutis

- 15% of all neoplasms identified in GPs
- Trichofolliculoma
  - Most common
  - 33-90% of all skin tumors
  - Dorsum
  - Benign
  - Can ulcerate or rupture
  - FNA + cytology – keratin, sebum, inflammatory cells
  - Surgical excision (including capsule)

- Lipomas
  - 25% of skin tumors
  - Ventral abdomen
  - Solitary vs. multifocal
  - FNA + cytology – helps to rule out other neoplasia
  - Complete surgical removal

Tumors of the Mammary Gland

- Occur in both boars and sows
- 30-70% are malignant
  - Adenocarcinoma
  - Simple tubulopapillary carcinoma
  - Reportedly low metastatic rate
  - FNA + cytology
  - Differentiate from other pathologies
  - Cytology can be variable

Tumors of the Reproductive System

- Uterine tumors
  - Leiomyomas – most common
    - Possible link with cystic rete ovarii

- Ovarian tumors
  - Teratomas – most common
  - 2-3 germinal tissues + high degree of neural tissue
  - Unilateral
  - Rarely metastasize

- Abdominal distension, abdominal mass, vaginal discharge, abdominal pain
Tumors of the Reproductive System

- Abdominal ultrasound
- FNA + cytology
  - Leiomyomas - low to moderate cellularity
  - Ovariohysterectomy + histopathology

Tumors of the Endocrine System

• Thyroid
  • Carcinomas: 37-56% of total thyroid tumors
  • Metastasis 5.3%
  • Nonfunctional or functional (hyperthyroidism)
  • Ventral neck mass, weight loss despite a normal appetite, polyphagia, hyperactivity

Tumors of the Endocrine System

• Thyroid
  • Ultrasound, FNA + cytology, serum total thyroxine (T4) levels, serum free T4, nuclear scintigraphy
  • Differentials: cervical lymphadenitis, salivary mucocoe, lymphoma

Tumors of the Endocrine System

• Thyroid
  • Treatment dictated by functionality and biologic behavior
  • Thyroidectomy
  • Radiation
  • Radioiodine (I131) therapy
  • If functional, medical management with methimazole or carbimazole

Tumors of the Endocrine System

• Hyperadrenocorticism
  • Presentation similar to canines
  • Middle aged to older
  • Bilateral symmetric alopecia, thin skin, polyuria, polydipsia, muscle weakness
  • Endocrine testing (ACTH stimulation test), abdominal ultrasound
  • Surgical excision, triostane

Tumors of the Endocrine System

• Pancreatic beta-cell tumors (insulinomas)
  • Neurologic signs (weakness, ataxia, head tilt, lethargy, seizures)
  • Administration of dextrose, normal to increased insulin levels, abdominal ultrasound
  • Dextrose IV/IO/PO, glucagon CRI, oral glucocorticoids +/- diazoxide, surgical excision
Tumors of the Respiratory System

- Pulmonary tumors
  - Most common – bronchogenic papillary adenomas
  - Solitary or multicentric
  - Affect multiple lung lobes
  - Ultrasound with aspiration and cytology

Photo courtesy of UC Davis Pathology

Tumors of the Hematopoietic System

- Lymphoma, Leukemia
  - Associated with Type C retroviral infections
  - Poor hair coat, lethargy, anorexia, peripheral lymphadenopathy, hepatomegaly, splenomegaly
  - Epitheliotropic T-cell lymphoma – pruritus, scaling, alopecia

Photo courtesy of UC Davis Pathology

Chinchillas (Chinchilla lanigera)

- Scarcity of reports in the literature
- May indicate a low incidence of cancer compared to other rodents
Degus (Octodon degus)

- Tumors?
  - Low reported incidence of neoplasia
  - Elodontomas commonly diagnosed

- Black-Tailed Prairie Dogs (Cynomys ludovicianus)

  - Tumors of the Hepatobiliary System
    - Hepatobiliary tumors common - most are hepatocellular carcinoma
      - Documented in other Sciuridae (woodchucks, ground squirrels)
      - Hepadnavirus (woodchuck hepatitis virus)
      - Anorexia, weight loss, acute respiratory distress, palpable abdominal mass

- Tumors of the Hepatobiliary System
  - Hepatocellular carcinoma
  - Imaging, cytology, biopsy
  - Metastasis reported
  - Treatment not reported
  - Other tumors: hepatocellular adenoma, biliary cystadenoma, hepatocellular carcinoma

Questions