#### Female Reproductive Pathology

#### Rob Foster rfoster@uoguelph.ca VetReproPath.com



#### Circle of Reproductive Life\*



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\* "Circle of Life" Music by Elton John, lyrics by Tim Rice, Performed by Elton John – The Lion King

#### Female Reproductive Pathology

#### Introduction

- Anatomy Nomina Anatomica Veterinaria
- Histology Nomina Histologica Veterinaria
- Embryology
- Disorders of Sexual Development
- Female genital pathology
- Failure of Pregnancy
- Perinatal mortality
- Mammary Pathology



## Objectives

- Make you a better more valuable pathologist!
- Show that reproductive pathology is easy
- Outline important diseases
- Concentrate on approach to evaluation of reproductive organs
- Have some fun with reproductive disease!



#### **Principles of Reproductive Pathology**

- Know normal anatomy and histology
  - Use species, breed and age matched controls
- Always correlate Macroscopic (Gross) Pathology with Histology
- Know what to expect!
- What happens in one species will happen in another



#### Female Reproductive Anatomy

Cat

- Ovary
- Bursa
- Uterine tube
  - Fimbria
  - Infundibulum
  - Ampulla
  - Isthmus
- Uterus
  - Horns
  - Body

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- Cervix
- Vagina
- Vulva

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Nomina Anatomica Veterinaria, 2017



Cow. Photograph complements of Dr Philip Ladds



#### Normal female development

- Female specific genes are activated
- WNT1, DAX1, FOXL2, are important genes
- Upregulate FST (follistatin gene)
- Paramesonephric ducts develop (WNT4)



## Female Reproductive Embryology

- Ovary
- Uterine tube
- Uterus
- Cervix
- Vagina
- Vulva

- Coelomic epithelium, retroperitoneal mesenchyme, mesonephric tubules, vasculature, endocrine cells, germ cells
- Paramesonephric duct
- Urogenital sinus and tubercle

















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#### **Disorders of Sexual Development**

**Replaces:** 

Hermaphrodite Pseudohermaphrodite Intersex Sex reversal

What about aplasia, hypoplasia, cystic remnants, duplications, persistent components? **Yes, these are DSD!** 



## Basis of Disorders of Sexual Development (DSD)

- Sex Chromosome DSD
  - Aneuploidy
  - Chimerism
  - Mosiacism
- XX DSD
  - Ovarian
  - Testicular
  - Ovotesticular
  - Dysgenesis
- XY

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- Ovarian
- Testicular
- Ovotesticular
- Dysgenesis

#### Sex Chromosome DSD

- Aneuploidy
  - Uneven number of chromosomes
  - X\_
  - XXY, XXXY (Tricoloured male cat)
- Chimerism
  - Chromosomes from 2 individuals
  - XX/XY
  - Freemartinism
- Mosaicism
  - Duplication of chromosomes
  - XX/XY, XX/XXY



#### Bovine: Chimerism; freemartin

Ovary Epididymis Segmental aplasia of uterus Vesicular gland\* Bulbourethral gland Vagina and vulva Prominent clitoris











#### Canine: Gonadal dysgenesis









#### Segmental aplasia (of paramesonephric duct)





#### **Bovine: Segmental aplasia**





Photograph complements of Dr Philip Ladds









Canine uterus

#### Cystic embryonic remnant

- Cystic rete ovarii (intraovarian)
  - Hilus of ovary
  - Single layer of ciliated epithelium and no smooth muscle
- Cystic mesonephric tubules (intraovarian)
  - Hilus of ovary
  - Ciliated epithelium with smooth muscle
  - Ovarian
- Cystic mesonephric duct
  - Hilus and poles of ovary
  - No glands
  - Thin smooth muscle
  - Cystic vaginal mesonephric (Gartner's) duct
- Cystic paramesonephric duct
  - Poles of ovary or in bursa
  - Thick smooth muscle
  - Often have glands
  - Hydatid of Morgagni



#### Canine: Cystic paramesonephric duct remnant/ duplication:









#### Equine: Cystic paramesonephric duct remnant





# Canine: Cystic remnants- mesonephric tubules







Ciliated epithelium with smooth muscle wall

## Bovine: Cystic mesonephric (Gartners) duct









Rete ovarii are in the hilus of the ovary. They have ciliated epithelium and no smooth muscle



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#### **Incomplete junctions**

Persistent hymen

Bands





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#### Sampling of female reproductive system

What to sample Fixatives and handling



#### Sampling

- Sample
  - All anatomical locations
  - All lesions
- Routine fixatives are just fine















# What is next!

#### Female Genital Pathology

