

A Fowl Lecture: Chickens, Pigeons and other Birds





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Species?
Significance of this species?



<http://www.genome.gov/11510730>, photo by Bill Payne, Michigan State, Lansing

Which group listed below have the highest basal metabolic rate of all vertebrates, which is 50-60% higher than other birds of the same body size?

- a) Galliformes 
- b) Anseriformes 
- c) Columbiformes 
- d) Passeriformes 

From: B. O'Malley Clinical Anatomy and Physiology of Exotic Species, Elsevier/Saunders, New York 2005, page 57

Learning from Bird Brains: How the Study of Songbird Brains Revolutionized Neuroscience "Harding, CF Lab Animal 33(5): 28-33, 2004

- Hormonal control of singing behavior-resulted in how hormones modulate brain function and behavior
- Sexual dimorphism in brain anatomy
- Adult neurogenesis discovered first with songbirds and led researchers to other species, including humans



Pigeons/Doves

Plexus venosus intracutaneous collaris

- Large vascular plexus of vessels
- back of neck
- both sexes, larger in male
- dilate to dissipate heat
- Be careful about injecting into this complex -can hemorrhage out



<http://www.avianmedicine.net/ampa/44.pdf>

Pigeons/Doves

Crop milk

Which sex produces it?



What hormone stimulates it?

- This is a normal chicken
- Commonly used Strains in Research:



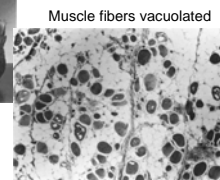
- What does OS stand for?
- What is the background breed of the OS?



- What disease is studied using the OS strain?
- What are some lab animals used to study this or similar disease?



Am J Pathol. 1973 February; 70(2): 273-276



Muscular Dystrophy in Chickens



"Expression of exogenous protein in the egg white of transgenic chickens" Alex J. Harvey, et al *Nature Biotechnology* 2002

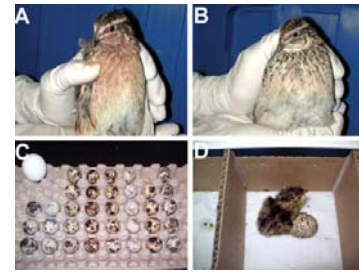
"Progress Toward the Culture and Transformation of Chicken Blastodermal Cells" Youliang Wang, et al *Stem Cells* 2006

Lack of Efficacy of Injectable Ketamine with Xylazine or Diazepam for Anesthesia in Chickens
Varner, et al *Lab Animal* 33(5): 36-39, 2004

- Measured toe pinch response
- Compared:
 - Ketamine: Xylazine (20mg/kg and 2mg/kg IM)
 - Ketamine: Diazepam (20mg/kg and 2mg/kg IM)
 - Isoflurane
- Only isoflurane obliterated toe pinch but reported ketamine dose in chickens goes up to 50mg/kg

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What is the common name of this species?

Which is the female-A or B?

Japanese Quail

- To what order do they belong?
- What is the genus and species?
- What disease is studied using these birds?



View of Syrinx

- What 3 other avian species have been most widely used for atherosclerosis research?



Japanese Quail uses:

- Operant conditioning
- Study of microgravity on embryonic development
- Regenerate the mechanosensory hair cells in their auditory and vestibular sensory organs after damage

<http://cshprotocols.cshlp.org/cgi/content/full/2009/1/pdb.emo112?print=true#R3>

Japanese Quail: An Efficient Animal Model for the Production of Transgenic Avians

Greg Poynter, David Huss, and Rusty Lansford¹ Division of Biology and the Biological Imaging Center, Beckman Institute, California Institute of Technology, Pasadena, CA 91125, USA in *Emerging Model Organisms: A Laboratory Manual*, Vol. 1. CSHL Press, Cold Spring Harbor, NY, USA, 2009.



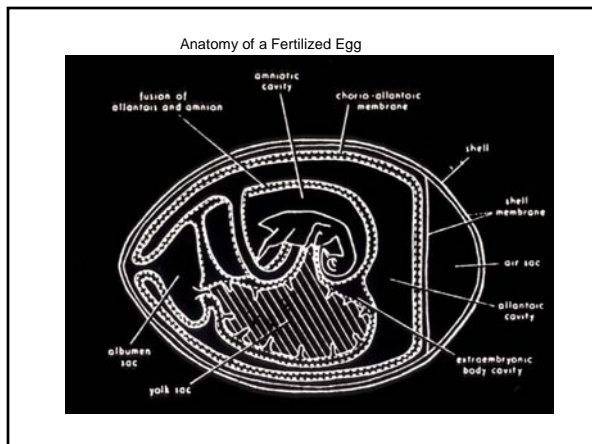
Guide Floor Space

Species	Floor space (ft ²)
Pigeon	0.8
Quail	0.25
Chickens <.25kg	0.25
Chickens 0.25-0.5kg	0.50
Chickens 0.5-1.5 kg	1.00
Chickens 1.5-3 kg	2.00
Chickens > 3 kg	>3.00

Name the structures seen in this picture of tissue taken from a chicken.

Line Drawing of a Bird

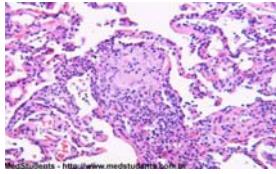
- Which ovary has developed?



Which species shown is **RESISTANT** to atherosclerosis?

Common name?

Scientific name?



What is the cause of Pigeon Breeder's Disease in Humans?

What type of pigeon is this?

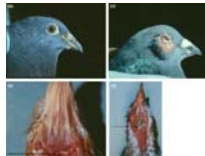
Unique to the pigeon model, atherosclerosis develops first in what highly predictable site in the aorta?

What virus induces atherosclerosis in pigeons?



Pigeon Herpes Virus

- PHV1, Columbid Herpes Virus 1
- Enveloped DNA virus
- Acute: rhinitis, conjunctivitis
- Chronic: pseudomembranous necrosis, encephalitis, sinusitis



D. Marlier, and H. Vindevogel *The Veterinary Journal* Volume 172, Issue 1, July 2006, Pages 40-51

- What reportable viral disease is carried by pigeons that can cause diarrhea and visceral hemorrhage or neurological signs?
- What is the virus family?
- What is the genus?



New Castle disease (NCD). Swelling of the lower eyelid and conjunctivitis



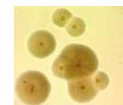
NCD. Acute form: Hemorrhage in the mucosa of the trachea (upper), large intestine, (middle), proventriculus (bottom) and gizzard.

<http://www.fao.org/docrep/003/t0756e/T0756E08.htm>

Etiologic Diagnosis?



Conjunctivitis

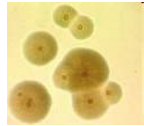


Culture



Pulmonary lesions

Most likely etiologic agent?



Chlamydophila (Chlamydia)

- Pigeons
 - C. psittaci-obligate intracellular parasite
 - Ruffled feathers, diarrhea, conjunctivitis
- Turkeys
 - Severe chronic caseous pericarditis and epicarditis



One of four



Dry crusty lesions



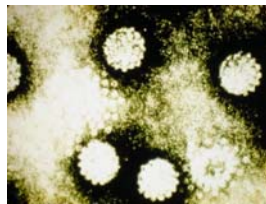
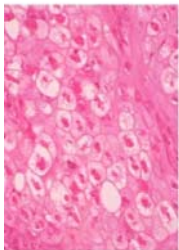
Caseous lesions

Two forms of one disease

Two of four slides



Three of four slides



Four of four slides

What is the disease shown in the previous four slides?

What is the method of microscopy shown in this slide?



Slide one of two

This chicken has matted feathers and thick scabby skin.

Upon close examination, multiple small gray or black discolorations are seen on the feathers



Slide two of two

Microscopic examination reveals the parasite shown here.

What is the genus and species of this mite?



Dermanyssus gallinae
red mite of chickens
feeds at night



Pigeon

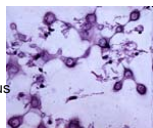
What fungus is common in the upper GI tract, associated with pseudomembranous inflammation of the mouth termed "thrush"?



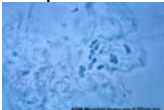
Zoonotic Fungal Agents

- *Cryptococcus neoformans*

cryptococcus



- *Histoplasma capsulatum*



- Aspergillosis

Air sacculitis in barn owl caused by *Aspergillus*
<http://www.ivis.org/advances/Kearns/kearns2/ivis.pdf>



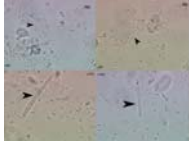
Tracheal / Lung Lavage

- A sterile catheter is inserted through the glottis into the trachea to the point just cranial to the syrinx. Sterile saline is introduced (0.5 - 1.0ml per kg bodyweight) and immediately aspirated.
- The cytology of normal tracheal or air sac lavage has a low cellular content with few pulmonary macrophages or inflammatory cells.

<http://cheval.vet.gla.ac.uk/vetscape/vet-x/redrobe/index.htm>

Crop Wash

- Restrain or anesthetized
- Pass soft plastic or rubber feeding tube into crop
- Palpate crop to confirm placement
- Infuse 10-20 ml/kg warm sterile solution-massage to increase cellular recovery and then aspirate



Crop wet mount:
yeast at arrows

Blood collection

- Blood volume about 10% body weight and take 10% safely
- Sites:
 - Wing vein (basilic)
 - Cardiac
 - Foot web
 - Jugular
 - Medial Metatarsal
 - Skin puncture, toenail clip

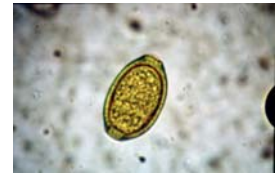
Tetrameres americana

- Nematode
- Female—is blood red in color and lies embedded in the proventriculus
- Male is free in the lumen, four rows of cuticular spines



Egg found in fecal material from a Chicken

- The common name for the worm that deposits this egg is the Crop worm
- What is the Genus of this worm?



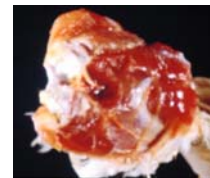
This was found on a pigeon

- What is it?
- What is the common name?
- What is the genus and species?



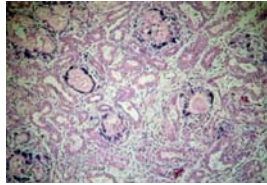
One of two slides

- Gross of a joint from a chicken



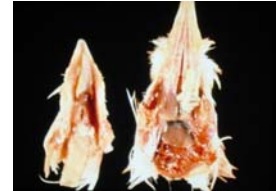
Two of two slides

- Histopathology from animal whose joint was shown in previous slide.
- What tissue is shown in this slide?
- What is the condition?



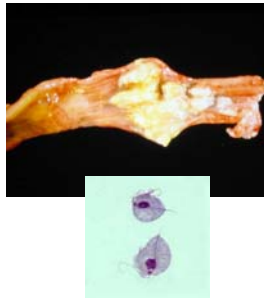
One of two slides

- Oral cavity of a pigeon



Two of two slides

- Esophagus of same animal from previous slide.
- Shows caseous nodules and ulceration.
- What is the etiologic diagnosis?



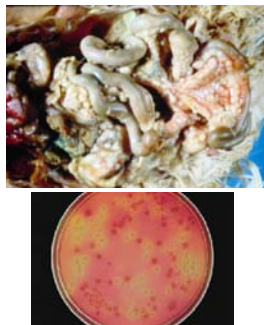
One of two slides

- Emaciated chicken

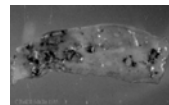


Two of two slides

- Peritoneal cavity of animal from previous slide
- Multifocal granulomatous peritonitis
- What is the cause of this condition?



Ulcerative Enteritis/Quail disease



Acute, highly contagious disease of chickens and quail
 Caused by the bacterium *Clostridium colinum*
 Ulcers of the intestines and caecae.
 High mortality: 100% in quail and 10% in chickens.
 Turkeys, game birds and pigeons may also be affected.
 Fecal-oral transmission
 Predisposing factors include Coccidiosis (especially *E. necatrix*, *E. tenella*, and *E. brunetti*) and overcrowding.

What is the avian genus and species depicted in this picture?

This species develop what specific lesion in association with naturally occurring atherosclerosis?



Turkey

What is the common name for this condition?

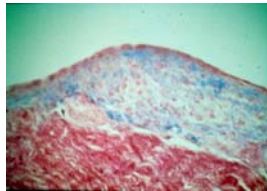
What protein is lacking?

What is it a model for?



Turkey

- What dietary additive induces dilated cardiomyopathy in turkeys?



- Name the Genus and species

- Name a virus commonly studied in this species.



- Duck plague

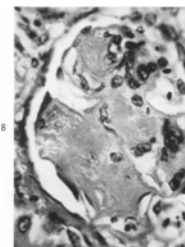
- Duck viral enteritis
- Herpes virus
- Ducks, geese, swans
- 3-7 day incubation
- Death, diarrhea, bloody beak due to ulceration of oral cavity
- Ducks, geese, swan



http://www.nwhc.usgs.gov/publications/field_manual/chapter_16.pdf



liver



glomerulus

Amyloidosis in Pekin Duck

Am J Pathol. 1961 September; 39(3): 369-378

Chicken-What is the Disease?

Lesion was also seen in the bursa
Mature birds are more affected than young birds
Seen in females more than males



- What is the term for the condition shown here?
- What is the disease?



Differential diagnosis between lymphoid leucosis and Marek's disease

Feature	Lymphoid leucosis	Marek's diseases
Age of onset	16 weeks	4-6 weeks or older
Neuro signs	Absent	Frequently paralysis or paresis
Gross Lesions		
Peripheral nerve enlargement	Absent	Usually present
Bursa of Fabricius	Nodular tumours	Diffuse enlargement or atrophy
Cytology	Uniform Lympho blasts	Pleomorphic lymphs

Avian Influenza

- Fowl plague
- H5N7



What is the procedure depicted in this slide?



Animal Models of Human Disease

species	animal disease	human disease	Model No
Turkey	Round heart disease	Alpha1 antitrypsin deficiency	112
Chicken	Thyroiditis-OS chicken	Hashimoto thyroiditis	49
Chicken	Muscular dystrophy	Muscular dystrophy	22
Pekin duck			337
Pekin duck	Amyloidosis	Amyloidosis	174
Chicken	Atherosclerosis induced by Marek's disease	Atherosclerosis	338
Chicken	Scoliosis	Scoliosis in children	333
Chicken	Scleroderma	Scleroderma	323
Pekin duck	Torticollis	Torticollis	314

- <http://partnersah.vet.cornell.edu/avian-atlas/>
- <http://www.fao.org/docrep/003/t0756e/T0756E08.htm>