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Anastasia was awarded the Diploma of Veterinary Medicine from the Aristotle University of Thessaloniki in 2001. In the same year, she became a member of the Royal College of Veterinary Surgeons and worked as an Official Veterinary Surgeon in England for three years.

In 2004, Anastasia joined the Veterinary Service of the Department of Agriculture and Rural Development (DARD) in Northern Ireland, and in 2006 completed her MSc in Veterinary Epidemiology and Public Health with merit. In August 2011, she took over the post of Education and Training Veterinary Officer at DARD's Greenmount College.

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A review of the gross anatomy of the chicken

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ABSTRACT: This article outlines the most important features of the skin, head and internal organs of a chicken. They are illustrated with photographs and references to nursing considerations. Feathers and the skeletal system are not discussed.

The skin is thin and inelastic, and it is attached loosely to underlying muscles. The epidermis of the tarsometatarsals and digits is thick and keratinised to form scales. The plantar area of feet is padded and the distal phalanges end as claws.

In males, a keratinised projection is visible at the tarsometatarsal region. This is the spur. It grows with age; although in females it is very small or may be absent.

The uropygial gland is located at the dorsal area of the base of the tail. It is also called the preen gland or 'nipple' colloquially. The uropygial gland has a left and right lobe with one opening each.

The base of the gland excretes a thick and fatty secretion **(Figure 1)**. This secretion is sebum. The uropygial gland is the main sebaceous gland of chickens.

Figure 1. Sebaceous secretion of the uropygial gland

Head

On the top of the head is the comb – a long, fleshy structure resembling a hair comb. It is located on the midline of the cranium extending from the caudal end of the upper beak to the middle of the cranium. It consists of a blade and points. It develops with sexual maturity.

Attached to the skin of the ventral area of the mandible is a pair of fleshy structures called wattles. These are oval and they hang down on either side of the mandible caudal to the lower beak. Male adult birds have larger combs and wattles than females and immature individuals.

The eyes of chickens are protected by an upper, a lower and a third eyelid. The third eyelid is also called the nictitating membrane. Each eye is located inside an orbit of the cranium.

The ears are on the lateral surface of the head, caudo-ventral to the eyes **(Figure 2)**. They are covered by a few small specialized feathers. Chickens don't have a pinna. An ear lobe is observed ventral to the ear.

The nostrils are located on either side of the caudal area of the upper beak. The nasal openings correspond to the nasal aperture of the maxilla.

The beak consists of the upper and lower part. The bone of the upper beak is called premaxilla and that of the lower beak, dentary. The premaxilla and dentary are covered by a horny sheath – the ramphotheca. Birds have no teeth.

Figure 2. Covert feathers cover the opening of the external ear

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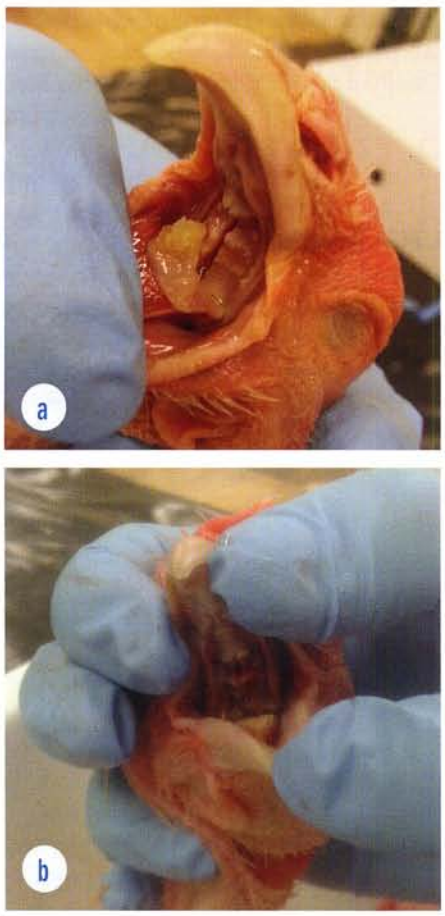

Figure 3. (a) The thick horny layer of the tongue is detached and reflected. The choana is visible on the roof of the mouth; (b) on the floor of the mouth is the tongue

On the roof of the mouth is a slit called the choana **(Figure 3a)**. The choana communicates with the nostrils. Caudal to the choana is a second smaller slit. This opening connects to the middle ears through the auditory tubes. It is called the infundibular cleft.

On the floor of the mouth is the tongue **(Figure 3b)**. The tongue of birds contains a small bone. Caudal to the tongue is another slit aperture called the glottis. The glottis is the opening to the trachea.

NURSING CONSIDERATION:
The glottis is where the endotracheal tube is inserted in a sedated bird.

When the mouth is closed, the choana fits perfectly around the glottis directing air from the nostrils to the trachea. Birds have no epiglottis.

Neck

The trachea (windpipe) of the chicken runs along the right side of the neck next to the oesophagus. The trachea is made of complete cartilaginous rings of a diameter of 2-4 mm **(Figure 4)**.

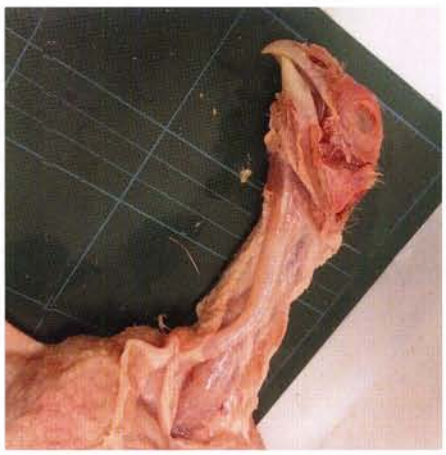

Figure 4. Trachea and crop

The oesophagus is a wider pipe with a fine muscular wall and, when empty, it lies flat. The jugular veins run along the left and right sides of the neck.

The cervical vertebrae are numerous – often about 20 – and can be palpated under the skeletal muscles.

At the base of the neck – and just outside the body cavity – lies the crop. The crop is an out-pouching of the oesophagus **(Figure 4)**.

NURSING CONSIDERATION:
Anorectic birds can be fed with a tube. The tube passes over the tongue and into the oesophagus. The feeding tube can be palpated at the level of the crop to ensure correct placement.

Breast

The superficial muscles of the breast are called pectorals **(Figure 5)**. There is a left and a right one. Underneath each pectoral muscle lies a supracoracoidal muscle.

NURSING CONSIDERATION:
The pectorals are the muscles of choice for intramuscular injections.

Figure 5. Pectoral muscles

Figure 6. Liver and peritoneal membranes attached to internal organs. Parts of these membranes are fused with air sac membranes

The sternum is the bone of the breast. The ventral midline process of the sternum is called the keel. This is where the breast muscles attach. In young chickens, there is cartilage at the midline and at the caudal and lateral edges of the sternum.

Coelum

Birds have only one cavity which is called the coelum. There is no diaphragm.

The heart is in the cranial area of the cavity. The liver is a large deep brown organ and surrounds the heart. It has a right and left lobe. The loops of the small and large intestines can be seen caudal to the liver **(Figure 6)**.

Internal organs are held in place within the body cavity by peritoneal membranes. Some areas of these membranes are fused to air sac membranes, forming parts of their walls **(Figure 6)**.

The gall bladder is a green sac. The spleen is a dark purple globular organ of the lymphatic system. Underneath the heart and cranial part of liver lies the

Figure 7. Bifurcation of the trachea and syrinx

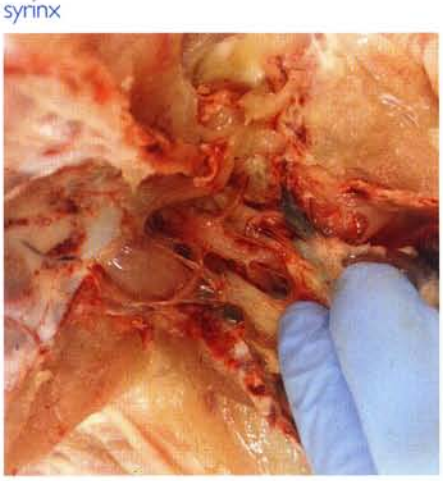

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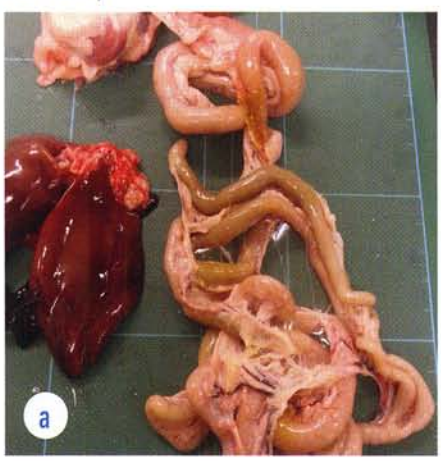
Figure 8. Liver, abdominal fat, duodenum and pancreas

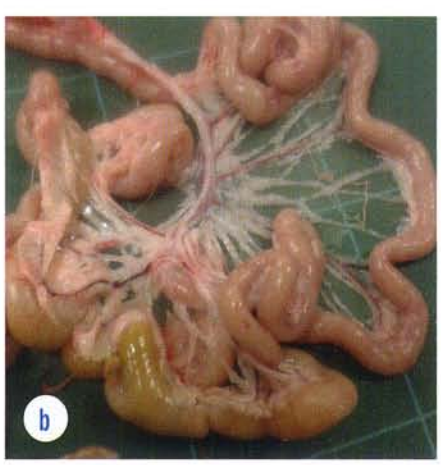
bifurcation of the trachea. The syrinx is the structure directly cranial to the primary bronchi (**Figure 7**). The syrinx is the organ of vocalization in birds.

The pancreas is a cream coloured, elongated gland attached to the first loop of the duodenum (**Figure 8**). It resembles fat tissue in its appearance.

The digestive tract consists of the oesophagus, crop, proventriculus, ventriculus (gizzard), duodenum, jejunum, ileum, caeca and rectum (**Figure**

Figure 9. (a) Proventriculus, gizzard, loops of small intestine, caeca; (b) the loops of intestines are spread open to show the mesentery





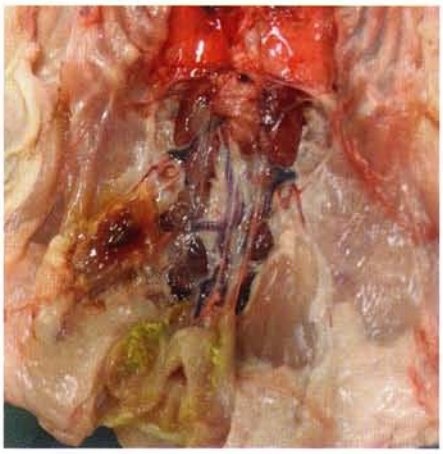


Figure 10. Lungs, kidneys and cloaca. Content from the rectum enters the cloaca. The folds that define the compartments of the cloaca can be seen

9a). The proventriculus is known as the glandular stomach. The ventriculus or gizzard is known as the muscular stomach

The loops of the small intestine are held curled up by the mesentery (**Figure 9b**). This is a very fine, mostly transparent, membrane. Chickens have a relatively long small intestine.

At the end of the small intestine, we find the caeca which are a pair of blind-ended long tubes (**Figure 9a**). The caeca are part of the large intestine and are well developed in chicken. Their content is dark green and 'pasty'. The rest of the large intestine comprises the rectum, which is very short.

Caudal to the rectum is the cloaca which is the common terminal area of the digestive, urinary and reproductive systems. The cloaca is made of three parts: the coprodeum, the urodeum and the proctodeum. The coprodeum is a direct continuation of the large intestine (**Figure 10**).

The urodeum is the middle compartment and it is separated from the other two by mucosal folds. The left and right ureters and the right oviduct are connected to the urodeum.

The proctodeum is the last part of the cloaca. The bursa of Fabricius (or cloacal bursa) is a lymphatic organ that opens to the proctodeum. The opening of the cloaca to the external environment is called the vent.

NURSING CONSIDERATION:
In live birds, a cloacal swab can be taken for examination. A moistened swab is rubbed on the mucosa of the cloaca.

Figure 11. Lungs, testes, kidneys (male)

Figure 12. Lungs, left ovary, kidneys (female)

The lungs are tightly attached and 'embedded' in the ribs. They are small relative to the body of the bird, dark pink and rigid.

NURSING CONSIDERATION:
Live birds must be held gently to allow breathing movements.

In male broiler chickens, the testes are two bean-shaped, cream organs a few millimetres long. They lie inside the coelum, ventral to the last thoracic vertebra and close to the vertebral column (**Figure 11**).

In the female, the ovaries are located at the same place. Hens have only one functional ovary – the left one. The right ovary is vestigial. In a non-breeding female chicken, the left ovary is only a few millimetres long (**Figure 12**).

Testes and ovaries increase in size significantly during sexual activity.

The kidneys are lobular. There is a right and left kidney. Each one has three or four lobes (**Figure 12**). The kidneys are embedded in the synsacrum which is the bone of the vertebral column caudal

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to the thoracic vertebrae. Birds have no bladder to store urine and there is no urethra either.

Acknowledgments

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Suggested reading

ASPINAL, V. (2011). *The Complete Textbook of Veterinary Nursing* (2nd ed.). (V. Aspinal, Ed.) London: Saunders Elsevier Ltd.

BREMMER, A., & JOHNSTON, M. (2002). *Poultry Meat Hygiene and Inspection* (2nd ed.). London: WB Saunders Company Ltd.

DORRESTEIN, G. M. (2010). Anatomy of Birds. In K. Dyce, W. Sack, & C. Wensing, *Textbook of Veterinary Anatomy* (pp. 784-813). St. Louis: Saunders Elsevier Ltd.

JACKOWIAK, H. & GODYNICKI, S. (2005). Light and scanning electron microscopic study of the tongue in the white tailed eagle. *Annals of Anatomy - Anatomischer Anzeiger* **187**(3): 251-259.

MCLELLAND, J. (1990). *A colour atlas of avian anatomy*. Aylesbury: Wolfe Publishing Ltd.

MCLELLAND, J. & KING, A. (1984). *Birds, their Structure and Function*. London: Balliere Tindall.

MCLELLAND, J. & KING, A. (1975). *Outlines of Avian Anatomy*. London: Bailliere Tindall.

STETTENHEIM, P. R. (2000). The Integumentary Morphology of Modern Birds – An overview. *American Zoology* **40**: 461-467.

Multiple Choice Questions

Which one of the following statements is false?

a. chickens have no urinary bladder

b. chickens have no urethra

c. chickens have no glottis.

When air is breathed into the bird's body, it is passing through the structures of:

a. nostrils, choana, epiglottis, glottis, trachea, lungs

b. nostrils, choana, glottis, trachea, lungs

c. nostrils, epiglottis, infundibulum, glottis, trachea, lungs.

Which of the following statements is correct?

a. The lungs of a bird are suspended in the coelomic cavity.

b. The lungs of a bird are spongy and fill most of the coelomic cavity.

c. The lungs of the bird are rigid and embedded in the ribs.

The cloaca is:

a. the end section of the digestive, urinary and reproduction systems

b. the last section of the small intestine

c. a common structure of the urogenital, respiratory and intestinal tracts.

Answers can be found on the inside back cover

NEWS REVIEW by Jean Turner

Novel therapy launched for canine pruritus

Zoetis has launched Apoquel (oclacitinib maleate), which is indicated for the treatment of pruritus associated with canine allergic dermatitis and the clinical manifestations of atopic dermatitis.

The firm says this is the first Janus Kinase (JAK) inhibitor approved for veterinary use and that it provides rapid and sustained relief of pruritus and improves skin lesions.

Canine pruritus affects about one in six dogs whose owners seek veterinary help and it would appear that about half of all itchy dogs may have an underlying allergic skin condition for which the product could be indicated.

The company claims that Apoquel has an innovative mode of action in that it targets specific pathways of pruritus and inflammation, which makes it different to glucocorticoids. It is, therefore, less likely to cause unwanted side-effects and also acts rapidly (demonstrating anti-pruritic efficacy within four hours) to reduce the itching.

In clinical trials, says the firm, the product demonstrated a good safety profile and efficacy for the treatment of pruritus caused by a number of allergic skin diseases, as well as atopic dermatitis – whether treated over either the short or long term.

It was reported that the decrease in itch scores was observed by pet owners within 24 hours of administration, and pruritus continued to decrease compared to baseline until the end of the study. Skin lesions scores assessed by veterinarians were significantly improved after one week and continued to improve long term during the studies (four months).

For more information, visit www.zoetis.com/news-media

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MyPetonline to be headline sponsor

MSD Animal Health's consumer website, MyPetonline, is to be the headline sponsor of the London Pet Show between 17-18 May.

London Pet Show, 2013

Launched at the BSAVA Congress last year, MyPetonline is a pet owner website aimed at supporting the company's veterinary customers by forging new links between pets, their owners and their vets.

Elizabeth Peplow, editor of MyPetOnline, said: "The London Pet Show and MyPetonline share the same goal in bringing pet owners, animal lovers and families together to enjoy the amazing world of pets."

And Amanda Melvin, website publisher added: "We are also delighted to announce that TV presenter and MyPetonline blogger, Chris Packham, will be joining us at the show as our guest to meet readers and talk about life with his two famous poodles, Itchy and Scratchy.

"We are also looking forward to introducing two of our other writers – TV presenters Louise Harris and Matt Brash – to visitors."

To sign up and find out more, go to www.mypetonline.co.uk or follow the mypetonline team on twitter @ mypetonline

Chris Packham with Itchy and Scratchy

Got An Itch That Needs Scratching - Pathophysiology Of The Puritic Dog
Booking Ref: R19-05/03/14

Wednesday 5 March 2014 | 7.00pm

Speaker: Hannah Newbury BVSc GPCert (DI) MRCVS

Wheatley Park School, Holton, Oxford OX33 1QH

Jo Brett RVN MBVNA, Tel: 07754 516161,
Email: jo_brett66@hotmail.com

First Opinion Emergency Anaesthesia | Booking Ref: R6A-11/03/14

Tuesday 11 March 2014 | 7.00pm

Speaker: Sam Bell BSc DipHE CVN AVN RVN

Abbeydale Vetlink Veterinary Training, Wyastone Business Park, Wyastone Leys, Monmouth NP25 3SX

Kirsty Gwynne RVN MBVNA, Tel: 01600 892682,
Email: kirsty.gwynne@abbeydale-vetlink.org

Are You Parvo Alert? Diagnosis & Management Of This Distressing Disease
Booking Ref: R18-12/03/13

Wednesday 12 March 2014 | 7.00pm

Speaker: Catriona Curtis BVM&S MRCVS

Conwy Lounge, Conwy Leisure Centre, Eirias Park, Colwyn Bay LL29 7SP

Laura Lacey RVN MBVNA, Tel: 07801 930033,
Email: llacey@hotmail.co.uk

Are You Parvo Alert? Diagnosis & Management of this Distressing Disease
Booking Ref: R15-13/03/14

Thursday 13 March 2014 | 7.00pm

Speaker: Catriona Curtis BVM&S MRCVS

Sweeney Hall Hotel, Oswestry, Shropshire SY10 9EU

Emma Gerrard DipAVN(SA) RVN MBVNA, Tel: 07814 617491,
Email: emmagerrarduk@yahoo.co.uk

'Snots & Squits' - Feline Infectious Diseases | Booking Ref: R6B-13/03/13

Thursday 13 March 2014 | 7.00pm

Speaker: Alex R Allen BVM&S MRCVS

Carmarthen Vet Centre, Llysonnen Road, Llanllwch, Carmarthen SA31 3SA

Pippa Steans RVN MBVNA, Tel: 07800 802734,
Email: pippasteansrvn@hotmail.co.uk

Help! My Cat Is Weeing In The House; an introduction to normal feline behaviour and common behavioural problems | Booking Ref: R7-18/03/14

Tuesday 18 March 2014 |7.30pm

Speaker: Emma Aitken AVN(small animal) Dip HE CVN RVN

The Animal Management Centre, Cannington Centre for Land-based studies, Rodway Hill, Cannington, Bridgwater TA5 2LS

Kate King RVN MBVNA, Tel: 07532 099397,
Email: katieking@hotmail.co.uk

The Role of the VN in Nursing Clinics & Preventative Veterinary Healthcare
Booking Ref: R20-27/03/14

Thursday 27 March 2014 | 7.00pm

Speaker: Joy Howell DipAVN(Surg) RVN HonMBVNA

Holiday Inn, London Road, Ipswich IP2 0UA

Lindsey Raven RVN MBVNA, Tel: 07974 005441,
Email: lindsraven@yahoo.co.uk

Answers: 1c, 2b, 3c & 4a