Budgerigar Health And Related

Avian Biology 101

Introduction
Well it has been over a year since I first proposed to write about avian anatomy and physiology here on this board. Now that I am in my third year of study to be a veterinarian, I believe I have enough knowledge to write articles on birds from a medical and biological point of view.

I will try to keep this going as long as I can - I am aiming to write at least an article a week but this will vary. Articles may be long or short and will cover a broad spectrum of avian biology.

Feel free to discuss the topics and ask me questions – I will do my best to answer. I hope this is in the right section as it is about birds in general but I will refer specifically to budgies wherever I can.

So let’s begin – from the inside out.

The Avian Skeleton
Birds have special requirements for their skeletons. They need a structure that will provide support for their powerful wing muscles and withstand the stresses of flight, yet will not weigh them down in the air. A characteristic feature of the avian skeleton is the presence of **pneumatic** bones, particularly in bird species that fly extensively. These are bones that are semi-hollow with criss-crossing struts and filled by air sacs – so the respiratory system is directly connected to the skeletal system. Examples of pneumatic bones are the humerus, femur and pelvis. Beaks are also characteristic of birds, and these structures are much lighter than the hefty mammalian jaw with teeth. These features help lighten the bird while retaining significant strength and size of the bones. However, it is not without consequence - pneumatic bones are more brittle, so they fracture more easily. Due to its association with air sacs, sometimes pockets of air will form under the skin around a fracture site (**emphysema**).

Another difference in the bird skeleton to the mammalian skeleton is that there are ossifications (fusions) between many bones. In the spine they are grouped into notarium, synsacrum and pygostyle. The **notarium** is formed from the first 3-5 thoracic vertebrae, and helps provide rigidity in the back when a bird is flapping its wings. The **synsacrum** is formed from the lumbar and pelvic vertebrae, and helps absorb shock when landing. The **pygostyle** are the fused and flattened caudal vertebrae that support the tail. It is important to note that the vertebrae between notarium and synsacrum are not fused, presenting a point of weakness in the spine. This area is usually the site of trauma when a small bird is accidentally stepped on, leading to compression of the spinal cord and paralysis of the legs.

*Diagram of the bird skeleton: http://www.birdwatching-bliss.com/images/bird_skeleton.jpg
*Diagram of the fused bones: http://people.eku.edu/ritchisong/RITCHISO//birdskeleton5.gif

Flying birds have a very large carina (keel) of the sternum (breast bone), which is the site of attachment for their powerful pectoral (breast) muscles. The pectoral girdle has three components, akin to the reptiles (mammals have two). These are clavicle (collarbone), scapula (shoulder blade) and **coracoid**. The clavicles meet to form the **furcula** (wishbone) and helps withstand pressure when the bird flaps its wings. Each rib has a projection called an **uncinate process** which overlaps the rib behind it, to prevent the ribcage from collapsing when the bird is flapping.

The pelvic girdle is composed of synsacrum and fused bones of the pelvis. Like mammals, the pelvis is made of **ischium, ilium** and **pubis**. In birds the pubis part of the pelvis is open rather than forming a ring, assisting passage of a large egg. There is also considerable fusion in the bird’s forelimb and hindlimbs, forming **carpometacarpus, tibiotarsus** and **tarsometatarsus** (breaking down these names will give you the unfused bones in a mammal – carpus, metacarpus, tibia, tarsus, metatarsus). These fusions provide strength for feather attachments and wing/leg strength for flying, landing and takeoff.

*Bird skeleton demonstrating the fused bones:

http://academic.emporia.edu/sievertl/verstruc/birdbody2.JPG
*Cat skeleton for comparison: http://www.csd.net/~abyman/images/catskllg.jpg

In conclusion, birds have a highly adapted skeletal system for the stresses of flight. From head to tail they are designed for being in the air, takeoff and landing, tasks which involve incredible forces on the body. The avian skeleton is truly amazing in its high specialisation.

Further reading
Excellent site for diagrams, especially of the fused bones:
http://people.eku.edu/ritchisong/RITCHISO//skeleton.html
Good introductory site for each section: http://fsc.fernbank.edu/Birding/skeleton.htm
Veterinary information on avian orthopaedics: http://www.exoticpetvet.net/avian/orthopedic.html

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