

INTEGUMENT LABORATORY EXERCISES

General trends.

As you examine material from the different vertebrate groups, identify dermis, epidermis and the basement membrane zone. Identify as many epidermal and dermal cell types as you can; these include ordinary (unspecialized) epidermal cells (keratinocytes, in those vertebrates with a keratinized stratum corneum), specialized secretory and non-secretory cells and pigment cells. Compare the thickness of the epidermis and dermis in those slides where these elements are present; also note the differences in relative thickness of each layer in the different vertebrate groups. Compare and contrast keratinized and other hard integumental structures among the vertebrates.

FISH

CVH 100 Lamprey skin. Represents a so-called "primitive" condition without scales. Identify epidermal cell types: club cells (large, start out anchored to basal membrane then migrate apically as they mature), granule cells (round to ovoid cytoplasm, red granules), mucous cells (more numerous toward surface, have translucent mucus granules in cytoplasm), epidermal cells (best seen between club cells in deeper part of epidermis). How thick is the dermis relative to the epidermis? Can you find any pigment cells? Where are they located? Can you distinguish a dermal stratum spongiosum from stratum compactum? What is deep to the dermis?

CVH 77 Dogfish skin. Analyse this slide in the same way as for the lamprey slide. What shape are the epidermal cells in the stratum basale? What epidermal cell types can you identify? The contents of some cells may have been washed out by the process of aming the slide. There are well-developed stratum spongiosum and stratum compactum layers in the dermis. Where are the melanocytes located? Identify a placoid scale; what components make up this type of scale? These may not have erupted through the epidermis in your specimen. Can you tell how the scales are anchored into the skin? Compare these scales with the demonstration of placoid scales from another shark species.

CVH 61 Head of developing dogfish. You will find developing dermal denticles associated with the epithelium covering either the upper or lower jaw (cartilagenous structures) or both, on this slide. Immature placoid scales will be associated with the integument. These will likely not have erupted through the skin. What are the columnar cells external to the developing placoid scales?

CVH 57 Elasmobranch placoid scales. This slide is a whole-mount of elasmobranch skin, viewed en face. Note that only the central point of the scale emerges from the skin; the wide base of the scale remains anchored in the skin. These scales are responsible for the rough, abrasive surface of shark skin.

CVH 155 Flounder skin and CVH 105 Teleost skin (species unknown). Identify all layers of the integument on these slides. The epidermis can clearly be seen to fold over the dermal scales in at least one of these specimens. At high magnification, goblet cells with mucus granules may be seen in the epidermal surface layers. Can you see the remains of a coating of mucus on the surface? The microvilli of surface epidermal cells extend into the mucus coat. What are the functions of this coat? The scales are lamellar bone (of dermal origin) with a very thin coating of enamel of epidermal origin; in life the scales would be tightly attached to surrounding tissue. Can you identify subdermal adipose tissue? Do you see any melanocytes? Where are they located?

CVH 135 Fish scales. Examine teleost cycloid and ctenoid scales in this slide at low power. Can you see the layers of new bone laid down during growth of the animal? These layers make a pattern which can be used to age some species of fish.

AMPHIBIA

CVH 32 Frog skin. Your slide will have several sections taken from different areas of the body. Analyse the epidermis with respect to the cell types present. How many layers of the epidermis can you identify? What are the most prominent characteristics of the surface layer (s) of epidermal cells in this group? Can you identify Leydig cells? Examine the demonstration of Leydig cells in the Ambystoma slide for comparison. Observe the multicellular mucus glands in frog skin. What type of gland do these represent, and how would you describe their epithelium? What are the functions of the mucus these glands secrete? There may be capillaries visible in cross-section in the epidermis; since the epidermis, being a true epithelium is avascular, what surrounds the outside of such capillaries? What might be the function(s) of capillaries in the epidermis? Note the locations of melanocytes in this integument. What are the characteristics of the dermis?

CVH 31 Frog skin pigment cells, whole-mount. Note the morphology and locations of the melanocytes.

CVH 164 Toad leg skin. Identify histological features. The brown outer layer still attached to some areas of the epidermis is the remains of keratinized stratum corneum.

Demonstration: Ambystoma skin: compare with the other slides in this group.

REPTILES

CVH 108 Snake skin. Snakes shed the outer epidermal generation as a unit. Note epidermal scales; they may be separated from the underlying layers as an artifact of histological preparation. Can you differentiate the epidermal layers? Scales consist of relatively inflexible β -keratin; hinges between scales are made of α -keratin, a more flexible material. Also see demonstration of hinge area on the side bench. Describe the organization of the dermis. Are chromatophores present? Where are they located?

CVH 169 Alligator skin. This animal sheds its skin in patches. How does the organization of the integument differ from that of snakes?

BIRDS

CVH 112 Bird skin. This slide may be confusing at first because of the high density of feather follicles in the area sampled. In order to identify the layers of the epidermis, try to find areas away from follicles. How many epidermal layers can you identify? What is the structure of the dermis? Of a feather follicle? You will have to examine partial sections through a number of follicles to build up an understanding of the anatomy of this structure.

CVH 111 Feather types. There are at least two types of feather on this slide; some slides may have more. Identify these and look at the patterns of pigment granules in the rachis, barbs and barbules. Do you see any small hook-like projections from barbules? These help to lock the barbules of one barb to those of adjacent barbs for mechanical strength. See feather demonstration for anatomy of a feather and some further details about pigmentation.

Mammals.

HUM 216 Thick skin. With the aid of your text or atlas, review the epidermal layers and consider how this epidermis compares with that of other vertebrate groups. What functional considerations might dictate the differences in epidermal structure among the vertebrates? How does the mammalian dermis compare with that in other vertebrate groups? Note the dermal papillae. What is their purpose? Can you find any sweat glands? If present, their ducts will pass through the epidermis (including the stratum corneum) to the surface.

DEMO 146, 150, 158, 161 Hair samples from mammalian species. Compare the structures of these hair types, and the patterns of pigmentation in the cortex. The sloth hairs (161) have a greenish tinge because of the presence of an algal symbiont.