Serous Cutaneous Glands in Phyllobates bicolor (Anura: Dendrobatidae): An Ontogenetic, Ultrastructural Study on Secretory Product Biosynthesis and Maturation

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Secretory activity of serous (poison) cutaneous glands was studied with light and transmission electron microscopy over the ontogenetic cycle of the Black-legged Dart Frog Phyllobates bicolor.

Serous gland activity includes two steps: biosynthesis and maturation. Biosynthesis is performed by the rough endoplasmic reticulum, smooth endoplasmic reticulum, and Golgi apparatus, and follows the usual pathways of exocrine secretory processes. Maturation is typical of anuran serous glands, which accumulate their products in syncytial secretory units. Maturation involves merging processes between secretory deposits (vesicles and/or granules) distally from the Golgi stacks, as well as an increase in the surface area between the syncytial cytoplasm and the secretory vesicles/granules. In P. bicolor, this interface area increases through the formation of peculiar cytoplasmic outgrowths. These outgrowths allow transport processes involved in maturational changes of secretory product. During maturational storage, the secretory products of P. bicolor acquire a repeating substructure of spherical to short tubular subunits. This recurrent pattern is seen in cutaneous poisons of several anuran species, regardless of their phylogenetic relationships. Among anurans, condensing serous cutaneous products into repeating aggregations of subunits appears to be a successful strategy, which allows intracytoplasmic accumulation of pharmacologically active and/or toxic molecules through various post-Golgian processes. The present findings provide evidence of a novel repertory of cytological activities that stress the large diversity of the maturational pathways leading to the peculiar repeating arrangement of secretory subunits.