Ultrastructural study on host-guest relationships between anuran serous cutaneous glands and nematodes

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Abstract — We described guest nematodes in serous and lipid skin glands in two anuran species from the Old and New Worlds: *Rana camerani* and *Phyllomedusa hypochondrialis*, respectively. These glands are involved in three types of response: a) invaginations from the periluminal plasma membrane which accommodate the "round worms"; b) secretory release into such hosting chambers; c) migration of macrophages from the periglandular stroma to the secretory unit. There are no obvious signs suggesting the glands are harmed by the nematodes, nor are the latter affected by defence reactions, either secretory or cell-mediated, of their hosts. Nematodes are natural tracers which allow analysis of the inner space system (lumina as well as interstitia) in the glands. Furthermore, they provide the opportunity for functional characterisation of anuran serous glands under intrusion stress, revealing peculiar reactive traits, namely a pliable periluminal plasma membrane and inducible processes of secretory release.

Key words: Nematoda, *Phyllomedusa hypochondrialis*, *Rana camerani*, serous glands, skin, ultrastructure

INTRODUCTION

Cutaneous serous glands in amphibians represent a diffuse exocrine system pertaining to the adaptive organ set that accompanied the transition of vertebrates from an aquatic to terrestrial habitat (Toledo and Jared 1995). These glands are interface organs between body and external environment, and consist of an intra-epidermal duct, a sub-epidermal intercalary tract (or neck, the stem compartment) and an intra-dermal secretory unit, ensheathed by a contractile layer of smooth myocytes or myoepithelial cells (Delfino 1991). Anuran serous units have a peculiar syncytial structure that develops during secretory cytodifferentiation processes in pre-metamorphic tadpoles (Delfino *et al.* 1988). Serous syncytia display a centripetal polarisation with the nuclei arranged at the periphery while the secretory deposits occupy the inner region. Secretory product storage is intracytoplasmic, as anuran serous glands posses an exiguous lumen at the level of, or just below, the intercalary tract.

Under the light microscope (LM), discrete secretory cells (adenocytes), have sometimes been detected between the neck and secretory syncytium (Delfino *et al.* 1990; 1992). Transmission electron microscope (TEM) studies revealed that they derive from stem cells (adenoblasts) of the intercalary tract, that differentiate during gland development (Delfino *et al.* 1988, 1994) or post-discharge gland rehabilitation (Delfino 1980) and will merge into the common cytoplasmic bulk of the syncytial secretory unit. Further individual cells have been described under the TEM in resting glands, inserted within the interstitium between the secretory and contractile compartments (Delfino 1980; Delfino *et al.* 1990; 1992; 1998; 1999a; Nosi *et al.* 2002). Pioneering LM studies (Faraggiana 1938a; 1939), complemented by ultrastructural findings (Delfino 1980; Delfino *et al.* 1992), indicate these cells to be macrophages

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