Received: 19 January 2019 | Revised: 24 March 2019 | Accepted: 29 March 2019

DOI: 10.1002/jemt.23276

RESEARCH ARTICLE

MICROSCOPY RESEARCH & TECHNIQUE WILEY

Light and transmission electron microscopic structure of skin glands and dermal scales of a caecilian amphibian *Gegeneophis ramaswamii*, with a note on antimicrobial property of skin gland secretion

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Review Editor: George Perry

Funding information
Department of Biotechnology, Ministry of Science and Technology; Kerala State Council for Science, Technology and Environment; Science and Engineering Research Board

Abstract

Amphibian skin secretions contain a variety of bioactive compounds that are involved in diverse roles such as communication, homeostasis, defence against predators, pathogens, and so on. Especially, the caecilian amphibians possess numerous cutaneous glands that produce the secretory material, which facilitate survival in their harsh subterranean environment. Inspite of the fact that India has a fairly abundant distribution of caecilian amphibians, there has hardly been any study on their skin and its secretion. Herein, we describe, using light microscopy and electron microscopy, two types of dermal glands, mucous and granular, in *Gegeneophis ramaswamii*. The mucous glands are filled with mucous materials. The mucous-producing cells are located near the periphery. The granular glands are surrounded by myoepithelial cells. A large number of granules of different sizes are present in the lumen of the granular gland. The granule-producing cells are present near the myoepithelial lining of the gland. There are small flat disk-like dermal scales in pockets in the transverse ridges of the posterior region of the body. Each pocket contains 1–4 scales of various sizes. Scanning electron microscopic (SEM) study of the skin surface showed numerous funnel-shaped glandular openings. The antibacterial activity of the skin secretions was revealed in the test against *Escherichia coli*, *Klebsiella pneumoniae*, and *Aeromonas hydrophila*, all gram-negative bacteria. SEM analyses confirm the membrane damage in bacterial cells on exposure to skin secretions of *G. ramaswamii*.

KEYWORDS

antimicrobial, caecilian, cutaneous glands, dermal scales, *G. ramaswamii*

1 | INTRODUCTION

The order Gymnophiona, under the class Amphibia, includes the caecilian animals that are elongated, limbless, and subterranean (Fox, 1983). The caecilians evolved from an ancestral amphibian that was tailed and had four limbs. The animals underwent several adaptive transformations to suit fossorial life (Wake & Case, 1975). In view of the limited distribution along the rain-fed tropical regions and the fossorial life, caecilians are the least studied vertebrates (Gomes, Antoniazzi, Navas, Moreira, & Jared, 2012). Only 212 caecilian species are known, and are assigned to 10 families (www.amphibian web.org, March 8, 2019). Being a tropical country, India is home to diverse forms of caecilians (Taylor, 1968). Many of them are endemic to the Western Ghats (Daniels, 1992). Out of the 39 species of caecilians reported from India, 26 are

