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<b>Autor:</b>	Pagan, O. / Müller, M.
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Institute of animal pathology, University of Berne

## DISECDYSIS IN SNAKES: NON-INFECTIOUS AND INFECTIOUS AETIOPATHOGENESIS, WITH SPECIAL REFERENCE TO THE FIRST VIRAL DERMATITIS

O. Pagan, M. Müller

Disecdysis – disorder in skin shedding – is a world wide disease complex of reptiles in captivity. Little is known about the aetiopathogenesis in snakes; a summary will be given. Non-infectious: – environmental disorders; – nutrition deficiency; – trauma; – neoplasia. Infectious disecdysis: – bacterial; – fungal; – viral: a myxovirus-like dermatitis will be described for the first time.

Knowledge of physiological skin shedding (sloughing) is very important for successful dermatology of snakes. Healthy snakes shed the epidermis periodically during their life; complete as a tube, often only partially (Boidae). The shedding starts always at the lips. The sloughing cycle is divided in three periods: during the period of inactivity, the epidermis is composed of the stratum germinativum, the stratum intermedium, and the stratum corneum; the synchronized mitosis in the stratum germinativum during the period of renewal results in a inner and an outer epidermal generation; the actual sloughing period is characterized by a split in the stratum corneum of the inner epidermal generation and the stratum intermedium of the outer one; the consequence of proteolytic enzymes and a reptile-specific lymphatic fluid. Any abnormal function in one of the sloughing periods or destruction of the skin cause a partial or generalized disecdysis.

A non-infectious etiopathogenesis in disecdysis is very frequent: a) disorders in care: low relative humidity or inadequate bathing facilities (low elasticity of the skin), low temperature (low metabolic activity) as well as lack of a suitable substrate (no scrubbing facilities) are well known factors. b) Nutrition deficiency: disecdysis often arises during importation, transport and maladaptation in cachectic animals (low vitellogenin, a lipo-protein). Amino-acids and vitamins are essential for collagen and keratin metabolism. Spontaneous rupture of the skin in Boidae (neck, thorax) is considered a vitamin

C deficiency. c) Trauma: burns, usually from poorly protected heat sources, and bites by rodents (food) are common. Dermal fibrosis and cicatrice involve a disecdysis for life. d) Neoplasia: In a saw-scaled viper the dermis was infiltrated by a rhabdomyosarcoma (thoracal, dorsal) and superficial ulceration in a boa constrictor the giant cell sarcoma of the upper lip prevented the disengagement of the «old skin».

Primary or secondary infectious disecdysis: *Pseudomonas* and *aeromonas* were often isolated in exsudative, ulcerative pyodermitis («Scale rot» of snakes). Intra- and subcutaneous granulomas and abscesses are common. *Aspergillus* spp. and *Candida* spp. were isolated in generalized necrotizing dermatitis. The complex «maladaptation-unhygienic environment-dermatitis-disecdysis» is of great importance.

For the first time we observed virus associated skin lesions in snakes (boa constrictor 2, ball python 1, anaconda 1). Clinical signs were segmental massive disecdysis, multiple adhered outer epidermal layers and a thin inner epidermal generation. By handling, the skin had ruptured. Histologically, spongiosis, ballooning degeneration and basophilic cytoplasmic inclusions of different size in the stratum germinativum with little lymphocytic infiltrations suggested a viral infection. Ultrastructural examination revealed a large number of filamentous and spheroidal extracellular mature virus particles of 140 to 320 nm in diameter, which were enclosed in a cell membrane-derived envelope. Budding on the cell surface was very prominent. Cytoplasmic inclusions consisted of accumulated nucleocapsid strands (7–8 nm in width). The irregular shape was a typical sign for myxovirus. It is not yet proven that this myxovirus infection corresponds with the classical paramyxovirus which causes proliferative broncho-pneumonia in snakes.

Dep. Pathology, University of Bristol School, Bristol (United Kingdom)

## THE NOMENCLATURE OF *E. COLI*: A PROBLEM FOR THE PATHOLOGIST

G. R. Pearson, C. Wray, I. McLaren, E. F. Logan

Until relatively recently it was believed that *E. coli* in the neonatal calf did not produce microscopic changes in the small intestine (Fisher & Martinez, 1976; Moon, 1978). However it was recognised that certain strains of *E. coli* produce enterotoxins which result in fluid secretion to the intestinal lumen (Smith & Halls, 1967; Nagy et al., 1979). Thus the recognised strains of *E. coli* up to the late 1970's were known as enterotoxigenic *E. coli* or ETEC and were not thought to be associated with pathological changes. However, in 1978, Pearson et al. identified pathological changes in the distal small intestine of anaesthetised calves challenged with an enterotoxigenic strain of *E. coli*. These findings were later confirmed by Bellamy & Acres (1979) and Hadad & Gyles (1982). Thus it was shown that some

strains of enterotoxigenic *E. coli* were also enteropathogenic. These strains of *E. coli* were adherent to the mucosa but separated from the microvilli of the enterocytes by a gap of 200–300 nm when viewed in the transmission electron microscope (Pearson & Logan, 1982). In the USA, *E. coli* were found associated with the colonic mucosa of calves with naturally occurring diarrhoea. The mucosa with adherent bacteria had a characteristic ultrastructural appearance, and the associated bacteria were called «attaching and effacing» *E. coli* (AEEC) (Moon et al., 1979). They were intimately attached to the enterocyte surface by 'cup and pedestal' arrangements of the cell cytoplasm, and microvilli were effaced. Similar organisms were also identified in the United Kingdom (Hall et al., 1985). These became known as enteropathogenic *E. coli* (EPEC) from similar organisms