AACL BIOFLUX
Aquaculture, Aquarium, Conservation & Legislation
International Journal of the Bioflux Society

Particular disposal of muscular component in prostate of nutria (*Myocastor coypus*, Rodentia, Myocastoridae)

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Abstract. Prostate sampled from three nutria males was processed for histological examination. It was found that, unlike terrestrial mammals, the capsula and conjunctive trabeculae not contain smooth muscle cells, so they do not participate in the evacuation of the content from gland during ejaculation. Glandular tubes from prostate of nutria present own-developed muscularis, similar to the arteries media, which allows an evacuation of secretions from each tube in part, so that evacuation of the contents of nutria prostate during ejaculation is made under a greater pressure than in terrestrial mammals. This particular mode of evacuation of prostate secretions appears to be a functional adaptation due to the fact that the nutria male performs the sexual act also in water, where conditions are totally different from those on land.
Key Words: Nutria, prostate, muscular component.

Rezumat. Las pruebas biologicas de próstata tomadas de tres machos de nutria fueron procesadas para el examen histológico. Se ha encontrado que, a diferencia de los mamíferos terrestres, la cápsula y las trabécuos conjuntivas no contienen células musculares lisas, por lo que no participan en la evacuación del contenido de la glándula durante la eyaculación. Los tubos glandulares de la próstata de nutria presentan su propia musculatura, similar a la tunica media de las arterias. Esto permite una evacuación de las secreciones de cada tubo en parte, por lo que la evacuación de los contenidos de próstata de nutria durante la eyaculación se realiza bajo una presión mayor que en los mamíferos terrestres. La manera particular de evacuación de las secreciones de la próstata parece ser una adaptación funcional debido al hecho de que el macho de nutria realiza el acto sexual también en el agua, donde las condiciones son totalmente diferentes de los de tierra.
Key Words: Nutria, próstata, componente muscular.

Rezumat. Prostata recoltată de la trei masculi de nutrie a fost prelucrată pentru examen histologic. S-a constatat că, spre deosebire de mamiferele terestre, capsula şi trabeculii conjunctivi intertubulari, nu conţin celule musculare netede, deci nu participă la evacuarea conţinutului din glandă în momentul ejaculării. Tubii glandulari din prostata de nutrie prezintă musculară proprie, dezvoltată, asemănătoare cu media arterelor, ceea ce permite o evacuare a secreţiei din fiecare tub în parte, aşa încât evacuarea conţinutului din prostata de nutrie în momentul ejaculării se face cu presiune mai mare decât la mamiferele terestre. Acest mod particular de evacuare a secreţiei prostatei pare să fie o adaptare funcţională datorată faptului că masculul de nutrie efectuează actul sexual şi în apă, unde condiţiile sunt total diferite faţă de cele de pe uscat.
Key Words: Nutrie, prostată, componentă musculară.

Introduction. The nutria or coypu (*Myocastor coypus*, Molina, 1782) is a rodent native to South America that has been introduced almost worldwide since the early 1900's, originally with the intent of fur farming in many cases (Baroch & Hafner 2002). The nutria is a large (over 6 kg), semi-aquatic rodent with a voracious appetite and high

reproductive potential (Baroch & Hafner 2002). It lives in colonies and inhabits areas around streams water and lakes that have banks covered by a rich hydrophytic vegetation (Sirbu & Păstîrnac 1980; Ciudin & Marinescu 1996), in natural conditions in Brazil, Paraguay, Uruguay, Argentina and Chile. Form there, the species was introduced in various countries worldwide (North America, Europe, Africa and Asia), including to Romania, during the 70's (Popescu & Murariu 2001).

In literature there are detailed descriptions of anatomical components and physiology of male reproductive tract of nutria (Hillerman et al 1958; Weir 1974; Willner 1982; Kinler et al 1987). Male and female nutria exhibit many of the unusual anatomical and physiological characteristic of hystricomorph rodent reproduction (Gosling & Skinner 1984).

The compact prostate (well developed in the stallion and carnivore and absent in the ram and goat) is a discrete compound tubular gland with a thick fibromuscular capsule extending into the gland to form the supporting framework (Aughey & Frye 2001).

Informations concerning structural (histologic) aspect, although they exist, are not so numerous and so comprehensive that those anatomical. Most of these informations were obtained from studies performed in humans (Ross & Reith 1985; Raica et al 2004) or laboratory animals, the most accessible being rat and mouse (Aughey & Frye 2001). Because in the literature we found no structural informations about the prostate of nutria, we considered it appropriate to make investigations in this direction. We proposed to test whether the prostate of a mammal (nutria) that can perform sexual act both on land and in water (cold or warm), differs morphofunctional from those of other mammals. Moreover this histological study completes a set of other scientific papers on anatomical particularities of this species (see Miclăuș et al 2009ab).

Material and Method. Three prostate glands were collected from three nutria males, aged between 8 and 16 months. Overall appearance of the animals was good and no gross lesions were noticed during necropsy. All three individuals originated from a private farm from Mureş county, Romania. For histological examination, from each prostate gland we collected 4-5 mm thick slices. Each sample was fixed in Stieve mixture for 48 hours. After fixation, tissues were dehydrated in ethanol, cleared using butilic alcohol and embedded in paraffin blocks. Paraffin blocks were sectioned at 6 μm and stained with Goldner's trichromic stain for light microscopy.

Results and Discussion. As a general structure, the prostate of nutria is similar to other mammals, containing supportive tissue and glandular tissue. Supportive tissue is composed by capsule and intertubular connective tissue, but their composition differs in some respects compared to most mammals. In other mammals, capsule is thick or very thick and it is composed by collagen fibers and mixed smooth muscle cells, proportion of them being collagen type in the external half and in favor of muscle type in internal half (Raica et al 2004). In nutria, capsule is thiner compared to other mammals, with moderate density and very well vascularized by small-caliber vessels and with rich innervation, represented by vegetative micro-lymph nodes of different sizes and many nerve fibers.

A very particular aspect of the prostate of nutria is the lack of smooth muscle cells from capsule, which appears exclusively conjunctive. Intertubular connective tissue is very well represented in most mammals and contains smooth muscle cells (Raica et al 2004). Usually, in close proximity of tubes and glandular alveoli, smooth muscle cells are absent, only connective tissue being found (Adlersberg et al 1955). Exceptionally, conjunctive-muscular stroma surrounding prostatic glandular formations (Junqueira et al 1992). In nutria, intertubular connective tissue is reduced quantitatively and appears lax, very well vascularized and innervated (Plate 1). As in capsule, intertubular connective tissue from the prostate of nutria, it contains no smooth muscle cells.

If in the other mammals, glandular tissue is represented by the large tubular or alveolar formations (Diculescu et al 1971), simple or branched, in nutria only tubular formations oriented obliquely or longitudinally are found. On cross section, the glandular

tubes appear, mostly, cross sectioned or at most slightly obliquely, and in form, are oval or round (see Plate 2). Glandular tubes are very well individualized, net outlined with a very particular structure. They have a secretive epithelium with a single row of cells, whose height is very different from one formation to another, which shows that the secretive process is not in the same stage in all tubes. The central area of the wall of glandular tubes consists in smooth muscle cells arranged circular on multiple layers making a developed muscular tunic, similar somehow with the media of muscularis arteries. Muscular tunic is relatively thick in all glandular tubes (Plate 3), but there are differences from one tube to another. There are also situations in which muscular layer surround two neighbouring glandular tubes (Plate 4), and rarely even three. Over muscular tunic, a thin layer of connective tissue relatively lax is disposed, which continue without a division limit with delicate intertubular connective tissue.

The product of secretion of the prostate gland is stored in the lumen of tubuloalveolar formations, from where it is expelled during ejaculation by smooth muscle cells contraction from the capsule structure and interstitial connective tissue (Junqueira et al 1992). The absence of muscle cells from the capsule and interstitial connective tissue in the prostate of nutria, suggests that these components do not participate in the evacuation of the gland secretions, as in other mammalian species. If the gland should not contain muscle tissue, evacuation of the contents would probably be slow and continuous which would be totally inappropriate for a gland whose secretion product is used intermittent only during ejaculation. The prostate of nutria contains muscular tissue even very well represented, but here it has other location and arrangement. Each glandular tube presents a thick muscular tunic, which represents it's dynamic component, and by it's contraction the evacuation of secretions from the tube can be made quickly and under some pressure. Functionally, this aspect is very important, muscularis developed allowing rapid and efficient evacuation of secretions from each glandular tube. This makes that the elimination of the prostate secretion product during ejaculation to be different in nutria compared to other mammals. If in the other mammalian secretion product is eliminated by pressure exerted by contraction of smooth muscle of capsule and trabeculae, in nutria the presence of its own muscularis for each glandular tube, ensure a more efficient elimination of secretion. Moreover, this particular disposal of the muscularis may allow the elimination of secretion synchronized, from the whole gland, or on segments which may contain few tubes, or even separate contraction of each tube. Apocrine secretion is cyclical and secretive epithelium is in very different stages of the secretive process, from one tube to another, its own muscularis may only allow the elimination of secretion only from the tubes found at the end of the secretive cycle. Furthermore, this developed muscularis can make an elimination of secretion with a greater force compared to other mammals, after all probabilities in the form of jet. Elimination of the secretion in the form of jet with high pressure appears to be an adaptation to particular conditions in which nutria male can perform sexual act not only on land, but also in water, which sometimes can be quite cold.

Conclusions. The absence of smooth muscle cells from capsule and intertubular tissue, suggests that these components do not participate in the evacuation of the content from prostate gland of nutria, as happens in other mammals. In nutria, the secretory component is represented by the glandular tubes which present their own muscularis, with the aspect and disposal comparable to the media of arteries muscularis, aspect did not find in terrestrial mammals. Particular disposal of the muscular component in the prostate of nutria assure a more efficient evacuation of the secretion during ejaculation compared with other mammals, after all probabilities in the form of jet. Elimination of secretion from the prostate under high pressure seems to be a functional adaptation to particular conditions in which nutria male may perform sexual act, both on land and in hot or cold water.

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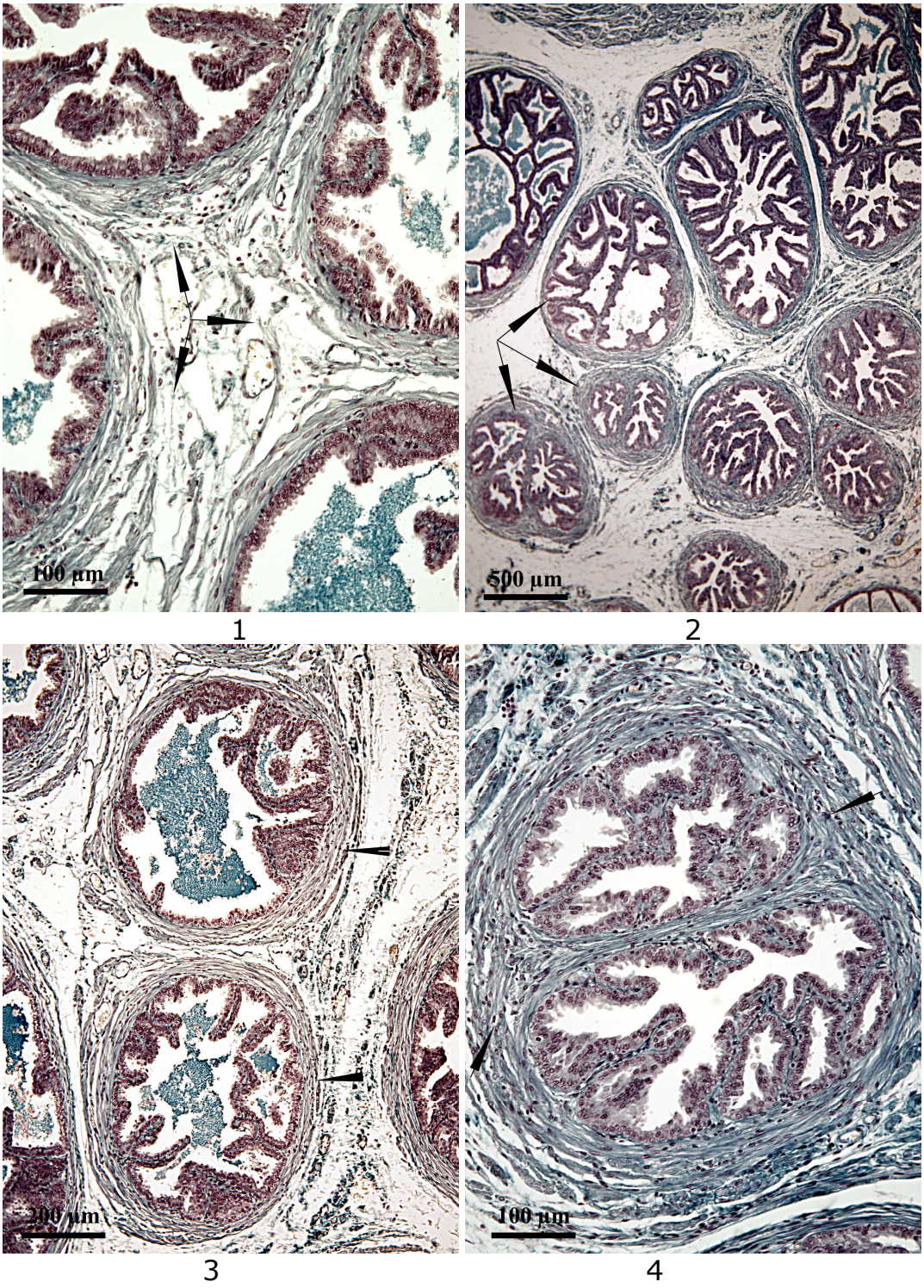

Plates: 1 - intertubular connectiv tissue; 2 - polimorphous glandular tubes; 3 - muscular tunic for each glandular tube; 4 - common muscular tunic for two neighbouring tubes (1,4 - Goldner's Trichrome stain, Ob 20X; 2 - Goldner's Trichrome stain, Ob 4X; 3 - Goldner's Trichrome stain).

Received: 03 April 2009. Accepted: 30 October 2009. Published online: 13 November 2009.
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How to cite this article:
Miclăuș V., Petrescu-Mag I. V., Mihalca A., Ober C. A., Rus V., 2009 Particular disposal of muscular component in prostate of nutria (*Myocastor coypus*, Rodentia, Myocastoridae). AACL Bioflux 2(4):401-406.
Printed version: ISSN 1844-8143
Online version: ISSN 1844-9166 available at: http://www.bioflux.com.ro/docs/2009.2.401-406.pdf