

Localisation of the Enzyme Activity of the Tissue Acid and Alkaline Phosphatases in the Prostatical Gland of Tomcat

R. Dimitrov, K. Stamatova

*Department of Veterinary Anatomy, Histology and Embryology,
Faculty of Veterinary Medicine, Trakia University, Stara Zagora, Bulgaria*

The acid and the alkaline phosphatases are hydrolitical enzymes whose abnormal tissue localization is indicator for prostatical pathology. Prostatical glands of seven sexually matured and healthy clinically tomcats were investigated. The animals were euthanised. Proving of the acid phosphatase by Gomori: we used frozen slices with thickness 10 μm , fixed in neutral formalin, they were put on objective slides. The slices were translocated in incubating medium and treated with Amonium sulfide, which stained them dark brown. They were included in glycerine-gelatine. Proving of the alkaline phosphatase by Gomori: the same frozen slices were transferred in incubating medium, treated with 2% cobaltous chlorate and translocated in Amonium sulfide till they get black colour. The most considerable localization of the tissue acidphosphatase activity was observed by a lightmicroscopical investigation in the apical parts of the prostatical epithelial cells, in the lumen of the glandular alveols, the basal membranes and the subcapsular zone of the gland. A remarkable expression of the tissue alkaline phosphatase in the normal prostatical gland of the tomcat was marked hystochemically in the basals parts of the epithelial cells, in the surrounding zones of the prostatical ductules, the perivascular regions and in the glandular capsule.

Key words: alkaline phosphatase, acid phosphatase, prostata, tomcat.

Introduction

The acid phosphatase is enzyme which catalyses in acid medium and is synthesized in the liver, the spleen, the bone marrow and in the prostatical gland. The high levels of this enzyme are indicators for prostaical pathology (cancer).

The alkaline phosphatase is also a hydrolitical enzyme, which is synthesized in the liver, the spleen, bones and in the placenta and presents normally in high levels in the growing bones and in the bile.

There are four izoenzymes of the acid phosphatase in the man. The lysosomal and the erythrocyte forms are widespread and are expressed in many cells, while the macrophagial and prostatical ones are with limited expression.

The changes of the activity of the tissue prostatical acidphosphatase are used like diagnostical and prognostical markers for the prostatical cancerogenesis [9].

There isn't any correlation between the activity of the acid phosphatase, the age of the specimen, the degree of the disease and of the prostatical cancer [3].

The isoenzymes of the acid phosphatase, in the prostatical gland of the man, vary in canceromatoses lesions, compared with the serum acid phosphatase, where it stays stable. These isoenzymes are present in the fetal and in the malignant prostate and are absent in the normal prostatical gland [11].

The ratio between the prostatespecific antigen and the prostatical acid phosphatase is a remarkable prognostic indicator about the prostatical cancerogenesis of the man [12].

There is a decreased tissue capacity of the producing of the acid phosphatase in many malignant prostatical lesions, compared with the normal glands [7].

A tissue acid phosphatase in benignant prostatical glands is distributed in the columnar epithelial secretory cells, compared with the basal ones, where it misses [15].

The prostatical acid phosphatase is a tissue specific enzyme, whose localization is in the epithelium of the tubuloalveolar parenchyma of the ventral prostatical gland of the rat [14].

The activity of the lysosomal acid phosphatase increases after castration which is proved by an enzymohistochemical observation, compared with the secretory one, which decreases after androgenical deprivation [13].

The acid phosphatase in the complex of Golgi in the prostatical gland of the rat is different from those in the lysosomes [8].

The epithelial cells with osteoinductive potential (transitional epithelium) show a high activity of alkaline phosphatase, while these without potential- a low expression of this enzyme. There isn't such enzymohistochemical differences with the activity of the acid phosphatase in these two kinds of cells [16].

The reduction of the level of the alkaline phosphatase, in the monitoring of the disseminated prostatical cancer, is a biochemical marker for a positive prognosis [10].

In the male genital organs of the dog is found that the activity of the alkaline phosphatase is highest in the epididymis, and lower in the testis and in the prostata. The result proves, that the biggest fraction of this enzyme is secreted by the epididymis and not by the prostata [5].

The vesiculous and the bulbourethral glands show a high expression of the alkaline and acid phosphatases in the epithelium, except the alkaline one, which is expressed only in the stroma of the bulbourethral glands. There isn't any phosphatase activity in the prostatical epithelium and in the fluid [6].

There is a different localization of the alkaline and the acid phosphatases in the male genital organs (rat, rabbit, guinea pig, cat and dog). The alkaline one is secretory, stromal, nuclear, and vascular, while the acid one is secretory and nuclear [1].

According to the other authors the reduced levels of the both enzymes are observed in malignant and benignant prostatical tissues [4].

The incomplete literary data about the localization of the enzyme expression of the prostatical tissue acid and alkaline phosphatases were a reasonable motif to make the enzymohistochemical investigation.

Our aim was to find separated tissue regions in the normal prostata of the tomcat where the activity of the investigated hydrolases is observed.

Material and Methods

Proving of the acid phosphatase by Gomori: Prostatical glands of seven sexually matured and healthy clinically male European shorthair cats (aged between one and two years with weight 2.8 kg to 4 kg) were investigated. The animals were euthanised with 200 mg Thiopental (Biochemie, Austria) IV.

Frozen slices with thickness 10µm were used. They were fixed in 10% neutral formalin for 24 h at temperature 0-4 C° and they were put on objective slides after that.

The slices were translocated in incubating medium and were put in a thermostat at 37 °C for 3 h. They were edulcorated with a distilled water, treated with Amonium sulfide for one minute which stained them dark brown and included in glycerine-gelatine [2].

Proving of the alkaline phosphatase by Gomori: The same frozen slices were transferred in incubating medium and put in a thermostat at temperature 37°C for 2 h, after that they were treated with 2% Cobaltous chlorate for three minutes and translocated in Amonium sulfide till they get black [2]. The localization of the enzyme expression of the tissue alkaline and acid phosphatases were proved lightmicroscopically.

Results and Discussion

The most considerable localization of the tissue acid phosphatase activity was found in the apical parts of the prostatic epithelial cells and in the lumen of the glandular alveols (Fig. 1). These results add the attitude [11, 14, 15] about the localization of this tissue enzyme in the prostatic gland of the man and of the rat. Probably it is a secretory form of the acid phosphatase, which is with apical and luminal fluidal expression. That confirms its presence in the ventral prostatic gland of the rat [13], the dog [1] and the man [12].

The apical localization of the acid phosphatase activity in the prostatic epithelium of the tomcat gives us a reason to suppose about its active role in the formation and in the secretion of the prostatic fluid.

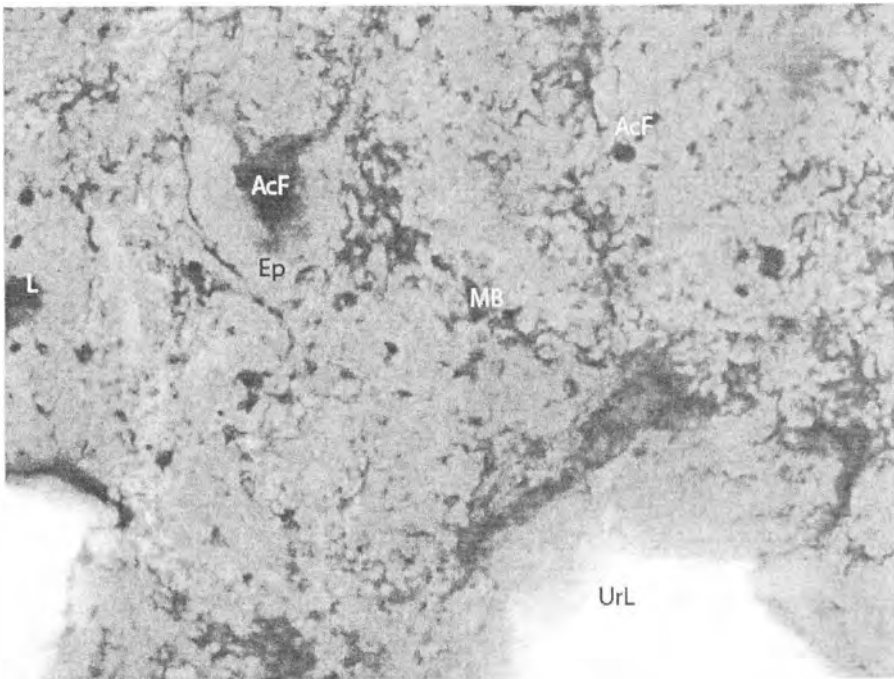


Fig. 1. Localization of the acidphosphatase activity (AcF) in the apical parts of the prostatic epithelial cells (Ep), in the basal membranes (MB) and in the alveolar lumen(L). Urethral lumen (UrL). (Bar=10 µm)

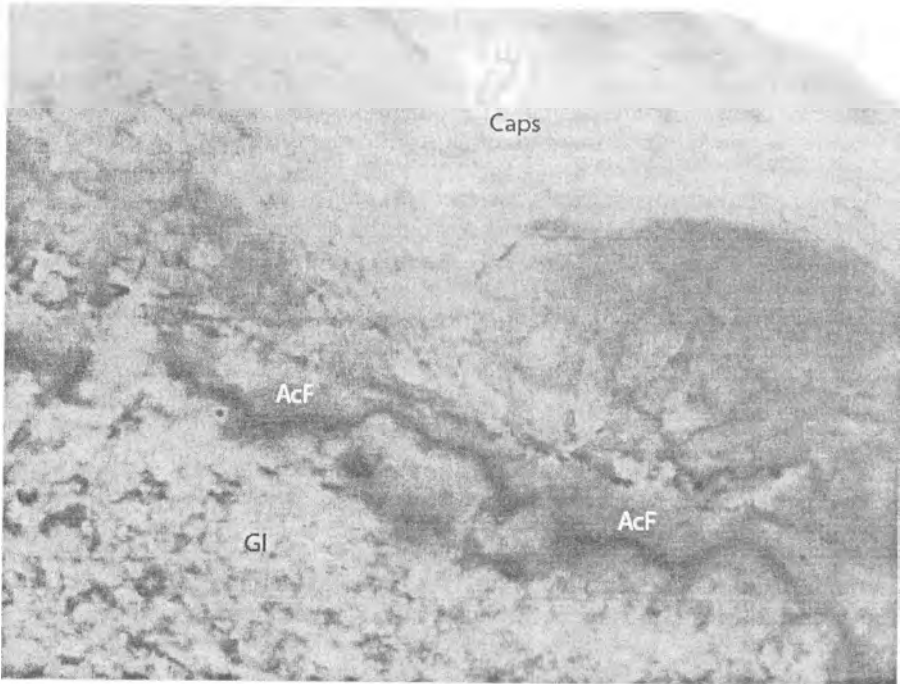


Fig. 2. Localization of the acid phosphatase activity (AcF) in the basal parts of the prostata (Caps) and in the glandular interstitium (INT). (Bar=10 μ m)

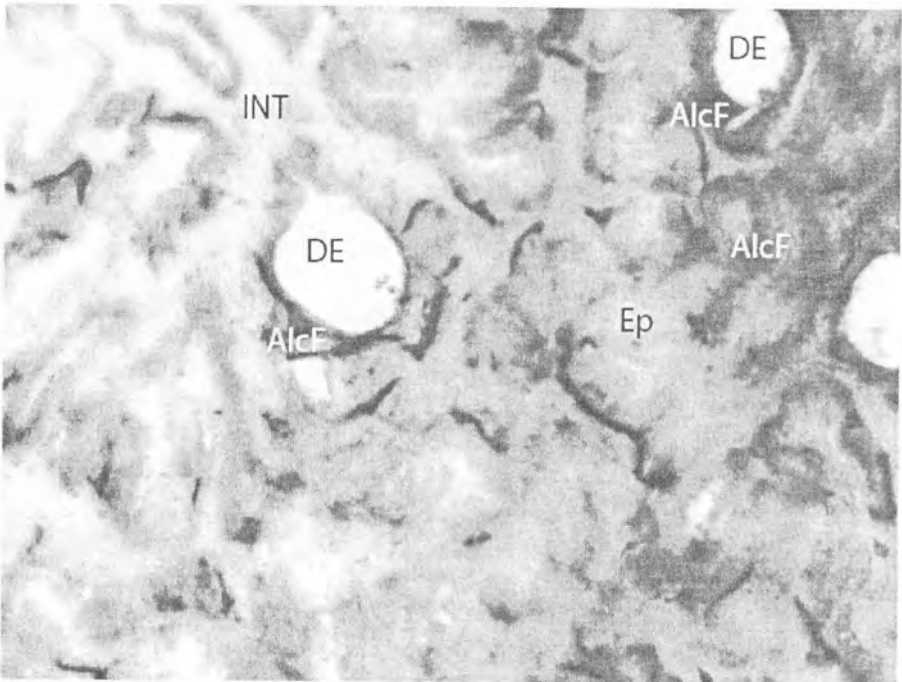


Fig. 3. Localization of the alkaline phosphatase activity in the (AlcF) in the basal parts of the prostatic epithelial cells (Ep) and in the epithelium of the prostatic excretory canals (DE). Interstitium (IT), (Bar=10 μ m)

The expression of the acid phosphatase, observed by us in the basal membranes and in the subcapsular region of the gland (Fig. 2) isn't confirmed by previous investigations [7, 8].

This distribution of the enzyme activity presumes its importance in the transport of substrates, necessary for the production of the prostatical fluid from the glandular parenchyma.

In the perivascular regions and in the periphery of the prostatical ductules, the enzyme expression is remarkable, that could be connected with the tissue collaborations between the vascular wall and the glandular part of the prostata, and between the drenaging elements and the glandular structures. The lowest acid phosphatase activity was found in the glandular stroma. (Fig. 2). That probably is connected with the different role of the interstitium about the glandular secretion-mechanical, nutritive, connecting etc.

Our results correspond with these of the man [3, 9], but they contradict with other investigations of this enzyme expression in some rodents [6]. Therefore the tissue acid phosphatase activity in the normal prostata of the tomcat shows characteristic animal species particularities, which is connected with the special glandular morphology of this specimen.

A remarkable expression of tissue alkaline phosphatase was marked in the basal parts of the epithelial cells, the periferial regions of the prostatical ductules (Fig. 3), in the perivascular parts and the glandular capsule (Fig. 4). By these results we can suppose the role of the investigated enzyme in the transport and in the processing of the secretory substrates between the parenchymal and the stromal part of the tomcat's prostata.

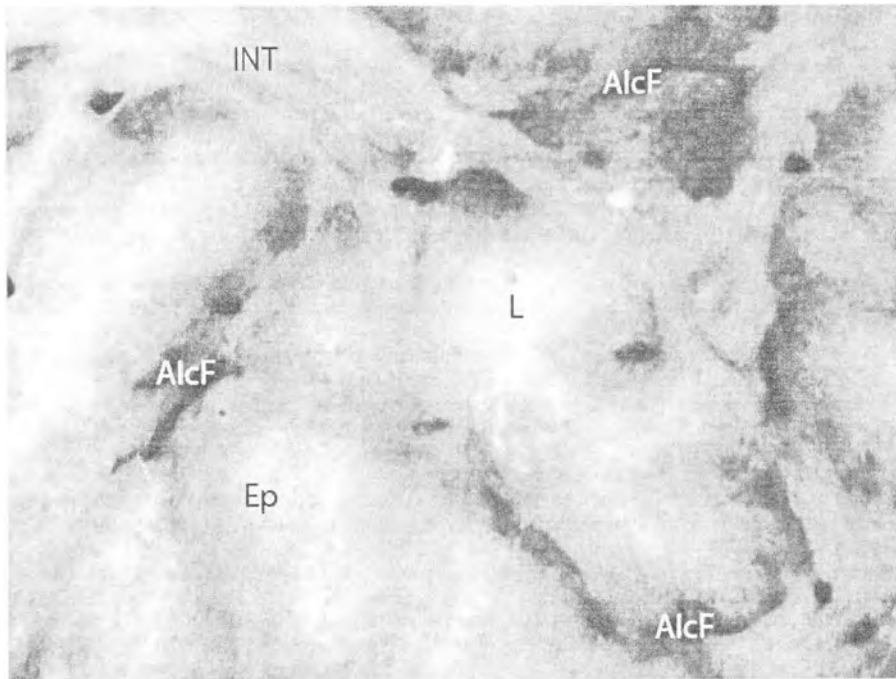


Fig. 4. Localization of the alkalinephosphatase activity (AlcF) in the basal parts of the prostatical epithelial cells (Ep). Alveolar lumen (L). Interstitium (IT). (Bar=5 μ m)

The prostatic epithelial cells of the tomcat resemble the epithelial ones with osteoinductive potential which show a high activity of the alkaline phosphatase.

There wasn't any expression of alkaline phosphatase in the lumen of the glandular alveols of the tomcat, in the same of the dog there was such expression so we can suppose that it has less important role as a fraction in the seminal plasma [5].

An activity of alkaline phosphatase was found in the prostatic epithelium of the tomcat, compared with some rodents, where such activity misses [6].

The localization of alkaline phosphatase activity, which was found by us, confirms the attitude of [1], so the investigated enzyme here is with stromal, secretory, nuclear and vascular localization.

Examined tissue localization of the alkaline and the acid phosphatase in the normal prostata of the tomcat is more different than the investigations of [4, 10], which are connected with her localization in malignant and benignant prostatic lesions of the other mammals.

Therefore the results of our investigation about the tissue localization of these two enzymes can be used like a basal marker for the differentiation of the normal prostata from the pathologically transformed prostata of the tomcat.

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