CONTEMPORARY AGRICULTURE / *SAVREMENA POLJOPRIVREDA* 60 (1-2) 139-144, 2011.
UDC: 63(497.1)(051)-"540.2" ISSN 0350-1205

UDC: 636.09:636.2:591.469

EFFECT OF DIFFERENT LENGTH DUCTUS PAPILLARIS ON PATHOMORPHOLOGICAL CHANGES IN UDDER PARENCHYMA

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SUMMARY: Pathomorphological changes in the mammary glands are usually caused by the interaction of macroorganism, microorganism and the environment. A very important processs during intramammary infection is the penetration of microorganisms in a tank papilla. In the mammary gland, there are several mechanisms to prevent penetration of bacteria into the mammary gland. The first line of defence against penetration of pathogens into the mammary gland is ductus papillaris. The interior of the ductus papillaris filled with similar wax, which contains long-chain fatty acids and basic proteins. It was found that these substances in vitro bactericidal effect and bacteriostatic toward specific mastitis pathogens. Previously it was thought that the musculus sphincter papillae most important obstacle to the penetration of microorganisms into the mammary gland. Research tasks are focused on monitoring the length of the ductus papillaris and its impact on the occurrence of pathomorphological changes in the parenchyma of the udder.

***Key wards**: ductus papillaris, udder, pathomorphology, cow.*

INTRODUCTION

Udder, the histological structure, belongs to tubuloalveolaran type of glands, and it has skin origin (Pantić 1980, Boboš 2005, Pobrić 2000). It is functionally closely related to the genital organs, well-developed in female animals, while with the males it is rudimentary (mamma masculina). The cow's udder is divided into four quarters completely separated. Glandular parenchyma was pink-gray in colour, firmer consistency as opposed to fatty tissue that surrounds the gland. Parenchyma is a complex character and consists of glandular tubes with alveolar enlargement (Hurly 1985, Simić 1997, Davidov 2010). *Papilla mammae* cows are cylindrical and slightly inclined towards the ventrocranial. Their function is the secretion of milk into the environment, as well as

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Original scientific paper / *Originalni naučni rad*
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suckling, which is the only way of feeding calves. On the *papilla mammae* no hair, sebaceous or sweat glands or. Their shape and size depend on the shape and size of udder and milk production. Papillae cow has only one channel running-*ductus papillaris* with one hole-*ostium papillae* and the link between the internal system of milk secretion and the environment. *Ductus papillaris* is the main barrier to infection. Closure of *ductus papillaris* and is enabled through the *musculus sphincter* that surrounds a channel (Simić, 1997; Boboš, 2005; Davidov, 2010). Length of *duct papillaris* a proper length of *papillae* varies and increases with increasing number of lactation, so the author is different. Most authors (Claude, 1983; Simić, 1997; Pobrić and al., 1998) reported that the length of the *ductus papillaris* is about 10 mm, but varies from 3 to 18 mm (McDonald ,1973; Hamann, 1987; Geishauser and Querengasser, 2000; Paulrud and Rasmussen, 2004; Paulrud et al., 2004), depending on the breed, and even the stage of lactation (McDonald, 1975). *Ductus papillaris* in last *papilla* is 5-10% longer than the *ductus papilaris* on frontal *papillae* (Paulrud et al., 2004). In dairy cows, mammary gland has a simple defence system consisting of *papillae* and udder. When pathogenic microorganisms penetrate this barrier, they are in the parenchyma of the mammary gland and produce the toxin, leading to damage to the wall causing inflammation and tissue injury. Mc Donald (1979) argued that the length of the *ductus papillaris* is not associated with the emergence of new infections because udder quarters that were infected had a longer *duct papillaris* of four who were infected. Milking microorganisms located in the immediate vicinity papilla take the opportunity to penetrate the *ductus papillaris*, causing trauma and damage to the keratin layer or even mucosal channels (Capuco et al., 1992). *Ductus papillaris* may remain partially open for 1-2 hours after milking and during this period microorganisms can get on. Pathogenic microorganisms are able to enter through an open *ostium papilla*, avoiding antibacterial activity (Khan, 2006). If microorganisms pass the first line of defense and penetrate into the tank, they get to the second line of defense consisting of polymorphonuclear leukocytes, macrophages, which are the main phagocytic cells of the mammary gland were polymorphonuclear leukocytes and macrophages. Macrophages are more in uninfected and infected polymorphonuclear leukocytes in the mammary gland (Davidov, 2010).

MATERIAL AND METHODS

Udder of Holstein-Friesian cows were taken for histological examination. We tested 104 mammary complexes which are measured by length of *ductus papillaris*, and from which tissue samples were taken for histological examination. All samples were fixed in buffered 10% formalin, and then dehydrated through a series of growing concentrations of ethanol and xylol treatment infused as a medium for the introduction of paraffin wax-molding means. Made paraffin molds were cut at a thickness of 5 μm microtome, and stained with hematoxylin eosin, and all were performed microscopic light microscope and photographed with a digital camera Canon.

RESULTS

Papillaris ductus (Figure 1.) represents the relationship between the environment and the interior of the mammary gland. Coated with a substance grey color, similar

to wax, which helps close the *ductus papillaris*. Central muscle layer, especially at its peak, is composed of smooth muscle and collagen fibers, which some *ductus papillaris* and become stronger to ultimately form a *musculus sphincter papillae*, which tightens and closes the *ductus papillaris*.

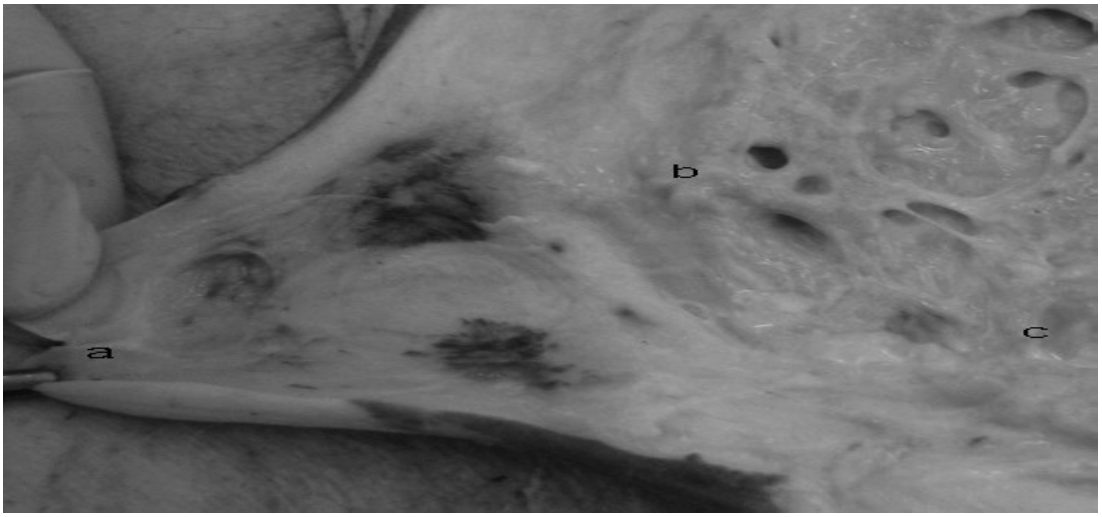

Figure 1. a) ductus papillaris, b) sinus lactiferus, c) parenchyma gl. mammae *Slika 1. a) ductus papillaris, b) sinus lactiferus, c) parenchyma gl. mammae*

By measuring the length of the *ductus papillaris*, we found that the number of *papillae*-84 (80.77%) has a length of *ductus papillaris* up to 10 mm, and only 3 (2.88%) *papillae* length to 5 mm (Table 1). Taking into account the mammary complexes as separate functional units of an udder, we found differences in the length of *ductus papillaris*.

Table 1. Length of ductus papillaris of udder distribution
Tabela 1. Distribucija dužine sisnog kanala vimena

Length of *ductus papillaris/ Dužina ductus-a papillaris-a*		≤ 5mm ≤ *5mm*	5,1-10mm 5,1- *10mm*	>10mm > *10mm*	Total *Ukupno*
Papillae mammae/ *Papila*	n	3	84	17	104
	%	2,88	80,77	16,35	100%

Table 2 shows the values calculated mass of leukocytes in the parenchyma of the mammary gland, where in 15 (14.42%) mammary complexes weight leukocyte infiltration was from 0 to 25%, and 45 (43.27%) mass leukocyte infiltrate was of 50.1 to 75%.

Table 2. Distribution of leukocyte infiltration in mammary gland parenchyma
Tabela 2. Distribucija leukocitarne infiltracije parenhima mlečne žlezde

Leukocyte infiltrate *Leukocitarni infiltrat*		0-25%	25,1-50%	50,1-75%	75,1-100%	Total/ *Ukupno*
Mammary glands *Mlečnih žlezda*	n	15	19	45	25	104
	%	14.42	18.27	43.27	24.04	100.0

DISCUSSION

Since the mammary gland is characterized by their fine structure and function, it has adequate and complex defence system of nonspecific and specific reactions involved in the protection of organs from microorganisms. The non-specific defense mechanism, the essential role belongs to morphological traits. (Avdić et al., 2008).. Natural hygiene is changing with the age of individuals, and there are differences within individual lines of dairy cows. Taking into account everything that belongs to the security system in the first place is the anatomy of the udder, rather *papillae mammae*. *Papillae* cow has only one channel running-*ductus papillaris* with one hole-*ostium papillae* and the link between the internal system of milk secretion and the environment. *Ductus papillaris* is the main barrier to infection. Closure of *ductus papillaris* and is enabled through the *musculus sphincter* that surrounds a channel. Length of *ductus papillaris* a proper length of *papillae* varies, so the author is different. Most authors (Claude, 1983; Simić, 1997; Pobrić and et al., 1998) Reported that the length of the *ductus papillaris* and about 10 mm, but varies from 3 to 18 mm (McDonald, 1973; Hamann, 1987; Geishauser and Querengasser, 2000; Paulrud and Rasmussen, 2004; Paulrud et al., 2004), depending on the breed, and even the stage of lactation (McDonald, 1975). Length of *ductus papillaris* is morphological characteristic of each mammary gland. According to our findings, most of the *ductus papillaris* with a length of 10 mm (Table 1.), which agrees with the findings of many authors (Claude, 1983; Simić, 1997; Pobrić et al., 1998; McDonald, 1973; Hamann, 1987; Geishauser and Querengasser, 2000; Paulrud and Rasmussen, 2004; Paulrud et al., 2004). Mc Donald (1979) Argued that the length of the *ductus papillaris* is not associated with the emergence of new pathomorphological changes in the mammary gland, udder quarter because you were not with the pathomorphological changes, had a longer *ductus papillaris* of four who were with the pathomorphological changes in the mammary gland. Unlike McDonald's claims, our research we found that of 104 histologically examined mammary complexes, in 45 (43.27%) (Table 2.) tanks mammary complexes with the length of the *ductus papillaris* and up to 5 mm was found dominant mass leukocyte infiltrate, indicating that the length of the *ductus papillaris* and is important in the development of pathomorphological changes in the mammary gland itself. Pathomorphological changes of the mammary gland of dairy cows are caused when the break through a barrier teat and when pathogenic microorganisms reach the tanks or the parenchyma of the mammary gland. That the degradation of histological structure of tanks and parenchyma. According to the Trinidad-in 1990. Histological examination are valuable in revealing the degree of damage to the tissues of the mammary gland of cows. Histomorphological examinations were recorded in the works of several authors (Chander et al., 1973; Heald, 1979; Nickerson and Head, 1981; Sordillo and Nickerson, 1988). In the altered parts of the mammary gland interlobular connective tissue spreads. Chander and Reid 1973 examined samples of mammary gland parenchyma cows and came to the conclusion that the tissue of infected mammary gland has a large number of polymorphonuclear leukocytes (PMN) and secretory tissue necrosis, which corresponds to our results.

CONCLUSION

Based on the results of our research, we found an uneven length of *ductus papillaris*, so that most of the papillae 84 (80.77%) had a length of 5 to 10 mm, a minimum of changes in the parenchyma (14.42%) of the mammary gland was the finding leukocyte infiltrate 0-25% and 43.27% of the mammary gland parenchyma were the findings leukocyte infiltrate from 50.1 to 75%. What can be concluded from our study is that the length of the *ductus papillaris* udder is important to the appearance of pathomorphological changes in the parenchyma of the mammary gland.

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UTICAJ RAZLIČITIH DUŽINA *DUCTUS PAPILLARIS*-A NA POJAVU PATOMORFOLOŠKIH PROMENA PARENHIMA VIMENA KRAVA

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Izvod

Patomorfološke promene u mlečnoj žlezdi najčešće nastaju interakcijom makroorganizma, mikroorganizma i spoljašnje sredine. Veoma važan proces u mehanizmu nastajanja intramamarnih infekcija je penetracija mikroorganizma u cisternu papile. U mlečnoj žlezdi postoji nekoliko mehanizama kojima se sprečava prodor uzročnika u mlečnu žlezdu. Prva linija odbrane od prodora uzročnika u mlečnu žlezdu je *ductus papillaris*. Unutrašnjost *ductus papillaris* je ispunjena masom sličnom vosku, koja sadrži duge lance masnih kiselina i bazične proteine. Utvrđeno je da ove materije *in vitro* pokazuju baktericidan efekat prema ambijentnoj mikroflori, a bakteriostatski prema specifičnim uzročnicima mastitisa. Ranije se smatralo da je *musculus sphincter papillae* najvažnija prepreka za prodor mikroorganizama u mlečnu žlezdu. Zadatke istraživanja smo usmerili na praćenje dužine *ductus papillaris*-a i njegov uticaj na pojavu patomorfoloških promena u parenhimu vimena.

Ključne reči: ductus papillaris, vime, patomorfologija, krava.

Received / *Primljen*: 05.04.2011.
Accepted / *Prihvaćen*: 16.05.2011.