

## APPLICATION OF PROPER MECHANICAL MILKING IN ORGANIC MILK PRODUCTION\*

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*SUMMARY: Milking is the most important process in organic milk production, which greatly affects both the quality of milk and the number of somatic cells and the occurrence of mastitis. One of the consequences of the introduction of mechanical milking at the farm was the occurrence of mastitis in the herd. Inflammation of the udder or mastitis is still one of the biggest problems on the farms for milk production, which is always accompanied by high costs. It is therefore very important that the correct procedures before, during and after milking are used in order to reduce mastitis to a minimum. Mastitis causes reduced ability of milk synthesis by the mammary gland and prevents the complete synthesis of certain ingredients. For treatment of mastitis in organic milk production in addition to treatment for sanitation and disinfection allowed in organic production, homeopathic remedies made based on plant and mineral salts are largely used.*

**Keywords:** milking, organic milk, mastitis

### INTRODUCTION

Organic agriculture is a management system that requires the integration of cultural, biological and mechanical practices that promote better utilization of existing resources, improve and maintain the biological balance of biodiversity and biological diversity (AMS National Organic Program 2008).

With regard to organic livestock production in Serbia, in all branches of animal husbandry there is a significant potential for the development of organic livestock pro-

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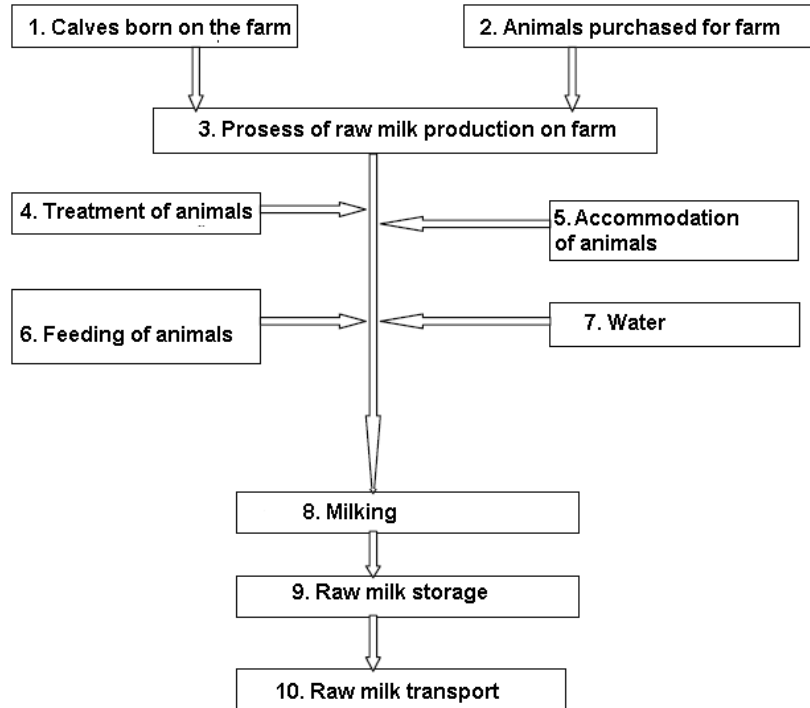
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duction, especially in mountainous regions. In cattle and sheep the predominant racial composition is in favor of traditional livestock and traditional production systems on pastures in mountainous regions that preserves the traditional production of indigenous species of dairy products (cheese and cream). Milk production based on organic principles is showing the increase around the world, especially in EU countries (Popović-Vranješ, 2011). In order to preserve the nutritional value of milk and suitability for processing, as well as to achieve the best price, it is needed to supply the milk with preserved quality, in the condition it was during the healthy milking of well fed and properly nurture cows. Producers effort to maintain good udder health after milking, to delivery and maintain the quality of milk, helps to reduce risk and has better marketing and profitability of production in organic livestock production (Jovanovic, 2008). Mechanical milking in organic production systems provides: significant reduce of the physical effort of workers – the milker, increases productivity and reduces the human labor required for these jobs on the farm, and secures bacteriological and chemical quality of milk (Popovic-Vranjes, 2009).

### Program for the safety of milk at the farm level

Program for the safety of the milk at farm level must be designed so that all process steps are defined, hazards identified and sources of relevant criteria for risk analysis, monitoring and control measures must be defined and corrective actions and records proposed. After defining the requirements for prerequisite program a flow chart for raw milk and process-related activities in accordance with the principles of HACCP must be designed (Scheme 1).



Scheme 1: Flow diagram of raw organic milk-primary production

Šema 1: Dijagram toka sirovog organskog mleka- primarna proizvodnja

Milking procedure, whether it's a manual or mechanical, is managed after the preparation process for milking, which consists of washing the udder, drying the udder, and udder massage for the first jets of milk.

These procedures provide:

- Stimulation of receptors in the udder, which is necessary for secretion of the hormone oxytocin and formation of the reflex for milk release;
- obtaining a good hygienic quality of milk;
- fast and efficient milking from the udder;
- shorter duration of milking;
- obtaining the maximum amount of milk and
- Healthy udder that is capable of further production of milk.

### **Washing of udder**

Before milking thoroughly cleaning of the udder should be done to eradicate all visible dirt, which contains a large amount of microorganisms, harmful and dangerous for the milk. Washing is carried out with hot water, with temperatures of 35 ° C to 45 ° C from the milking pail in the stall or with a shower (strong jet of hot water) when the milking is performed in the parlor.

When washing out from bins for each cow water should be changed. Very dirty udders can be washed with neutral pH means allowed in organic production, and then rinse with clean water.

### **Drying the udder**

The water left behind after washing the udder is often contaminated with bacteria. When placing the liner sets there is a possibility that such water is inlet in the udder cups and thereby contaminate the milk. To prevent this, it is important to wipe udders after washing or to dry them. To wipe the udder dry paper towels are used, in the absence can clean cloths or towels can be used, in a way that one cloth that is used to wipe only the udder of one cow. This prevents transmission of pathogens between cows.

### **Milking of first jets of milk – trial milking**

Milking of first jets of milk (two or three jets from each teats) is performed in a container for sampling of milk with dark bottom, which allows the milker to easily spot any changes to it (curd flakes, blood, pus). The goal is to, based on visual inspection of the milk, to make control of udder health status, or secretion. In this way very early mastitis can be detected and potentially contaminated milk can be removed.

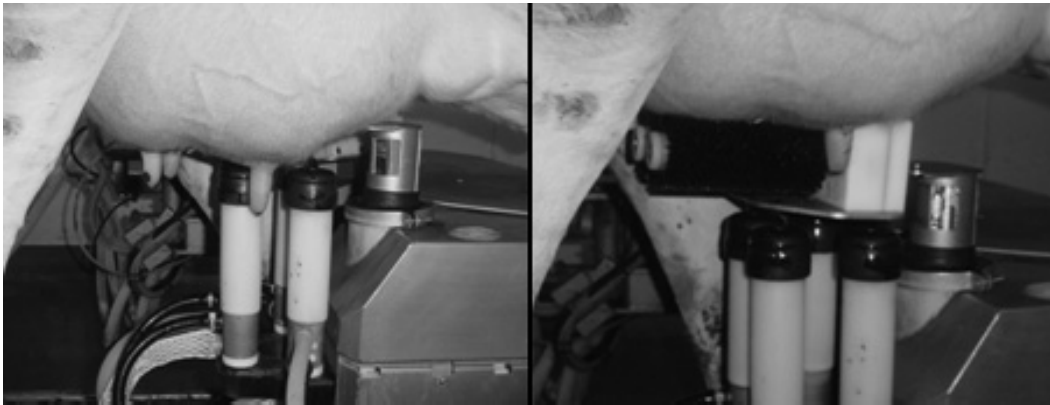
### **Milking**

The space for milking must be located and constructed in a manner that ensures satisfactory hygienic conditions during milking and it must be kept clean. During milking a sufficient quantity of clean water must be available to clean dirty teats and udders, equipment, arms, floors, walls (Havranek et al. 2003). When choosing a device for milking, one should pay special attention to: that the device does not damage the cow's udder in physiological and biological terms, that the flow control of milking is secured (initial phase of milking, active milking, the end of milking with the possibility of full milking so-called "blind milking"), that it is simple to operate and maintain (<http://>

poljoprivreda.info/?oid=10&id=213).

Right moment to start milking is when the udder is swelling, getting a slight pink color, and teats becomes full and firm to the touch. Milking should be carried out always at the same time and in the same way over time to maximize the cows developed a conditional reflex milking. It is important to use the time after preparation of the udder (3-5 minutes), when it is most effective time for giving milk.

Various types of parlors are used around the world; according to the layout of boxes for cows and capacity. The main types of parlors, which are most used in practice: a tandem, parallel parlor, herringbone and rotolactor. Tandem type milking parlors, herringbone and parallel are stationary and rotolactor milking parlor is rotary. By the degree of automation, parlors are divided into standard, semi-automatic and automatic. With standard milking all operations are carried out by hand except the act of milking which is done with machine. In semi-automatic milking parlor next to the device, there is an automatic mechanism for exclusion and removal of the liner sets, control of the end of milking, full milking, exclusion and removal of the liner sets automatically. Out of the newer systems the most efficient is robot milking for the full automation of the milking process, figure 1,2.



*Figure 1. Detection of teats*  
*Slika 1. Detekcija sisa*

*Figure 2. Cleaning of teats*  
*Slika 2. Čišćenje sisa*

Benefits of robot milking are reduced physical work on the farm to the extent that the worker does not even attend the milking; better animal health (which is controlled by the robot); achieved a greater degree of hygiene of cows and teats; amount of milk is higher than the previously described milking systems (Ostojić, 2007). Automatic milking systems are routinely equipped with automatic feeders. Complete milking robot system consists of: a box for milking, a system for detection of teats, teats cleaning system, the robotic arms that attach the teat cups, the control system including sensors and devices for milking.

Liners should provide: tightness of the joint at each end of the teat cups, tightness of the joint of the teat liners, no air leaks, to reach the basic cleaning and hygiene requirements, excluding the entire milk from the teats, adjusting the shape and size of teats in the determination of categories of dairy cows and a longer life (6-12 months) (<http://poljoprivreda.info/?oid=10&id=213>).

Under certain conditions milking equipment may cause significant vacuum fluctuations in the teat glass shell. This results in milk turbulence, which normally flows from the teat, but in this case returns to the teat (i.e. reverse flow). In this way it is pos-

sible to transmit pathogens to the milk in the teat and to penetrate to teat canal and to cause infection. Infections caused this way can be avoided if you use milking equipment that can not slip during milking (Cergolj and Tomašković, 2003). For stable milking system turning off vacuum and liner removal sets is done by automatic remover. They are connected to the flow meter, and when the milk flow drops to 0.2 l/min, automatic removers partially or completely exclude the vacuum, the liner sets off and milking is interrupted. They are of great importance, because their use prevents the blind milking, which otherwise can lead to internal and external damage which causes the appearance of mastitis. Mastitis is inflammatory disease of the mammary gland and milk channels and is of great economic importance in dairy cows, since it can lead a change in quality and reduced volume of milk production. As agents of mastitis occur following microorganisms: *Staphilococcus aureus*, *Streptococcus agalactia*, *Str. dysgalactia*, *Str. uberis*; *koagulaza neg. stafilokoki*, *E. coli*, *Str. pyogenes*, *Micobacterium tuberculosis*, *Salmonella*, *Listeria monocytogenes*, *Bacillus cereus*, *Clostridium perfigens* and *Corinebacterium bovis*.

Efficient milking is very important for maintaining the health of the teats, damaged teats tops are the door to bacteria that enter from the environment in the mammary gland.

### Subsequent milking

Milk, which is left over in the teats after milking, does not stand out on its own from channels into the dairy milk cistern and teat canal. For this reason, in the end of milking each of four teats should be massaged in order to milk final (residual) milk. Subsequent milking begins when there is a sudden drop in milk flow (0.2 l/min). Efficient subsequent milking increases milk yield and helps to prevent mastitis.

### Disinfection of the teats and equipment after milking

At the end of milking, the teats must be disinfected immediately, to prevent the entry, growth and colonization of pathogenic microorganisms in the teat canal, and especially *S.aureus*, *Str.agalactiae* and *Str.dysagalactiae*, which causes mastitis. Disinfection encourages healing of minor wounds on teats, which are suitable for the propagation of microorganisms. Teats can be disinfected by dipping in a disinfectant solution or spray disinfectants permitted for use in organic production. These are products which form a physical barrier at the bottom of the channel of mammary gland and thus reduce the risk of new infections that enter through the teat (Popović Vranješ, 2009), figure 3.

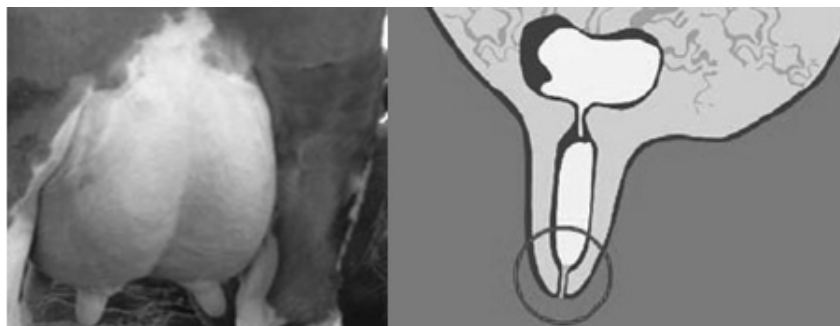


Figure 3. Use of the preparation for the closing of channels in the prevention of mastitis  
Slika 3. Primena preparata za zatvaranje kanala mlečne žlezde u prevenciji mastitisa

From herbal preparations, the most efficient are those on the basis of aloe Vera, seaweed, whey, essential oils and healing herbal oils for teats massage, tinctures based on Echinacea, garlic, fennel and chamomile. Some of these products are in the form of pills and should be placed under the tongue or in the vulva of cows with mastitis. Aloe Vera and garlic tinctures are used in an increased number of somatic cells, and a tinctures of Echinacea plants have success with summer mastitis and the incidence of teats gangrene. The success of these products depends on the immune system of cows and proper nutrition and hygiene for farmers, milking equipment and facilities for accommodation and milking (Dettloff, 2009).

Milking parlor and equipment must be properly washed, cleaned and disinfected to prevent infection and propagation of carriers of infection. Proper milking technique and selection of adequate milking equipment reduce risks and protect the production process of raw milk. Funds are granted for cleaning and disinfection of buildings, installations, equipment and accessories in organic livestock production (potassium and sodium soap, water and water vapor, limestone, lime, sodium hypochlorite (liquid bleach), caustic soda, baking stone, hydrogen peroxide, natural plant extracts, citric, acetic, formic, lactic, oxalic and acetic acids, alcohol, nitric acid (for equipment in the dairy industry), phosphoric acid (for equipment in the dairy industry), formaldehyde, cleaning and disinfection of the nipple and the milking equipment and sodium carbonate.

The use of antibiotics in organic milk production in the prophylaxis is prohibited, although these can be used in exceptional cases. Antibiotics are only allowed in cases of emergency. Milk from such animals should not be used, but they can keep their organic status. Many European countries require all antibiotics treatments to be recorded in a national database, and recording the use of alternative botanical and homeopathic treatments is not required (Popović Vranješ, 2010).

Organic milk is a potentially profitable alternative to conventional milk producers. Depending on the price that is available and possibility to control costs it is realistic to expect a decent profit. Many states subsidize this production in many ways. Premiums are generally higher for organic than conventional milk. It is conceivable that organic milk production is more expensive, requires more work, more control and is still struggling in the market. Consumers have to understand that for the higher quality need to pay a higher price, which is up 30% higher compared to the conventional. For consumers such a milk is pure and natural product (Ostojić and Cvijanović, 2004).

## CONCLUSION

It is known that with the introduction of mechanical milking on the farm mastitis has appeared as a problem. The most important factor affecting the number of somatic cells in milk is the beginning and development of inflammation of the teats. NSC increases over the number of 200.000 in ml of milk is generally considered abnormal and indicates teats infection. Since mastitis leads to disturbances in the secretion of milk, consequently appears a large number of microorganisms that secrete with milk which is further reflected in the hygienic quality of milk. It has consequences in creating large costs as in the primary production of organic milk as in milk processing. Correct application of milking machine has multiple significance in ensuring the health of the teats and reduce production costs in organic livestock production.

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# PRIMENA PRAVILNIH POSTUPAKA MAŠINSKE MUŽE U ORGANSKOJ PROIZVODNJI MLEKA

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## Izvod

Muža predstavlja najvažniji postupak u organskoj proizvodnji mleka, koji u velikoj meri utiče kako na kvalitet mleka tako i na broj somatskih ćelija, odnosno pojavu mastitisa. Jedna od posledica uvođenja mašinske muže na farme bila je pojava mastitisa u stadu. Upala vimena tj. mastitis danas predstavlja jedan od najvećih problema na farmama za proizvodnju mleka, koji je uvek praćen velikim troškovima. Zbog toga je veoma bitno da se ispravnim postupcima pre, tokom i nakon muže mogućnost pojave mastitisa svede na najmanju meru. Mastitis uzrokuje smanjenje mogućnosti sinteze mleka od strane mlečne žlezde i onemogućava potpunu sintezu pojedinih sastojaka. Za lečenje mastitisa u organskoj proizvodnji mleka pored sredstava za dezinfekciju i sanitaciju dozvoljenih u organskoj proizvodnji u velikoj meri se koriste i homeopatska sredstva napravljena na bazi biljaka i mineralnih soli.

**Ključne reči:** muža, organsko mleko, mastitis.

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