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Single tube guiding in conventional milking systems

One of the advantages of automatic milking systems (AMS) is the integrated individual quarter tube guiding, which distributes the forces to the udder equally to all teats, also in stepped udders. Furthermore, it is possible to record milking parameters of each quarter individually and hence to achieve better controlling of udder health and milk quality with single tube guiding. This makes it meaningful to use quarter individual systems in CMS's, too. Workload reduction for the milker is also attained.

Udder health greatly influences the economics of dairy farms. Mastitis is an udder disease connected with the quality of milking process and can cause serious problems in dairy farms. The technical design, construction and the condition of the milking equipment may have influences on udder health and milk quality. One important reason for udder damage can be the wrong positioning of the milking unit in relation to the teats. The teats are pulled by different forces because of wrongly placed support arms and milk tubes [1].

Regarding this problem, automatic milking systems (AMS) may be better adapted to the needs of the udder and therefore be better for udder health than conventional milking systems (CMS). Milking in AMS increased production by 6.75 %, lowered somatic cell count and improved teat condition [4].

Another advantage is the quarter individual tube guiding in AMS. In quarter individual systems it is possible to analyse udder health parameters for each teat and to get better control of udder health and milk quality. Unnecessary blind milking can completely be avoided in such conventional milking systems with individual cluster removal [3]. For this reason it would be helpful to have quarter individual systems in CMS.

Force measuring at the udder

For an investigation on the influence of the single tube milking cluster in CMS the vertical-, turn- and resulting horizontal forces were measured in coope-

ration with the German Agricultural Society (DLG) on laboratory and practice farms. The test machine used was developed by the DLG as described by [2]. The forces are measured with the aid of strain-gauge-strips. Two different udder formations „normal“ and „stepped“ had been investigated in this study.

New milking system offers „natural“ milking principle

Between different conventional and automatic milking systems a new system with single tube construction was tested in CMS. The single tube milking system (MultiLactor®) is produced by the company Siliconform GmbH, Türkheim, Germany (Fig. 1). The length of the milk tubes is 2100 mm and their inside diameter is 10 mm. A sequential pulse rate of 60 per minute had been set. The machine-vacuum was determined as 33 kPa.

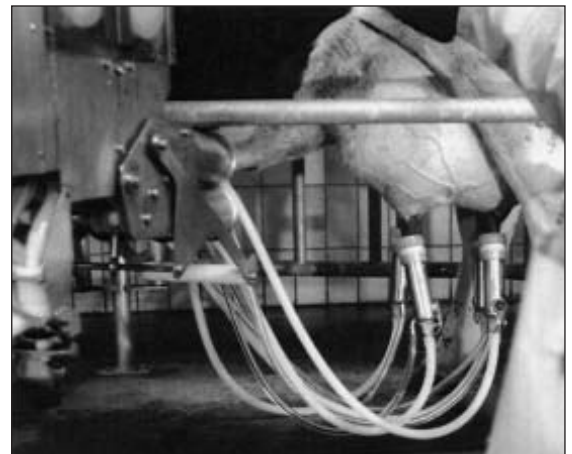
The teat cups are with silicon liners inside and described as the BioMilker method, which has an atmospheric air inlet in the teat cups. The investigations were done in a her-ringbone parlour with an angle of 33°. For attaching the cluster the teat cup holder swivels automatically under the udder. The teat cups were attached individually and manually to the teats. The re-attaching results automatically, but not quarter individual. After

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Keywords

Milking technique, quarter individual milking, force measurements, vacuum

Fig. 1: Quarter individual milking with MultiLactor®



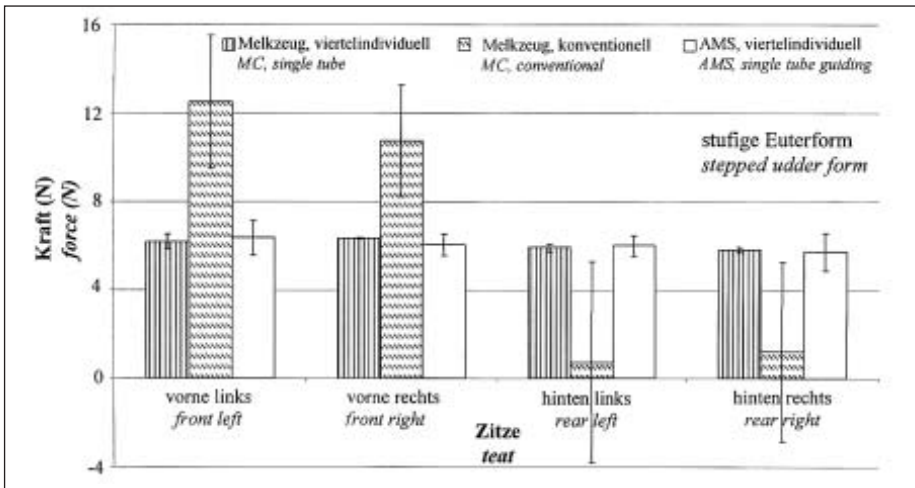


Fig. 2: Vertical forces at the udder of different milking systems and stepped udder formation

milking the cluster was cleaned and disinfected automatically.

At all tested milking places and clusters five repetition were carried out. The collected data of the MultiLactor® are compared with a data base of force measurement results in conventional and automatic milking systems. The data were analysed with the statistic software SPSS 10.0 Windows™.

Even allocation of the forces to every teat

The even allocation of the vertical force to all teats is important for the milking process and udder health. However in preceding studies it has been shown that AMS with single tube guiding have a good adaptability and conventional milking clusters have a bad adaptability to irregular udder formations.

Figure 2 shows the data for the average vertical force in different milking systems with stepped udder formation. The conventional milking cluster (MC) shows major differences between the front and rear teats. The maximum force is at 12.5 N. This means that the front teats are subjected to a force, which is several times higher than that at the rear teats. [5] expected a faster milk flow in the front teats, if they get more pull than the rear teats. In the AMS and the MC with single tube guiding it is noticeable that all teat pairs are subjected to nearly the same force. This means that the adaptability of the cluster by irregular udder formations is good. This helps to reduce udder damages. Another aspect is the reduced bacterial transport mechanisms in the cluster. [6] asserted that compared to the cluster, the AMS single tube teat cups reduced average main milking time by 0.18 min. Automatic stripping per quarter may be a promising solution to reduce cup-on time. So these advances should

be also used for the conventional milking systems.

Figure 3 shows the average vertical force in the MultiLactor® with different udder formations. The vertical forces mainly result from the weight of the teat cups with the milk tubes (535 g per teat cup). The mean vertical force of the different udder formations shows almost the same results. That means all teats are subjected to nearly the same force. This is the consequence of the quarter individual tube system.

As a second aspect, the standard deviations are depicted in Figure 3. However, all standard deviations have a lower value than 1. So the positioning of the teat cups to the udder can be said to be regular.

Conclusions and future work

The analysed characteristics of the new milking cluster with single tube can be rated as very positive. All teats are loaded with a similar vertical force and can help to reduce

disturbing turning and horizontal forces (www.dlg-test.de). Milking characteristics and udder health parameters will be tested in further time on dairy farms. Besides more technique details for monitoring the udder health could be introduced in the quarter individual system. This helps to analyse and control the milking process exactly.

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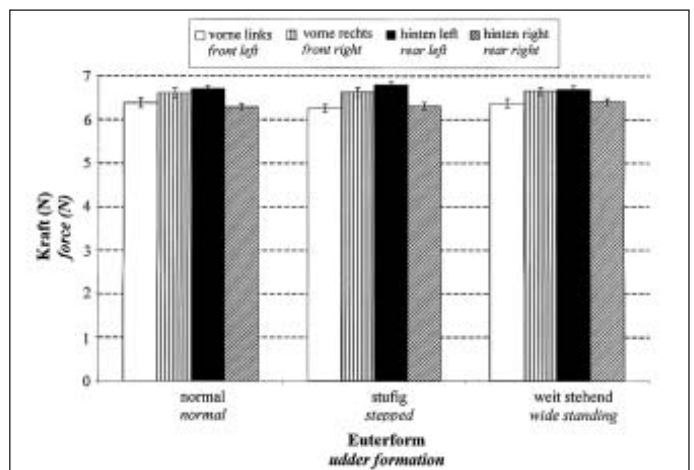


Fig. 3: Vertical forces in the MultiLactor® with different udder formations