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Dry cows also need cooling in summer

By **Israel Flamenbaum Ph. D**

Summer losses in milk production are usually related to the negative impact of summer heat stress on the lactating cow. This is due to the large negative effect of heat stress on feed consumption and the efficiency of feed utilization of the lactating cow, as well as on reproductive traits. Recently, it was found that also dry cows, although they are not producing milk, are negatively affected when subjected to heat stress conditions.

This is mainly due to lower milk and milk solids production in early subsequent lactation, higher incidences of diseases (due to reduced immune function) and metabolic disorders and poor fertility traits, all occurring after calving and in early stages of subsequent lactation, although occurring in autumn and early winter, when heat stress is already over.

The first publications describing the negative summer effect on late pregnant cows appeared in the seventies in Florida. In those days, milking cows were kept in corral shelters with limited access to shade, while dry cows were kept outdoors with no shade at all. Florida “Herd Book” data showed that cows calving in late summer and autumn produced near 15% less milk in their subsequent lactation as compared to those calving in the winter. Researchers from Gainesville, Florida showed that dry cows, provided with shade during the dry period gave birth to heavier calves and produced 5% more milk in early stages of subsequent lactation, as compared to dry cows without any shade at all (1). The birth of heavier calves obtained in this study can probably be related to better blood flow (as well as hormones and nutrients) to pregnant cow’s uterus (as cows do not need to spread more blood to cow’s surface as a cooling mechanism). It was confirmed that heavier calves and their placentas (as was detected in other studies), is related to better hormonal induction of the development of the mammary tissue (fetal and placental hormones are responsible for the renewal and cells proliferation of mammary tissue before calving), leading to better preparation of the udder for lactation and therefore, increasing milk output in early stages of subsequent lactation.

Based on the experience gained in the seventies in Florida, and due to the fact that dry cows in Israel are usually provided sufficient shade, we decided in the mid-eighties, to investigate the effect of cooling dry cows by a combination of wetting and force ventilation (as we did with milking cows), on offspring weight and cows milk production in subsequent lactation. In the control group, identical cows were provided only shade (2). Calves weight and average daily milk production in the first trimester of lactation are described in Table 1.

Table 1 – Calves birth weight (kg) and average daily milk production (kg), in first 150 days of lactation in cooled dry cows, as compared to cows provided only shade.

Calves birth weight	**cooled**	**shade only**
Birth weight of calves born to first calf heifers (kg)	42.0	41.9
Birth weight of calves born to adult cows (kg)	45.9 **	38.3
Milk production		
Average 150 d milk of first calf heifers (kg/d)	37.6	37.0
Average 150 d milk of adult cows (kg/d)	43.6 **	36.3

** - P< 0.05

From the results presented in table 1 we can learn that cooling cows in the dry period positively influenced adult cows, but not heifers, before the first lactation.

During the last two decades, other studies dealing with cooling dry cows were carried out, studies were performed in different climatic conditions and by making use of different cooling systems.

Cooling dry cows by low pressure fogging system (3) and by high pressure fogging system (4), provided in arid climates of North West Mexico and Arizona increased milk production in early subsequent lactation by 7.5% and 4.0% respectively. Intensive cooling dry cows by a combination of wetting and forced ventilation provided few times per day in summer was studied in hot and humid conditions in Israel (5,6) and Florida (7). Dry cows, cooled in the entire dry period, produced near 10 % more milk in early subsequent lactation (Israeli studies) and close to 20% in almost the entire subsequent lactation (Florida study), as compared to dry cows provided with only shade. There is however a duration effect, as dry cows cooled for only the final portion of the dry period had a lower milk response to the cooling treatment, relative to studies that cooled the cows the entire dry period (8).

Results from the different studies describes above are presented in table 2.

Table 2 – Average milk production (kg/d) of dry cows cooled by different systems, as compared to cows provided only shade.

Cooling Treatment	Location	Test days (from calving)	Cooled	Not Cooled	Difference (%)
Shade	Florida	0 – 100	26.7	25.5	5.0
Wetting and forced ventilation	Israel	0 – 150	40.7	37.2	9.4
Fogging (high pressure)	Arizona	Peak	41.3	39.7	4.0
Fogging (low pressure)	Mexico	0 – 60	26.1	24.3	7.5
Wetting and forced ventilation	Israel	0 – 150	44.8	41	9.1
Wetting and forced ventilation	Florida	0 – 280	33.9	28.9	17.3

In conclusion:

Heat stress also negatively affects dry cows. As compared to normal climate conditions, dry cows in heat stress conditions tend to produce less milk with less fat and protein in the subsequent lactation, are more sensitive to early lactation diseases, and have a higher risk for lower fertility.

Cooling dry cows improves milk yield in subsequent lactation and in addition, improve immune status in time of significant risk for disease. Positive effect of cooling in the dry period is much higher in adult cows than in young ones.

Cooling the dry cows can be provided by different cooling systems, adapting them to farm's climatic and installation conditions. Cooling the dry cows is expected to prevent them from the need to activate body mechanisms in order to dissipate heat load (mainly by distributing more blood to cow's surface in account of blood hormones and nutrients reaching internal organs, among them the uterus).

It seems that the intensity of cooling the dry cows can be lower than that provided to the high producing cows (total hours of cooling per day), this is due to the fact that dry cows generate less heat to be dissipated. Still, cooling should be implemented as early in the dry period as possible to maximize the benefit to the cow as she transits into lactation.

Cooling dry cows in high yielding herds can increase annual production of late summer and autumn calving cows by more than 1000 kg per lactation (300 kg annually for each cow in the herd). Cost effectiveness of cooling dry cows is even higher than cooling milking cows (lower cooling expenses in relation to benefit obtained).

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