

Dry Cows & Heifers Need Cooling Too



Dr. Flamenbaum started working with dairy cows in the late sixties as an herd man and then, in charge of the 150 dairy cows herd in Kibbutz Misgav Am, in the northern part of Israel. Then he joined the State of Israel, Ministry of Agriculture Extension Services in 1977. From 1977 until 2008 he served in different positions for the Extension Service, starting as a dairy cattle regional extension officer, head of cattle department and then as the director of the division of Animal Husbandry. Since 2008 he has been working as a private consultant on heat stress in dairy cattle, assisting farmers all over the world.

Summer losses in milk production are usually related to the negative impact of summer heat stress on the lactating cow. Actually, this is true, as we are familiar with the large negative effect of heat stress on feed consumption, the efficiency of its utilization, as well as reproductive traits.

Decades of research

In last 40 years, studies done in different parts of the world show that dry cows, even when not producing milk, are negatively affected when subjected to heat stress conditions. This happens mainly due to lower milk volume and milk solid production in early stages of subsequent lactation, higher incidences of diseases (due to reductions in the cow's immune function), as well as increases in metabolic disorders. Cows suffering from heat stress during late pregnancy also suffer from poor fertility traits during the next lactation. These changes takes place after calving and in the early stages of subsequent lactation, even if this happens in autumn and early winter when heat stress is already over.

15% less milk!

First publications describing the negative effect of summer on dry cows appeared in the early eighties in Florida in the US. In those days, milking cows were kept in simple so-called corral shelters with limited access to shade, while dry cows were kept outdoors, with no shade at all. According to the registration system

used by farmers in Florida the data showed that cows calving in late summer and autumn produced nearly 15% less milk in their subsequent lactation, compared to those calving in the winter.

Shades help

Researchers from Gainesville in Florida have shown that dry cows, provided with shade during the dry period, gave birth to heavier calves and produce 5% more milk in early stages of subsequent lactation, as compared to dry cows without any shade at all. 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 the cow's surface for heat dissipation. Heavier calves are related to better hormonal induction of the mammary tissue development, as fetal and placental hormones are responsible to the renewal and cells proliferation of mammary tissue before calving, leading to better preparation of the cow's udder for lactation, as well as increase cow's body energy reserves, and therefore, increasing milk output in the early stages of subsequent lactation.

Cooling is better

Due to the fact that most dry cows are usually provided sufficient shade, most of the studies carried out in last 3 decades deal with providing cooling treatment to dry cows, comparing it to cows provided only shade. These studies were

conducted in different climatic conditions, dry and humid regions, and by making use of different cooling methods: direct cooling, by combing wetting and forced ventilation and indirect cooling, by using fogging or evaporative pads. Results from these different studies (see column "Source" in **table 1**) can be summarized to the following main results:

- ❖ Body temperature of cooled dry cows was 0.4C° lower, as compared to not cooled cows (38.9 C° and 39.2 C°), respectively.
- ❖ Dry Matter Intake (DMI) was higher by 1.6 kg/day in cooled dry cows, as compared to not cooled cows (11.4 kg/d and 9.8 kg/d), respectively.
- ❖ Calves' birth weight was 4.4 kg higher in calves born to cooled dry cows, as compared to calves born to not cooled cows (42.4 kg and 38.0 kg), respectively.
- ❖ Calves weaning weight was 7.7 kg higher in calves born to cooled dry cows, as compared to calves born to not cooled cows (77.7 kg and 70.0 kg), respectively.
- ❖ Milk production in subsequent lactation was 3.5 kg/d higher in cooled dry cows, as compared to not cooled cows (35.8 kg/d and 32.3 Kg/d), respectively as can be seen in **Table 1**.



Table 1. Average milk production (kg/d) of dry cows from different climatic regions, cooled by different cooling methods, as compared to cows provided only shade.

Cooling Treatment		Source	State in US	Not Cooled, kg/day	Cooled, kg/day	Difference kg/day
Shade		Collier et.al. 1982	Florida	25.5	26.7	1.2
Fogging	Low pressure	Avendano et. al. 2006	Mexico	24.3	26.1	1.8
	High pressure	Armstrong et. al. 1994	Arizona	39.7	41.3	1.6
Wetting + forced ventilation		Adin et. al. 2009	Israel	41.4	44.8	3.4
		Wolfenson et. al. 1988	Israel	37.2	40.7	3.5
		Urdaz et. al. 2006	Florida	26.2	33.7	7.5
		Do Amaral et.al. 2011	Florida	32.2	34.5	2.3
		Tao et. al. 2011	Florida	28.9	33.9	5.0
		Tao et. al.2012	Florida	27.7	34.0	6.3
		Thompson et. al. 2014	USA	30.0	33.8	3.8
		Karimi et. al. 2015	Iran	40.5	44.6	4.1



Shades for dry cows



Wetting system for cows



Cooling tunnels

It pays to cool dry cows!

The economic aspect of cooling dry cows was studied in different parts of the US by researchers from the University of Florida. According to their findings, the number of days with heat stress conditions ranges from 50 to 250 per year. By cooling the dry cows for almost 100 days per year you can predict an increase in the average annual milk production per cow by almost 500 kg and despite investment in both sheds and cooling equipment you can expect a net income by US\$ 22 (155 RMB) per cow! If the dry cows already have access to shades and the farm only needs to invest in cooling equipment the net income will be US\$ 50 (353 RMB) per cow!

In conclusion

Cooling dry cows under heat stress conditions allows them to maintain a normal body temperature and

consume more feed in the period up to calving. This leads the cows to give birth to heavier calves that benefit the dairy farm as they keep being heavier throughout the weaning time and in same time, to better preparation of the cow's udder.

Cooling dry cows in the summer increases subsequent milk production in late summer and autumn by up to 10%, as compared to cows provides only shade. The positive effect on milk production in the subsequent lactation occurs if first lactation cows are cooled in late gestation as heifers, but the influence of cooling is more significant on cooled adult dry cows. It is also important to remember that cooling dry cows in the entire dry period gives better results than cooling them in the first month of the dry period or only in the last month of

the dry period.

Cooling dry cows in high yielding herds and extremely warm region can increase annual production of late summer and autumn calving cows by more than 1000 kg per cow and increase the per cow annual net income by US\$ 230 (1625 RMB) based on US prices.

Cooling dry cows needs of course investment but the cost per dry cow is less than the expected increase in the net income when cooling is provided to the dry cows! In other terms this means the cooling system pays for itself within one year! Few if any other investments on dairy farms have this quick return on the investment and therefore it is actually economically justifiable to invest in dry cow cooling equipment if dry cows suffer heat stress conditions for 10 days or more yearly.