Selection for heat tolerance has been proven possible but up to date no official EBVs have been published. Data required for such an evaluation are, in addition to pedigree and production and reproduction data, temperature and humidity from nearby weather stations. A study developing a national evaluation for heat tolerance in the US in 2005 has shown that the top 100 bulls for heat tolerance were lower in milk production, angularity and in somatic cell counts and higher for productive life, daughter fertility and TPI compared to the lowest 100 bulls. Selecting bulls for functional traits or for composite indexes that give enough emphasis to longevity, fertility and somatic cells are expected to indirectly favour heat tolerant genetic lines.

1. Average PTAs of top 100 bulls for heat tolerance and bottom 100 bulls for heat tolerance (Bohmanova et al., 2005. Interbull Bulletin. 33:160-162.)
day allows to estimate the different response at genetic level in terms of production and reproduction traits. Genetic variance for heat tolerance has been found different from 0 only at a THI above 72 for production traits and 70 for NRR at 90 days. Estimated genetic correlation was around -0.30 between heat tolerance and production traits and around -0.41 between heat tolerance and reproduction traits like non return rate at 90 days (NRR90). Selection focused on production traits or fertility traits only will indirectly select cows that will result more sensitive to heat stress. A study developing a national evaluation for heat tolerance in the US in 2005 used test day production record combined with weather station data on temperature and humidity at milk recording in repeatability test day model with a random regression on THI level. Estimated sire Predicted transmitting ability varied from -0.48 to +0.38 kg of milk per THI unit. The top 100 bulls for heat tolerance were: a) lower in milk production, dairy form and somatic cell counts; b) higher for longevity, fertility and TPI compared to the bottom 100 bulls. These differences suggest that sire selection focused on functional traits will indirectly select cows that will be more tolerant to heat stress on milk production. The moderate size of genetic correlation between heat stress and both production and reproduction traits shows that genetic improvement for both production, reproduction and heat tolerance is possible if PTA for heat tolerance would be made available. Ongoing studies are using genomic information to identify genes involved in heat stress response and could be applied in genomic selection to recognize animals that show superior levels of heat tolerance together with PTA estimated in traditional quantitative models.

Health & Nutrition

Guidelines for summer nutrition of dairy cows

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Some guidelines for the nutrition of dairy cows in the summer. It is advisable not to further increase the intake of fat, of course only in rumen-protected form, to oppose to the energy intake reduction due to ingestion decrease. The sources of unsaturated fats that can easily go rancid, as those contained in the integral soybeans or full linen, should be excluded or reduced from the ration. Not advisable, if not in modest quantities especially in summer, are rich of oils byproducts such as rice husk, wheat bran, distillers, the corn germ extraction and soya and sunflower expellers also for the negative effects that they have on fibers rumen fermentation and on the milk fat. The metabolic reorganization of the bovine prefers, for liver glucose synthesis, the propionic acid normally deriving from ruminal fermentation of starch and the glucogenic aminoacids, to the point of looking for them in the muscle tissue. It is therefore good practice in summer to increase protein concentration of the ration using protein sources with low rumen degradability as corn gluten meal and, in critical cases, make use of rumen-protected methionine and lysine. During the summer, blood levels of hormones such as GH and IGF-1 reduces and this can also have negative effects not only on production but also on fertility, in particular because the IGF-1 is a “powerful” follicular growth factor. The production of IGF-1 is stimulated by aminoacids blood concentration. Greater availability in the liver of saturated fatty acids and aminoacids helps the hepatic synthesis of cholesterol, its export from the liver through the lipoproteins and therefore a higher cholesterol supply to the ovarian follicles for the synthesis of estrogen and progesterone. In particular the latter hormone is declining in the summer. The summer lack of progesterone and high body temperature of the cow is the most obvious explanation for that part of summer infertility resulting from embryonic death. Sugars are also recommended, of which the rations for dairy cows are “chronically” lacking not so much to directly supply glucose, difficult thing in a ruminant, but for the action that they have on the attractiveness of the ration and as a growth factor of the rumen biomass. During summer time, sugars are preferred to starches, which concentration generally decreases in the summer, to avoid an aggravation of the already para-physiological
Dairy cows suffer overcrowding very much not so much for access to the manger as to the resting area. Furthermore there are departments such as the phase of dry and close-ups where overcrowding is the main risk factor for metabolic diseases as well as for low production and sub-fertility in the next lactation. In farms where the summer heat is not properly managed through cooling systems and adequate food, we can find both a decrease in milk production and a marked fertility reduction. In these farms there will again be pregnancies in late autumn and winter and then a concentration of calvings in high summer, the well known worst period for calving of dairy cows. Having the calvings concentrated in summer and early fall means that many cows will spend the dry phase, or rather the last eight weeks of pregnancy, in hot overcrowded environments with a rather long light hours duration. These three conditions cause a subsequent lactation with not very high production and a low fertility. In fact the cows per capita production during fall, to equal days of lactation, will be lower than during spring in countries in the north of the equator. What solutions can be adopted to prevent this serious economic loss? The first and most important it is to avoid summer infertility using electronic devices for the detection of heats, diets aimed at this and correctly cooling the lactating dairy cows. In any case it is important to care also about the dry cows with attention in trying to avoid overcrowding especially in the close-up while maintaining unchanged the duration of this phase. Where possible it can be of great interest to give access to an external paddock with shaded areas to dry and in preparation for calving cows. Also in this phase, should be predisposed fans and showers for cows cooling should be predisposed.

Conclusions
Proper management of the environment and nutrition during the summer can give a significant contribution to prevent the reduction in milk production and its main constituents such as fat and proteins, the summer infertility and the immunosuppression during both the peripartum and in full lactation. It will also give a secure contribution to the prevention of the “Syndrome of the low milk production in the fall” that causes an economic damage to the farms definitely higher than the one brought by the heat in the summer months.

The importance of avoiding heat stress and overcrowding at the last stage of pregnancy
by Alessandro Fantini

Environment & Management
A research conducted by the University of Bologna has investigated the effects of administering 20 grams per cow per day, under heat stress conditions, of Fibrase formulation (containing Saccharomyces cerevisiae, Kluyveromyces marxianus var. lactis, Aspergillus Oryzae and Aspergillus Niger). The study was carried on a dairy farm in Lombardia (350 lactating cows milked through 8 milking robots), daily production data was recorded automatically by robots, milk fat and protein concentration measured weekly. Faeces were analysed to estimate influence of Fibrase on digestibility of fibre and the fibrous fraction. Fibrase has shown to be positively effective on feed consumption (+ 0.467 kg per cow / per day in respect of control group), average milk production (difference of + 1.88 kg per cow /per day in respect of Control group), digestibility of ration and particularly in decrease of fibrous fractions (- 7% fibre, - 7% ADF, - 21% ADL Lignin less in respect of Control group faeces analysis).