Does Heat Stress Affect Immune Function in Dairy Cows?

Mike Steel

Hello, and welcome to this Knowledge Summary, ‘Does heat stress affect immune function in dairy cows?’ My name's Mike Steele and I'm a dairy consultant and Director of Inspire Cattle Solutions.

The reason why I did this Knowledge Summary is because we know that cows experiencing heat stress give less milk and may be susceptible to increase diseases, but it's hard to associate heat with diseases specifically because of the other factors that are involved. So instead of this, you can investigate how the effects of heat on the innate immune system are and then imply that the risks of that are associated with increased risk of disease.

So, heat stress was measured in most of the papers defined as a temperature-humidity index greater than 65 to 68. And most papers looked at cows in heat stress compared to cows in cooled conditions, such as with fans and sprinklers on, and then they took blood from the cows and looked at blood values of cytokines and differentials, looking at the cells and the functionality of cells, and also looking at innate immune cells in vitro under heat stress conditions. So, in the results, they found that heat lowered the viability of white cells in vitro. They also noticed in vivo that there was a lower number of cytokines and higher suppresses of cytokines in cows with heat stress. This implies that cows are less able to react to pathogen signals. There were higher cortisol levels in plasma, in heat-stressed cows, which implies immune suppression activity, but also there was no effect on colostrum immunoglobulin in heat.

So, they also found that prolactin receptors and prolactin expression are lower in cows experiencing heat stress, which would explain some of why cows give less milk experiencing heat stress as well. So, in terms of appraisal, some of the work was in vitro rather than in vivo, but also you could ask why not just measure mastitis and metritis and associate that with heat and the reason why is because they have so many other factors influencing them like nutrition, parlours, labour routines, calving practices, et cetera. And that would mean that you'd need a randomized control trial with huge numbers that would be very difficult and costly to design with sufficient statistical power to associate heat with effects on the immune system. So that's why they looked at immune systems themselves and the effects on the heat in terms of blood values. So, the result is that heat does affect the innate immune system in cows in a negative way. And this may imply that this is why you get, increased disease risk in heat-stressed environments.

Thank you for listening to this podcast and I hope you enjoy the Knowledge Summary.