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Report on relationships between THI and dairy cow performance

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Abstract/Executive summary

The work carried out under LIVEM, L1.2 and described herein was based on construction and query of large databases which included multiannual productive and health field data. Productive data referred to dairy cows and included milk yield and composition, whereas health data were relative both to dairy cows and pigs. The analysis established the THI values above which a significant decline in the performance and health of dairy cows or pigs is to be expected. These results may help to adopt management environmental strategies which may permit to limit THI increase under farming conditions and/or to provide animals with interventions which may reduce heat load and/or increase dissipation of heat.

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1. Introduction

Several studies were carried out to establish the critical ambient temperatures for thermoregulation in farm animals. Information on critical temperatures for a number of productive or health parameters are limited.

The activities carried out under LIVEM L1.2 were aimed at establishing the critical temperature humidity index (THI) values above which a decline in productivity and risk for health have to be expected for dairy cows and pigs. A further aim was to describe the risk of death in dairy cows in relation to heat wave events.

2. Methods

Three dairy cow databases with THI data were used. A first one included seven years THI data from 35 meteo stations and 1,488,474 test- day records for milk yield, fat, and protein yields and fat and protein percentages data from 191,012 first-, second-, and third-parity Holstein cows from 484 farms (Bernabucci et al., 2014). The second one was based on milk composition/quality data (Bertocchi et al., 2014; see deliverable DL1.2.2.). For the purpose of the activities described herein, it was merged with THI data from 40 meteo stations. The third one included mortality data (46,582 deaths recorded during six consecutive summer). In this case, THI data were used to characterize heat wave events (unpublished). Characteristics of the pig database are described in DL1.2.2. (Vitali et al., 2014). For the purpose of the activities reported herein it was merged with THI data from 82 meteo stations.

3. Results

Values (breakpoints) above which a change in the relationship between THI and all parameters described above has to be expected were established (Bernabucci et al., 2014; Berthocchi et al., 2014; Vitali et al., 2014). Furthermore, the heat wave/mortality dairy cows study pointed out that the risk of death during heat wave is higher compared to that in non heat wave days, that Increase of risk varies with the length of the wave and with the age of the cows, that it tends to be higher for waves occurring in early summer and remains high during the days which follow the wave.

4. Discussion

These results may help to adopt management environmental strategies which may permit to limit THI increase under farming conditions and or to provide animal with interventions which may reduce heat load and/or increase dissipation of heat.

5. References

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