

8:13

A PASSIVE METHOD FOR DETERMINING ANIMAL'S BODY TEMPERATURE

A.A.BELOUSOV, V.A.BORAVSKY, A.N.ZAKHAROV,
E.N.MUSHINSKY and V.M.POLYAKOV*

The All-Union Meat Research and Designing Institute, Moscow, USSR

*The Institute of Radio Engineering and Electronics of the USSR AS, Moscow, USSR

SUMMARY

Thermometrical devices based on thermocouples and thermoresistors (Electronica TsT-1, etc.) have a big disadvantage - inertia, i.e. the time a thermometer stays in the animal's body and the time needed for temperature reading. A method for measuring animal's body temperature, based on the intrinsic radiation of the body, is suggested. Radiations can be received by means of special devices. A remote measuring method allows to achieve better localization with less technical difficulties. The most important aspect is that remote measuring is reticent and, consequently, prevents stresses. This method can be considered a promising one since it comfortable for animals, needs little time and is reasonably accurate (0.1°C).

INTRODUCTION

At large highly-mechanized farms contacts between man and animal are decreased. This makes an individual approach to animals difficult, lowers productivity. Therefore, at big farms of special importance is automated collection of data on animals' physiological state. An important objective factor for the evaluation of animals' state is their body temperature which is traditionally measured with a rectal mercury thermometer. It is an inertial operation, causing stress of animals and cannot be automated.

MATERIALS AND METHODS

The paper presents the results of a study into the possibility of using a radio-thermometer to measure cows' rectal temperature. The purpose was to find correlations between the temperature in the deep of different parts of an animal's body and its rectal temperature, and to study the dynamics of the "deep" temperatures in those parts which correspond to the vital organs, viz., heart, stomach and working muscles of the legs. Temperature fields were recorded with a radiothermograph at the 20 cm wavelength, which has the fluctuation sensitivity of 0.1 K . The data were processed in a computer and displayed on the digital indicator, the display and the digit printer. Simultaneously, surface and rectal temperatures were measured with electronic thermosensors and mercury thermometers. Spectral reflectance of the animal's body was controlled. Both temperatures were taken at 16 points. Reflection coefficients were averaged. Within some frequencies their values for the reference and test objects differed by 0.01 only or less. The analysis of the temperature fields indicated that correlations of some deep temperatures with the rectal ones are high enough. E.g., the correlation coefficient for the groin region is equal to 0.2 . Most convenient for automatic body temperature recording is the convex lateral surface, mean square deviation being 0.07°C . The maximum error in the rectal temperature recording by the integral deep temperature was 0.1°C with account for

calibration and measurement errors. The parts of the body with a poor deep-to-rectal temperature correlation are found.

RESULTS

The study carried out demonstrated that radiothermometers can be used to non-invasively, automatically control the rectal temperature and the physiological condition of farm animals.