



# Can thermography of the cut surface of the ham describe the adiabatic equalisation temperature?

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## AIM

A shorter factory equalisation period (EP) combined with final equalisation during transport would greatly benefit the industry. This study investigates the relation between thermography of the cut surface of the ham and the adiabatic equalisation temperature of ham cuttings as a potential method for automatically documenting sufficient cooling of not fully equalised products.

## METHOD

A study based on seven groups of pig carcasses (given different EP after slaughter and blast chilling). The first group was equalised for 6 hours, and with a 1-hour reduction in EP between the groups, the last group had an EP of 0 hours. Thermographic images of the ham cut surfaces were obtained before adiabatic equalisation was made in flamingo boxes. The median and standard deviation of the mean temperature within a selected region on the cut surface ( $T_{surf}$ ) and the adiabatic equalisation temperature ( $T_{eq}$ ) was compared.

## CONCLUSION

A good correlation with a linear coefficient of determination ( $R^2$ ) of 0.92 between the estimator  $T_{surf}$  and  $T_{eq}$  was observed, and the corresponding root mean square error (RMSE) of the linear model was 0.59°C (see Figure 2 right). Both results indicate that the thermographic profiles contain information about the total thermal energy. This information could have the potential to be used for automatic, inline and contact free documentation of sufficient cooling for not fully equalised products.



Figure 1a. Camera setup used to obtain thermographic images (A), placement in flamingo boxes for adiabatic equalisation (B) and manually annotated pixel region corresponding to *M. gluteus profundus*, *M. gluteus medius* and *M. gluteus accessorius* used to calculate  $T_{surf}$  (C).

## RESULTS

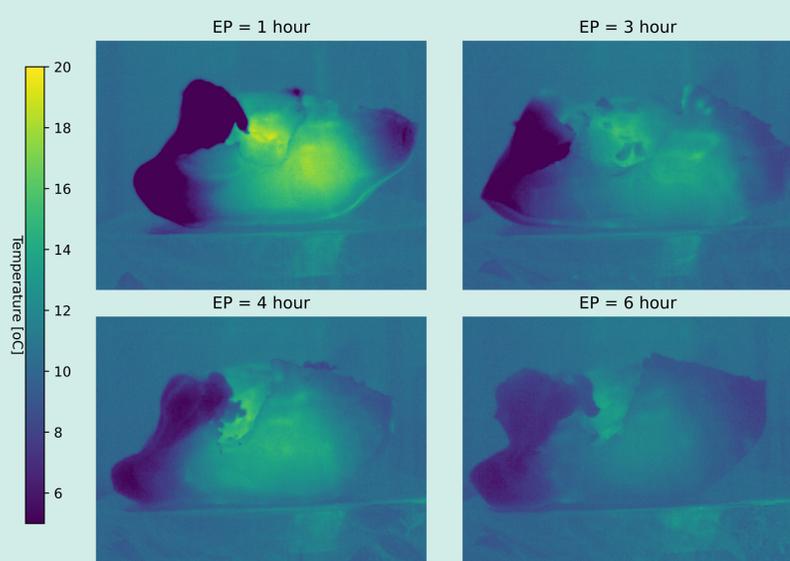


Figure 2. Thermographic profiles of the cut surface of the ham after selected equalisation periods. Significant variation in the thermographic profiles is observed.

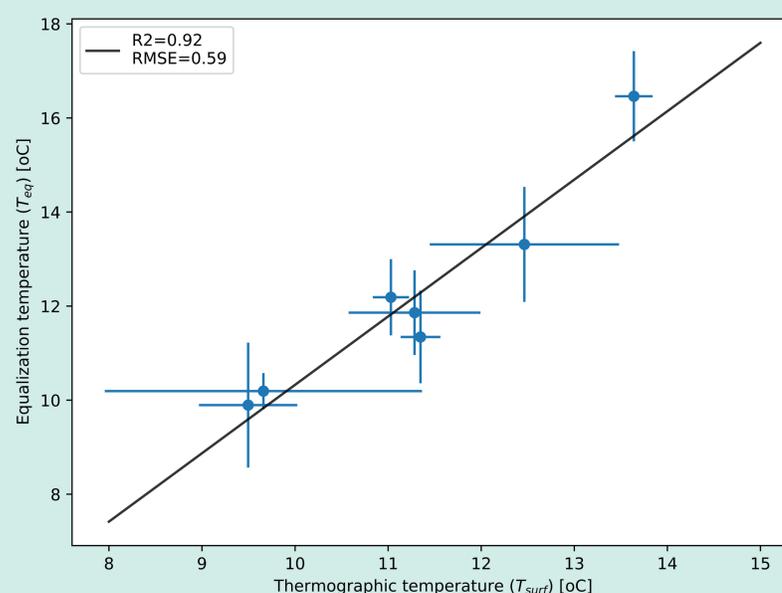


Figure 3. Relation between  $T_{surf}$  and  $T_{eq}$  where each point is the group median of three measurements, and the bar is plus and minus one standard deviation within the group.

## ACKNOWLEDGEMENTS

The work was supported by the Danish Pig Levy Fund.



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