

Setting of the Process Hygiene Index Performance Criteria

The performance criteria

According to the Performance Criteria set in the MPI Red Meat Code of Practice, Post Slaughter Activity Chapter 9:

When post slaughter cooling processes are validated they should meet the following PHI (V2) criteria:

	<u>PHI (V2)</u>	<u>PHI</u>
• 80% of PHI values	≤ 0.72	10
• maximum PHI value	≤ 1.0	14

The equivalent values from the original PHI methodology are also displayed above. The performance criteria were derived using the original PHI units.

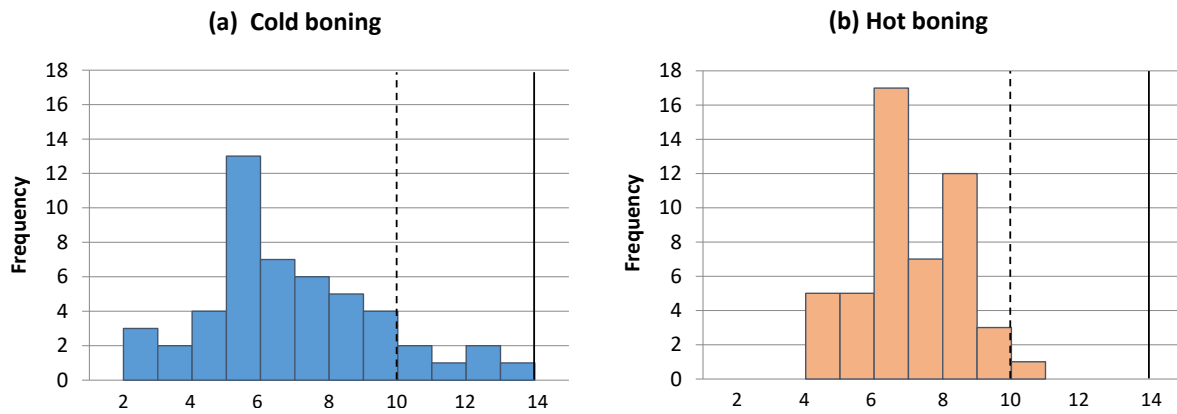
The PHI is calculated from temperature recordings taken from immediately after slaughter and dressing (post mortem examination point), and include all activities during cooling until the surface of concern has been reduced to 7°C or less.

The PHI calculation uses a surrogate temperature for any time during cooling that the temperature is not directly measured by a temperature logger. Examples include the time from dressing to when the temperature recording starts and for warm boned product when the carcass is being deboned until boxed.

Data underlying the PHI performance criteria

The limits were initially suggested in a paper by Gill et al (1991). A cold boning meat plant which was operating according to Good Manufacturing Practice (GMP) was used to collect the cooling profiles of 50 different beef carcasses. The potential growth was calculated for each carcass cooling profile using the growth model. They found the predicted number of generations of growth ranged from 2 to 14, with 80% of values below 10.

A second similar study of 50 beef carcasses was conducted at a hot boning plant also operating according to GMP (Reichel et al. 1991). The potential generations of growth ranged from 4 to 11 and only one value (2%) above 10. See Figure for the distribution of potential growth from these two studies.



Frequency distribution of potential generations of growth, calculated from temperature histories of (a) aitch-bone socket for 50 chilled beef sides as shown in Gill et al. (1991) and (b) hot boned and cartoned beef as shown in Reichel et al. (1991).

Worst Case Approach

The temperature histories recorded by processors use data loggers that are placed on the product, in a position that is expected to have the slowest rate of cooling and represent an area that could be subject to microbiological contamination (Kemp et al. 2009). The temperature is taken on the surface of the meat.

The growth models used to calculate the PHI are only dependant on temperature and time. The model does not take into account other hurdles to cell growth that may be present such as bacterial competition or surface drying.

Both these factors help to ensure the PHI Performance Criteria err on the side of caution in ensuring there is limited growth of mesophilic bacteria during cooling of the meat to 7°C. The PHI method and performance criteria have been used successfully since the 1980s to validate cooling processes to ensure they produce product that is safe and fit for purpose.

References

- Gill CO, Harrison JCL and Phillips DM (1991) Use of a temperature function integration technique to assess the hygienic adequacy of a beef carcass cooling process. *Food Microbiology* 8:83-94.
- Kemp R, Jones R, Phillips D, Lawson C and Bell G (2009) PHI (Process Hygiene Index) User Manual. AgResearch Client Report CR 1295 prepared for MIA and NZFSA.
- Reichel MP, Phillips DM, Jones R and Gill OC (1991) Assessment of the hygienic adequacy of a commercial hot boning process for beef by a temperature function integration technique. *International Journal of Food Microbiology* 14:27-42