

## **Title**

The development of an assessment tool for pork slaughterhouses to measure pathogen control efficiency in the production chain

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## **Abstract**

A web based assessment tool has been developed for slaughterhouses to assess how well pathogens are controlled in their process. The scoring available in the assessment is linked to the quality and weight of scientific evidence supporting the use of certain practices and their measurable effect on pathogen levels and is awarded in response to objective evidence on their implementation. The scientific evidence supporting the scoring is accessible from the tool to encourage the development of improved practices. The UK results for an EU survey of salmonella levels on pork carcasses carried out in 2006/7 ( EFSA 2008) is being used as a baseline value against which the effect of using the tool and improving scores can be measured.

## **Introduction**

Pigs have been identified as important carriers of Salmonella spp ( Milnes et al 2008) and consumption of contaminated pork meat is recognised as one of the key sources of human salmonellosis( Fosse et al 2008) . Pigs slaughtered in the UK are stunned and exsanguinated before the carcass is scalded, dehaired, singed, polished, eviscerated and laterally split in half prior to refrigeration and butchery. Much research has been undertaken on the influence of each of the individual dressing stages on the level and nature of the microbial contamination on the carcass, however comparison of results are not always possible due to differences in sampling and testing methods as well as operating practises in abattoirs. There is however no universally accepted way to measure plant hygiene. One obvious way is to microbiologically monitor the final product however the shortcomings in the sampling and testing methods (Hutchison et al 2006) together with the log normal distribution of the bacteria on the carcass surface (Gill 2000) means it is of questionable value to solely assess processes in this manner. Other

approaches have used scoring systems in response to audit style questions but the questions do not have a clear scientific basis and are not weighted relatively to each other (Wood et al 1998).

## **Material and Methods**

### *Tool development*

Commercial pig processing plants in the UK were visited in an attempt to identify objective records that could be used as a basis of assessing hygiene. Concurrently a review of the literature was undertaken to identify hazard control at each stage of processing and this was linked to records that were either available or could easily be available with a small amount of additional effort. The slaughter process was broken down into a series of stages and the hazards identified. A scoring system was developed that allocated points for processes that controlled hazards. The more convincing the evidence was on pathogen control the more points were awarded. Where possible, the evidence used were publications in peer reviewed scientific journals however if such evidence was lacking technical reports and conference proceedings were included. Practices where there was no evidence were not included. The initial scoring system allocated by the project team was then the subject of challenge by a group of experts and industry representatives and the scoring system refined. A web based computer programme was developed to capture the scoring in response to a range of questions and possible answers as well as providing links to the scientific evidence supporting the inclusion of each question.

### *Pilot studies with industry*

The tool was presented to the pig processing industry as part of the UK Zoonosis National Control Programme for Salmonella in pigs (ZNCpig) and a working group of interested processors formed who agreed to undertake a trial of the tool and provide feedback on its use in a commercial setting. Representatives from nine abattoirs were trained in the use of the tool and provided with a technical support help line during the trial period. Following their feedback the tool was further refined into a working model.

### *Baselines values*

The nine abattoirs which are all in the ZNCpig scheme have undertaken a self assessment using the tool and their scores recorded as a baseline against which to measure improvement. An EU baseline survey of salmonella in pigs was undertaken by all EU Member States from October 2006 to October 2007. (EFSA 2008). In addition to the mandatory measurement of salmonella in ileo-caecal lymph nodes thirteen MS including the UK voluntarily undertook to measure salmonella by sponging the surface of

the pig carcasses. The UK carcass results from this study will be used alongside the baseline tool values and progress measured by repeating the salmonella on carcasses study and values measured by the tool in the future. Areas of the pig process where scores by the tool could be improved were identified and partnership projects with industry recommended.

## Results

The process stages, their relative weighting, the number of questions in the stage and the maximum score possible from each stage are given in the table below.

Process stage	Weighting	Number of questions	Maximum score	Comment
Farm Practices	4	17	108	In development
Transport	4	5	112	
Lairage	4	8	93	
Stunning	1	5	46	
Exsanguinations	1	5	7	
Scalding	4	9	147	
Hair removal	4	8	81	
Singe and Polish	6	7	249	
Evisceration	5	12	595	
Carcase splitting	3	5	122	
Head removal	3	2	21	
Inspection	4	7	110	
Microbiological monitoring	4	4	400	In development
Chilling	5	6	193	
General	2	5	90	

Feedback from plants participating in the pilot study was very positive. The open and educational aspects of the tool as well as the requirement for objective evidence were given as the reasons for liking the tool.

Following 9 plants self assessments the areas identified for partnership improvement projects that would help these plants measure key data and implement new processes that would result in a significant improvement of their overall scores were.

- Assessment of singer operational conditions

- Development of a pre scald bunging process
- Assessment of scalding methods and operating conditions
- Using a secondary singeing process
- Decontamination of the polisher
- Characterisation of rapid chilling

### **Discussion**

A tool has been developed to measure how well a pork slaughterhouse is controlling the risk of pathogens in the production of chilled pork carcasses that attempts to take into account all the available scientific evidence as well as differences in production practices in UK slaughterhouses. The tool is designed to be used as a self assessment audit and by including links to the scientific information as well as information on how to generate some of the evidence required to answer the questions has an educational element. The use of the tool can assist operators to understand their processes with respect to the effect on microbiological hazards. For example points are available if it can be demonstrated that no parts of the carcass stay below 50 °C during singeing and links are given to a method and contractors that can assist with undertaking such measurements with an infra red camera.

### **Conclusion**

Our results suggest that using the tool to measure slaughterhouse hygiene results in slaughterhouses identifying processes in their production that could be modified to result in a reduction of salmonella on the surface of pig carcasses.

### **References**

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