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Recovery-test sampling size for stunned poultry in industrial halal meat production (#288)

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Introduction

Poultry/birds meat is only halal if the birds are alive pre-slaughter. 100% assurance that birds are alive prior to slaughter can only be provided when birds are hand slaughtered without stunning and the speed the birds are presented was optimal to allow *tasmiyya* (invocation) to be uttered on each bird by the slaughterer. In the industrial production of halal poultry meat, birds are mostly electrically stunned in waterbath stunners(ES) and either hand or machine slaughtered. A recovery-test (birds are stunned, not slaughtered and allowed to recover) of the birds should be performed before any stunner is accepted as meeting the requirements for halal. The recovery-tests (RT) are currently done too subjectively with no sampling plans to provide confidence that stunning processes are halal compliant. The aim of this study is to determine statistically the sampling size for RT needed to objectively validate a new electrical stunner for halal compliance and for harmonization of halal standards. αα

Methods

Recovery -Test sampling size: If we stun *n* bird and we observed that *x* of stunned birds failed to recover, then the probability of birds failing to recover is P = n/x. This probability of failure to recover can be modelled by the binomial distribution. When x = 0, that we observed that all the birds that we sampled recovered then the Clopper–Pearson interval gives us a certainty as to the true probability of failure to recover: [0,1 – (α/2)^(1/n)], Where α is the level of confidence. For example, a 95% confidence interval is obtained when α = 0.05.

Results

For poultry RT, the number of birds that should be stunned and allowed to recover for any newly installed electrical stunner depending on the level of confidence required (P < 0.05 – P < 0.01; 95-99%) could be determined from Figure 1. The effect of increasing the number of birds sampled on the possible level of confidence given that we observed all birds recovering can also be deduced from Figure 1. If we stunned 72 birds and observed that no birds failed to recover, then we would be confident that the true probability of birds failing to recover is between 0 and 0.05. Whereas, as we increase the number of birds stunned this interval get smaller. If we sampled 368 birds being stunned and observed that none of the birds failed to recover, then we would be confident that the true probability of birds failing to recover is between 0 and 0.01. This relationship can be used in many experimental designs to determine how many birds should be tested before a new ES is considered halal compliant.

Recovery test (RT): A New Zealand Halal Poultry processor installed a new electrical waterbath stunner – Simmons SF-7016 Step-Up Stunner; the stunner uses high frequency pulsating direct current (DC) and low frequency alternating current (AC) in the same Stunner. The processor applied for Halal certification from one of the authorized New Zealand Ministry of Primary Industries (MPI) Approved Halal Certification Organization (AHO). The AHO used figure 1 and advised the processor that 72 birds needed to recover after being stunned with the new stunner for halal certification be issued the processor. The poultry processor obtained ethics approval for a recovery test to be performed by the AHO on 72 birds. During normal processing, 72 chickens (41 days old) of different weights were randomly selected from three different batches and stunned using the new stunner (DC = 500Hz, 14mA, 20 volts, 16 s; AC = 50/60Hz, 10mA, 20 volts), pulled off in fives from the processing line, laid in a recumbency position until full recovery (~ 5 min) (Figure 2). All stunned birds recovered, and the stunner was approved by the AHO, with routine RT post-approval to be according to New Zealand Halal Notice (MPI, 2016).

Conclusion

New ES should pass a RT before being approved for poultry halal meat production. To be 95% confident in the industrial halal poultry meat processing that stunned birds are alive when slaughtered using a new stunner, the minimum number of birds that must recover post-stunning prior to slaughter should be 72. Close to 100% confidence could be achieved using the approved stunners if process flow is timed for stunned birds to emerge from the stunners at speeds that allow the few that might be mis-stunned, mis-slaughtered or that died for any reason to be picked off by the checker/slaughterer before the birds reach the scalding tank and further processed as halal.

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REFERENCES

MPI (2016). New Zealand Ministry for Primary Industries. Animal Products Notice December 2016. General Export Requirements for Halal Animal Material and Halal Animal Products. Annex 4. Animal Welfare Recovery Criterion. Pg. 51.

Notes

Fig. 2.
L = 5 stunned birds laid for recovery test; R = The 5 birds fully recovered within 5 min

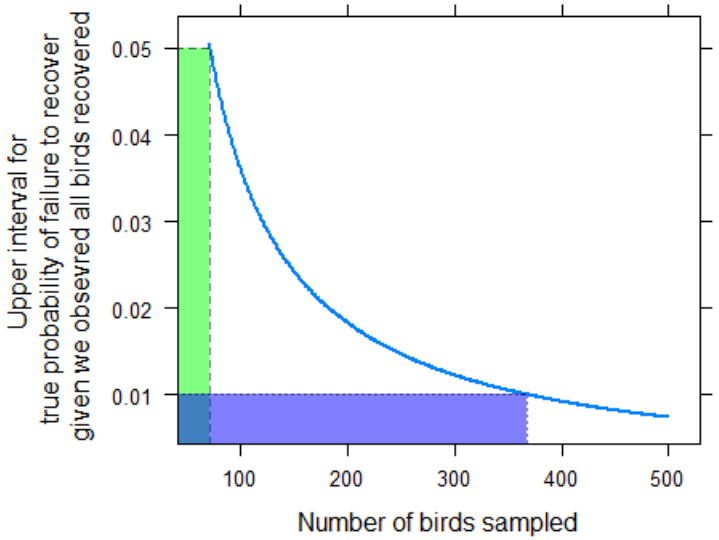

Fig. 1
Number of birds to be sampled for a given probability (P = 0.05-0.01)

Notes