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Sampling strategies used of determine the microbiological recovery in beef carcasses during slaughter operations: A systematic literature review

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Abstract

The use of microbiological sampling to test beef carcasses for ensuring food safety is a critical activity that food manufacturers need to prioritize. Differences in sampling strategy may affect the quality of the results being reported possibly leading to misinformed action. Moreover, failure to use an appropriate sampling strategy directly impacts the validity of study results. A systematic literature, covering the period 1965-2014, was conducted to identify sampling strategies used to determine the microbiological quality of beef carcasses in slaughter operations in North America, South America, the European Union, and Australia. Six electronic bibliographic databases were searched for beef microbiological studies in English. Two independent trained reviewers analyzed the full text of articles to assess the quality of the study methods. A total of 30 articles were included for a full review. The number of carcass sites sampled ranged from 1 to 7. Brisket (23/27, 85.2%), flank (17/27, 63%), rump (13/27, 48.1%), and neck areas (8/27, 29.6%) were most often sampled. Most studies described sample characteristics, such as slaughter step to be sampled, carcass sites, and sampling tools used for sampling, sampling frequency, microbiological testing, and handling of sample. Seven had very small sample sizes (10, 18, and 25 beef carcasses). In 13 studies, samples were randomly collected. Only eight reported conducting a power analysis to determine sample size. The average of overall alignment score across all studies with government regulations (except Latin American studies) was 77 points (maximum point was 100). The average score was 62 points in the United States, 78 points in Canada, 90 points in Australia, and 77 points in European countries. Two main sampling tools (swabbing or excision or both) were used in 29/30 studies, with most (24) using swabbing. Microbiological analysis of carcass samples was mentioned in 28/30 studies, 18 used standard plate count, seven used 3M petrifilm, and four used membrane filtration method. Our analysis concluded that there were multiple flaws in the sampling strategies of many of the studies included in our sample, potentially impacting study quality hence limiting utility in the food industries.

Biography

Omar Ahmed Al-Mahmood has completed his PhD since 2020 from Clemson University, USA. He is a faculty member in department of veternary public health, college of veterinary medicine, Mosul University, Iraq. He has published more than 7 papers in reputed journals.

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