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The effect of pre-enrichment media on the recovery and detection of *Salmonella* in feed

Current methodology for detecting *Salmonella* in feeds and feed ingredients are adapted from food safety methods. These methods do not take into account the stressed state of *Salmonella* in feed, presence of competing microorganisms nor the sample matrix. The objective was to evaluate four pre-enrichment media for the ability to maintain buffering capacity and the impact of acidic conditions on recovery. A wide variety of feed and ingredients were incubated in pre-enrichment media and pH determined at 24 hrs. It was observed that acidic conditions (pH 4.0-5.0) developed during pre-enrichment. Acidic conditions have been shown to impact the isolation and detection of *salmonellae*; however, the responses of more than 2,600 serotypes of *Salmonella* have not been evaluated. In a second study, cultures of four feed isolates (*S. Montevideo, S. Senftenberg, S. Tennessee* and *S. Schwarzengrund*) and four processing plant isolates (*S. typhimurium, S. enteritidis, S. Infantis and S. Heidelberg*) were grown on meat and bone meal before desiccation and heat exposure to induce stress similar to the feed production cycle. The survival of stressed isolates in acidic conditions (pH 4.0 to 7.0) was compared to non-stressed isolates. Cell injury was determined on xylose lysine tergitol 4 (XLT4) and death determined on nutrient agar (NA). Curve fitting techniques were utilized to determine the pH which resulted in 50% cell death or cell injury. Measured by cell death, *S. typhimurium* was the most acid tolerant and *S. Heidelberg* was the most acid sensitive in non-stressed *Salmonella* whereas *S. Senftenberg* was the most acid tolerant and *S. Tennessee* was the most acid sensitive in stressed *Salmonella*. The pH required to cause cell injury varied among isolates. The findings suggest that the pH of pre-enrichment media influences the recovery and biases the serotype recovered during pre-enrichment .

Recent publications

1. Richardson K E, N A Cox, D E Cosby and M E Berrang (2017) Impact of desiccation and heat exposure stress on *Salmonella* tolerance to acidic conditions. J. Environ. Sci. and Health, Part B., 53(2):141-144.
2. Richardson K, C Hofacre, G Mathis, B Lumpkins and R Phillips (2017) Impact of controlling bacteria in feed on broiler performance during a Clostridial challenge. Avian Disease 61:453-456.
3. Cox N A, K E Richardson, D E Cosby, M E Berrang, N Holcombe and C Weller (2017) The effect of environmental poultry samples on the pH of typical pre-enrichment and enrichment media following incubation. J. Appl. Poult. Res., 27(1):112-115.
4. Richardson K E, N A Cox, D E Cosby, M E Berrang and L DeRome (2017) Acid tolerance of dry-stressed *Salmonella*. Poult. Sci. 96(E-Suppl. 1):312.
5. Berrang M E, D E Cosby, N A Cox, J A Cason and K E Richardson (2015) Optimizing buffering chemistry to maintain near neutral pH of broiler feed during pre-enrichment for *Salmonella*. Poultry Science 94:3048-3051.

Biography

Kurt Richardson received his PhD in Toxicology from North Carolina State University (1986). His expertise is in the research and development of intervention strategies to reduce or eliminate *Salmonella* and other microbial contaminants in feed and feed ingredients, pet food and bioethanol fermentation. He has worked at Anitox for the past 30 years in the role of Chief Science Officer. He is responsible for research and development and technical support. In the field, he provides technical assistance to animal producers in the area of biosecurity and HACCP related problems.

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