

“LONE STAR PERSPECTIVE” FROM YOUR PRESIDENT

Why do we love end-product testing so much? We scientists are a logically thinking group, so I guess it just seems to be the logical thing to do. Maybe that is not the reason, however. It apparently doesn't take a Ph.D. to come to that conclusion. Even most consumers, unfamiliar with microbiology, will tell you that if you want to know if food is contaminated, just test it. Unfortunately, as we all know, microbiological sampling of food to detect presence of low levels of pathogens is often unsuccessful. Most bacterial pathogens are not homogeneously distributed in our food, so it is difficult to represent the overall level of contamination through the collection of a microbiological sample. In addition, the enteric pathogens that many of us spend our careers fighting, like *Escherichia coli* O157:H7, are most often present in very low numbers in raw foods of animal origin, when there at all. To detect them takes examination of an extremely large number of sample units from a lot, and even then, probability works against us in any associated attempt to ensure food safety. So are low numbers significant? Depends on the pathogens, but for enteric pathogens, presence at almost any level should be of concern. We cannot expect to test food and detect the presence of pathogens unless the contamination level is fairly high and we just happen to be lucky enough to hit a contaminated sample unit. Do you feel lucky?

Back in the 1980s, a group of food microbiologists was tasked with writing microbiological criteria with the goal of ensuring the



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safety of food. They published their findings in a report entitled *An Evaluation of the Role of Microbiological Criteria in Foods and Food Ingredients*. After much research and lengthy discussion, the group determined that microbiological criteria were insufficient for ensuring safety, primarily for the reasons discussed above. Assuring the safety of food from production through con-

sumption is a complicated process requiring an organized, deliberate approach to preventing and controlling potential hazards rather than detecting them. The authors of the report realized that process control and prevention was the answer, not microbiological criteria, and recommended that the Hazard Analysis Critical Control Point (HACCP) System be adopted to ensure food safety. That system is now widely accepted as the most effective and logical way to produce the safest food possible. Microbiological testing is an active and important part of a functioning HACCP plan, but it is most likely to be effectively used in verification of said plan. Included in verification activities is validation, defined by the National Advisory Committee on Microbiological Criteria for Food as the “element of verification focused on collecting and evaluating scientific and technical information to determine whether the HACCP plan, when properly implemented, will effectively control the defined hazards.” Before a HACCP plan can function with any level of assurance, it must be determined that all hazards have been identified and that the plan to control them is scientifically sound and will be effective. Validation, both of individual CCPs as well as the entire HACCP plan, is integral to determining the soundness of a HACCP plan, and it often requires a significant amount of microbiological testing.

Let's talk about raw products for a minute, specifically red meat. Microbiological testing can play a unique role in HACCP plan activities. However, in the production of red meat, it is generally agreed that detection of foodborne pathogens

is not an effective tool for monitoring CCPs within a slaughter/processing HACCP plan. In addition, pathogens are often absent from a carcass and, when present, their uneven distribution makes it difficult to obtain a truly representative sample. In contrast, microbiological testing can be applied within a HACCP plan to validate and verify the effectiveness of carcass decontamination procedures. It is important to note that on-going verification activities are more accurately conducted to verify the effectiveness of the process that will control hazards rather than to verify the safety of the food product. That is, you want to know whether the control procedures are working, whether there are actually pathogens present or not.

So why does the red meat industry spend a “gazillion” dollars sampling their end products for enteric pathogens every year? To ensure safety? I hope that is not what they are thinking, although I often get that impression from hearing comments that testing is the “last line of defense.” Sorry, testing is not an intervention. We have known for decades that testing will not ensure safety. I know consumers think testing is the best safety precaution, but as scientists, we know better.

Now don't get me wrong – I am not saying that we should not test food. I am simply saying that we need to test smarter. We need to spend our resources validating our critical control points to make sure they actually do what we say they do. We need to use testing to demonstrate the effectiveness of our HACCP plans and process control. We need to challenge our process control in innovative ways

and make sure we are controlling the identified hazards. While validation and verification of HACCP systems may initially seem intimidating, careful thought and planning can make the process logical, reasonable and extremely helpful. Many tools are available to assist, such as rapid and sensitive microbiological tests, extensive publication of research results in the scientific literature and numerous HACCP experts. The human tendency is to find a single tool that works and use it to excess; however, successful validation and verification will most likely be attained through the efficient utilization of as many tools as possible. Continuous, regular challenging of the validity of a HACCP system through verification will only serve to strengthen confidence in the ability of the process to control hazards.

So, I know exactly what some of you are thinking. If product testing is not the answer, why is it we sometimes detect the presence of a pathogen like *E. coli* O157:H7 in ground beef and thereby prevent its entry into the food supply? Isn't that worthwhile? Step back, and view the situation with a broader perspective. Do you really think we are catching all of the lots of ground beef with low levels of O157:H7 that way? It is more likely that we are just randomly detecting the low-level presence of that pathogen through the haphazard selection of a contaminated sample unit. Other lots of ground beef with low levels of contamination probably proceed through to the consumer undetected. But we already knew that, right? That's why we tell consumers to cook to 160°F. And how much time and money did

we spend on negative samples to find that one positive? It sure would have been helpful to use those resources for validation of process control. Keep in mind, I am not trying to single out the red meat industry, it is just that I am most familiar with that process, and I don't believe that we have sufficiently validated existing CCPs. I also believe that we could be further down that road except that, in our attempt to meet the demands of regulatory agencies and expectations of a well-meaning but misinformed consumer, we have wasted an enormous amount of time and money testing end products when we could have been improving process control.

Here is the question I believe we should all be asking: If we occasionally detect the presence of enteric pathogens in ground beef, why are we not concerned that our process control could be better? Obviously, the critical control points that we have in place for slaughter/processing are not sufficient to prevent the presence of enteric pathogens in a raw product (if that is even possible), so our testing simply confirms what we already know. We can't possibly be testing to ensure food safety, can we? If that is the case, it is a shame, because we have known that doesn't work for a long time now. We need to put our resources, both intellectual and monetary, to work solving problems, not just continually detecting that we still have them. And that is what *Advancing Food Safety Worldwide* is all about.

As always, please feel welcome to comment on any of my columns. I always enjoy hearing from you (gacuff@tamu.edu).