Mark Kline, (Speaker #14)
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# Questions

1. **Although rapid cooling of the nuts is the worst case scenario (stops cooking), it varies greatly from the standard process. How much is too much to vary from the process?**

It is important to complete validation studies under the worst case conditions to determine the minimum log reduction that a process can achieve; in this case rapid cooling would be worst case. If a process delivers a much slower cooling scenario, then the actual process may deliver a higher log reduction. Beyond microbial risk, a slow cooling process may increase your risk of oxidative degradation of the nuts.

2. **If pasteurized almonds require a 5 log kill, does a roasting process that achieves a 4 log kill meet the requirements for a DV-certified process?**

A 5 log kill is required for a food manufacturer to label the almond product as "pasteurized." For a DV-certified process, yes the process must deliver a minimum 4 log reduction.

3. **There is a trend by certain foodies to use raw almonds or nuts. What are their risks?**

Raw almonds in the U.S. are mandated to have gone through a sterilization treatment such as steam sterilization or PPO treatment. Unpasteurized raw almonds can only be sold in the U.S. to processors with a DVD-certified process. Raw unpasteurized nuts carry the risk of containing *Salmonella*. Consumption of nuts containing *Salmonella* can result in illness.

4. **Can cocoa butter also be used for roasting?**

There are numerous types of fat that can be used for roasting. A food processor would need to ensure that the fat is stable at the specified roasting temperatures and remain stable for the duration of use.

5. **If it is 6 log kill in peanuts, why is this not applicable to other nuts? If there is size variation, how does large nut versus small nut apply?**

The recommendation by the FDA is a minimum 5 log reduction for peanuts. This level is a recommendation, not a mandate. I do believe that a 5 log reduction is achievable for other nut types. Nut kernel size can affect the thermal process delivery.

6. **Is there a table somewhere that shows what log kill is required for various nuts and cocoa beans?**

I do not believe there is a table that contains all of the recommendations for each nut type and cocoa.

7. **What are the surrogate organisms used and what is the criteria for choosing them?**

Surrogate organisms should be nonpathogenic and studies completed to demonstrate the surrogate has a similar reduction as *Salmonella* in the selected thermal process with the

selected nut type. For example, studies have been completed on *E. faecium* NRRL B-2354 to demonstrate that it is a suitable surrogate organism for *Salmonella* Enteritidis Phage Type 30 for almonds in dry-heat and moist-air processes.

**8. How do you define the pasteurization technology as "natural," e.g. RF?**
In the context of my presentation, I defined natural as technologies that deliver a thermal heat treatment as opposed to technologies that deliver a chemical treatment such as PPO.

**9. For macadamia, how do you achieve a higher log kill and maintain sensory properties?**
With any nut type it is all about ensuring sensory properties are maintained while achieving the desired log kill. Some thermal processes alone are better suited for delivering higher log reduction than others while not compromising sensory qualities. In addition, combining multiple technologies may deliver better microbial reductions. An example would be combining steam with another process whereby the steam helps to initiate microbial reduction and the remainder of the process adds to the microbial reduction but also delivers the desired roasted nut attributes.

**10. Has the FDA mandated a specific log reduction for various nuts?**
To my knowledge it is not mandated, it is only a recommendation.

**11. What is the impact of nut moisture content on pasteurization?**
In some processes, moisture from the nuts is released and generates steam which, if retained in the process for a period of time, can aid in pasteurization.

**12. Which method yields the best micro kill?**
That's a tough question; it depends on a number of factors beyond just the roaster including the raw nut temperature, conditions in the room, desired sensory attributes (light or dark roast), etc.

**13. Do you have an opinion of what the log kill should be for cocoa beans?**
I am not aware of specific requirements for log reduction in cocoa beans but there are some international cocoa processors achieving > 5 log kill.

**14. How often is validation required?**
An inoculation challenge study should be completed when a process is first installed and before start-up is complete. The measurement of physical delivery should be completed at a minimum annually. Validation studies should be completed again if any modifications to the system occur; this can include new roaster location, motor/electrical changes or upgrades, or any other modifications that may have been made to the system.

**15. Regarding the scaling of oil roasting – would validation study be confirmed on a large production scale even though you mentioned they scale up well from bench?**
Although oil roasting studies on the bench top are more scalable than other thermal process

technologies, I would confirm the results on a production system.

**16. What are the risks of roasting multiple types of nuts together or nuts of many different sizes?**

Kernel to kernel consistency in roast color and flavor. Heat transfer will also vary based on nut size which could impact your microbial reduction.

**17. Why are bed depth and batch weight considered critical in oil roasting if oil level is monitored and does cover all nuts?**

If a system is designed to handle a certain volume or weight of nuts and you double the volume, the oil roaster heating system may not be able to compensate for the larger load. This could result in the nuts not achieving the desired temperatures by the end of the process.

**18. Does the pasteurization method choice influence the shelf life of the nuts?**

Yes. Certain nut types such as almonds are more stable (oxidatively) when roasted under low temperature, long residence time conditions. If a roasting process cannot achieve the desired log reduction with these conditions and a higher temperature is required, then the almonds will have a higher susceptibility to oxidation.

**19. If a nut processor wanted a nut with virtually no roast character, which would be the best pasteurization process?**

PPO treatment for nuts such as almonds can deliver the required log reduction while still maintaining the lack of roasted flavor characteristics of a raw nut.

**20. How do you determine batch size in roaster? Would it vary by nut type?**

Roaster anufacturers will typically build a system based on the size or throughput you desire. The batch size may vary based on nut type or product size (chopped versus whole kernels).

**21. How do the D and Z values of *Salmonella* sp. in raw peanuts compare to other sources, such as eggs? Is there a major difference in microbial load amongst difference sources or variation within raw peanuts?**

The D-value is the time required at a certain temperature to produce a 1 log reduction in the bacteria, in this case *Salmonella*. The Z value relates the resistance of an organism to differing temperatures. I am not that familiar with the *Salmonella* sp. that are relevant to egg and egg-based products but I'm sure there will be differences in these values when compared to peanuts and tree nuts. There may also be differences in microbial load amongst different sources of nuts.