Meeting the Humidity Requirements for Appendix A

By Lynn Knipe

Meeting the Appendix A requirements for humidity during cooking and smoking can be a challenge for some products that smaller meat processors make. Options for maintaining sufficient humidity to meet Appendix A requirements include: introducing steam into the oven for 50% of the total cooking time, or 1 hr. (whichever is longer); using a sealed oven for 50% of the total cooking time, or 1 hr. (whichever is longer), a relative humidity of 90% is maintained for at least 25% of the total cooking time or 1 hr. (whichever is longer). The problem is that with surface drying during cooking and smoking, Salmonella can adapt to a dry surface and later survive the final cooking steps if the surface isn't rehydrated. Dehydrated Salmonella is known to have an increased resistance to heat. This is the same food safety concern that you deal with if you make jerky.

So, if you are supporting the safety of your products during cooking using Appendix A, what do you do, when you discover that you are not meeting the requirements for the humidity option that you chose for your cooking process? One option is a relatively new concept, called Hydrated Surface Lethality (HSL) that has been identified and validated by Bob Hanson (HansonTech) and the Food Research Institute at the University of Wisconsin. Rehydration of the product surface is done by raising the wet-bulb temperature in the final steps of the cooking process, so that the wet-bulb temperature is above the product surface temperature, thus condensing moisture on the product surfaces. One option is to monitor the product surface temperature, which isn't easy to measure. However, Sindelar et al (2020) found that when a wet-bulb temperature greater than 160ºF is used, moisture will condense on the meat product surfaces, at a lethal temperature. By rehydrating the surface this way, the Salmonella will also be rehydrated and then killed in the final step of the cooking process. Gruzdev et al (2011) showed that rehydrated Salmonella were as susceptible to heat as Salmonella which had not been dehydrated on the product surface.

To accomplish this, set the wet-bulb temperature for your final cooking or smoking step at 160ºF, assuming the dry-bulb temperature is 175ºF or high in the last step of your cooking process. This process should raise the wet-bulb temperature above the surface temperature of the product, causing moisture to condense on the surface of the product, and rehydrating any Salmonella present on the product surface.

The above discussion of HSL is based upon monitoring wet-bulb temperatures, which is easy to do if your oven or smokehouse has a wet-bulb probe and displays the wet-bulb temperature continuously during cooking. Some ovens have wet-bulb probes but convert the wet-bulb temperature to % relative humidity. % relative humidity can be converted back to wet-bulb temperature, by using a relative humidity slide rule and the dry-bulb temperature of that step.

Some ovens may not have wet-bulb probes installed in them, but you can either purchase a wet-bulb probe to place in your oven or you can make your own.

Hydrated Surface Lethality (HSL) can be used, in addition to Appendix A, to support the safety of your cooking process. Please contact me if you have questions on this process, the literature citations or about wet-bulb probes at knipe.1@osu.edu