

# Food safety and Hygiene

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## Process optimization with a single screw extrusion of low moisture food

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Since extrusion is the major thermal process used in 95 percent of all pet food production, the primary issues are the retention time in extrusion thermal processing and the monitoring of the temperature along the extruder barrel as measured at the highest level in the extrusion process (Rokey, & Baldwin (2013); Pet food Industry, 2013). Salmonella is known to be extremely resistant to lethal treatments in low-moisture foods (Carrasco, et al., 2012).

The heat resistance of Salmonella is affected by many factors, mostly by strain and serotypes tested, previous growth and storage conditions, the physical and chemical food composition, test media, and the media used to recover heat-damaged cells. Salmonella heat resistance generally increases with reducing moisture (Podolak, et al., 2010). Salmonella survivor cells can enter a viable but nonculturable (VBNC) state, which is a dormant state of the vegetative cells and a survival strategy for many nonsporulating bacterial species (Podolak, p. 1927)

- Issues to consider in optimizing the lethality step against these “survivor” Salmonella cells:
- Is any unprocessed material bypassing the lethality (cooking) step (Podolak, p. 1921)?
- Since the lethal damage occurs during the dehydration process, more rapid cell destruction may occur at temperatures lower than 700C (Podolak, p. 1924).
- Are sublethally injured cells revived post-processing

treatment because of moisture (Podolak, p. 1927)?

- Could agitation of the suspension before heat treatment enhance the lethal effect of the heat process, kill step (Podolak, p. 1928)?
- Could the thermal death time be experimented with to determine optimal kill effects (Podolak, p. 1928)?
- Has the heat resistance of the Salmonella pathogen in the specific low-moisture product(s) been studied specifically, rather than applying published D- and z values from the literature (Podolak, p. 1932)?
- Was the oxygen and moisture content examined as elements of Salmonella survival of sub lethally heat-damaged cells (Podolak, p. 1927)?
- Are any aerosols created which could cross-contaminate the produce post-lethality step(s) (Carrasco, et al., 2012, p. 547)?
- Has the water and soil involved the lethality step(s) been tested for the presence of Salmonella (Carrasco, et al., p. 549)?
- Has the particle density and fat content been optimized to increase lethality (Carrasco, et al., p. 549)?
- Is there evidence of biofilm formation in the post-lethality step(s)/areas (Carrasco, et al., p. 551)?

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