

Food Safety - Botulism

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Botulism (*Clostridium botulinum*) Q & A.

Are these statements correct?

1. Botulism bacteria die at boiling.
2. Botulism spores die at 250 F.
3. Botulism toxin that is the cause of the disease dies at 185 F (below boiling) or boiling for 10min.

1. Do botulism bacteria die at boiling?

The bacterium *Clostridium botulinum* has two forms. The active form is also known as a vegetative form and the dormant form is called the spore form. Vegetative cells are much easier to destroy. Destruction is usually measured by a combination of TIME *and* TEMPERATURE – the hotter the temperature the shorter the time required to kill a given number of bacteria. There are many types of *C. botulinum* and they can vary in their heat sensitivity. But if all particles of food have reached boiling temperature (212F) then it would be reasonable to assume the vegetative cells of *C. botulinum* have been destroyed. The spores, however, would survive.

2. Do botulism spores die at 250F?

Killing spores is a time *and* temperature relationship and it is also heavily influenced by the properties of the food. This is why we do not have one process that is applicable to all low acid foods.

See here: http://nchfp.uga.edu/how/general/ensuring_safe_canned_foods.html.

The processes for low acid foods can range from 20 to 100 min at 240 to 250 F. Altitude affects the maximum temperature achieved and can thus impact processing times. Higher altitudes require longer processing times.

3. Does botulism toxin that is the cause of the disease die at 185F (below boiling) or boiling for 10 min?

The toxin is not alive so it cannot die but it can be inactivated. It is considered heat sensitive.

The CDC states (<http://emergency.cdc.gov/agent/Botulism/clinicians/control.asp>):

Despite its extreme potency, botulinum toxin is easily destroyed. Heating to an internal temperature of 85°C for at least 5 minutes will decontaminate affected food or drink.

The National Center for Home Food Preservation states:

Boiling food [outside of the jar or can is implied] 10 minutes at altitudes below 1,000 feet altitude should destroy this poison if it should be present. For altitudes at and above 1,000 feet, add 1 additional minute

per 1,000 feet additional elevation. Boiling means that you are able to see the liquid in the food actively forming large foamy bubbles that break all over the surface.

However see the message here:

http://nchfp.uga.edu/how/general/for_safety_sake.html

"This [boiling recommendation] is not intended to serve as a recommendation for consuming foods known to be significantly under-processed according to current standards and recommended methods. It is not a guarantee that all possible defects and hazards with other methods can be overcome by this boiling process."

This recommendation assumes that the jar of food does not appear spoiled and that there is a good seal.

Most food safety specialists do not think it wise to rely on "the boiling method" as a means for canning foods by procedures that known to be risky for botulism.

4. If these assumptions are correct and I had improperly canned a jar of, for example venison, then if I boiled that can for 10 min, if it had the toxin it would neutralize it and I could eat the meat without ill effect? If eaten immediately.

I would not recommend consuming a low acid food such as venison that is known to be inadequately processed. See comments to question #3 above.

5. How long does it take at rolling boil 212 F to kill Botulism spores? How many hours? There are people without access to anything except wood fires.

I do not believe this is known. As stated above even at high pressure the appropriate processing times range from 20 to 100 min depending on the food. At a rolling boil one would expect similar large variability and orders of magnitude longer times. At this point one would question the palatability of the food in question – possibly why we do not have this information. Sometimes one sees general statements that *C. botulinum* spores will survive 5 to 10 hours of boiling but this is meant as an example of how heat resistant the spores are and should not be interpreted as validated processing times.