

**FSIS Guidance on Safe Cooking of Non-Intact Meat Chops, Roasts, and Steaks
April 2009**

Temp °F	Temp °C	Time for 5.0 log Reduction	Unit Time
130	54.4	86	min.
131	55.0	69	min.
132	55.6	55	min.
133	56.1	44	min.
134	56.7	35	min.
135	57.2	28	min.
136	57.8	22	min.
137	58.4	18	min.
138	58.9	14	min.
139	59.5	11	min.
140	60.0	9	min.
141	60.6	7	min.
142	61.1	6	min.
143	61.7	5	min.
144	62.2	4	min.
145	62.8	3	min.
146	63.3	130	sec.
147	63.9	103	sec.
148	64.4	82	sec.
149	65.0	65	sec.
150	65.6	52	sec.
151	66.1	41	sec.
152	66.7	33	sec.
153	67.2	26	sec.
154	67.8	21	sec.
155	68.3	17	sec.
156	68.9	14	sec.
157	69.4	11	sec.
158	70.0	0	sec.
159	70.6	0	sec.
160	71.1	0	sec.

The required lethalties are achieved instantly when the internal temperature of a cooked meat product reaches 158 °F or above. Humidity must be considered when using this Time/Temperature table.

This Time/Temperature table is based on Thermal Death Curve for *Salmonella* in Beef Emulsions in tubes (Derived from Goodfellow & Brown¹, 1978) Regulatory Curve obtained from Jerry Carosella, Deputy Director, Microbiology Division, Science and Technology. All times that were a fraction of a minute or second was rounded up to the next whole number (e.g., 16.2 seconds for 155 °F was round up to 17 seconds).

1. Goodfellow, S. J. and W. L. Brown. 1978. Fate of *Salmonella* Inoculated into Beef for Cooking. Journal of Food Protection. 41:598-605.