

## THE RESISTANCE OF TUBERCLE BACILLI TO DRY HEAT.\*

CHARLES KRUMWIEDE, JR.

(From the Research Laboratory, Department of Health, New York.)

Although as a general rule all bacteria are more resistant to heat when dry, the degree of resistance of the tubercle bacillus to dry heat as given seems very great. Thus, Schill and Fischer<sup>1</sup> used sputum dried 98 or 142 days and failed to infect pigs after one hour's heating. A sputum dried only five days infected all the pigs after one-half hour's heating. After one hour's heating only one of three pigs became tuberculous.

Grancher and Ledoux-Lebard<sup>2</sup> conclude from their experiments, that heating to 100° C. for two or three hours reduces the virulence of cultures but does not destroy it. A comparison of these two reports shows little agreement. A repetition of the work therefore seemed advisable.

The material for the test was from eight different recently isolated human cultures on glycerine egg. The cultures were about three weeks old. The bacilli were removed, mixed, and ground up in an agate mortar. They were then dried in a thin layer in the incubator for 24 hours, the object being to approximate practical dry air sterilization with air-dried contaminated material, and again ground up in the mortar to a fine dust-like condition. This grinding was sufficient to break up clumps of any size, but not sufficient to break up the bacilli. The material was placed in narrow test tubes which were then drawn out to capillary size and bent at the upper end in an acute angle. Approximately 0.025 gm. of culture was added to each tube. The culture was therefore in the bulb-like extremity of the tube, the capillary part giving free exit of air, and the upper end—the diameter of the original test tube, but bent down—was plugged with absorbent

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<sup>1</sup> *Arch. a. d. k. Gsndhamie*, 1884, 2, p. 131.

<sup>2</sup> *Arch. de méd. expér. et d'anat. path.*, 1892, 4, p. 1.

cotton. A large pail of water was heated to boiling and the bulbs suspended in the water by hooking the bent tube over the side of the pail. The bulbs were protected from the side of the pail by a thick layer of cotton. The openings of the tubes being bent downward were protected from the steam which rose upward due to the draft in the hood. A thermometer suspended in the water registered  $100^{\circ}$  C. The same thermometer when put into a tube of the same size as used for the tests registered about  $0.2^{\circ}$  less. As this tube was open, one is safe in assuming that in the tubes with a capillary opening only, the temperature was practically  $100^{\circ}$  C.

After heating, the bacilli were suspended in a salt solution and injected intramuscularly in guinea-pigs. The results are given in the accompanying table.

Time	Pig A	Pig B	Notes
0: control.....	++++	++++	Marked generalized tuberculosis
5 minutes.....	++++	+++	Approximately same as control
10 minutes.....	++++	++++	Approximately same as control
20 minutes.....	++	++	Lesions decidedly less than in control
45 minutes.....	.....	Died acutely	No local caseation at site of injection
1 hour, 15 minutes.....	.....	.....	No local caseation at site of injection

Evidently there was already some diminution in the number of bacilli at 20 minutes. Complete destruction however took place in between 30 and 45 minutes.

Air-dried tubercle bacilli are therefore many times more resistant to dry heat than are bacilli heated in fluids or steam.