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Some Effects of Temperature Upon Development of the Oocysts of Coccidia.

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Pérard¹ has shown that while the oocysts of the rabbit coccidia are extremely resistant to chemicals, they are, on the other hand, quite susceptible to heat. For example, *Eimeria perforans* was rendered incapable of sporulating if kept in an aqueous medium at a temperature of 40°C. for one day. Eighty per cent. of the oocysts were killed within 20 minutes in water at 55°C., within 10 seconds in water at 80°C., and within 5 seconds by boiling water.

In our experiments with *E. perforans* and *E. magna* the temperatures were maintained by an electric thermo-regulator water bath which did not fluctuate much beyond 0.1°C. The oocysts were kept in a 2% aqueous solution of potassium dichromate aerated by a constant succession of bubbles of air which was humidified and equated to the temperature of the bath prior to coming into contact with the culture solution.

At 25°C. about 50% of the oocysts of *E. magna* completed the sporulation process within 84 hours, while *E. perforans* required but 48 hours to attain the same percentage of development. At 33°C. 80% of *E. magna* sporulated within 72 hours, while all of *E. perforans* sporulated within 48 hours. A comparison of both the rapidity of development and the percentage of degeneration at higher and lower temperatures indicates that 33°C. is the optimal temperature for the sporulation of oocysts of both species. At 35° and 36°C. the number of degenerated oocysts after 72 hours varied considerably in the different trials, but in nearly all cases it was at least 50%. Although the developmental process sometimes progressed to the sporoblast stage, we were unable to find any sporozoites in *E. magna* which had been kept at 36°C. for any length of time. At this temperature only 10 to 14% of *E. perforans* completed sporulation, the rest becoming degenerated.

Oocysts of both species kept at temperatures of from 40° to 50°C. inclusive for 10 minutes were capable of further development. In the case of *E. magna*, however, we were able to find only 6 sporulated oocysts in 6 tubes of oocysts which we had attempted to culture after they were subjected to a temperature of 50°C. for 10

¹ Pérard, C., *Ann. Inst. Pasteur*, Paris, 1925, **39**, 505.

minutes. At temperatures of 51°C. and above for 10 minutes the oocysts of both species were rendered incapable of further development. The thermal death point of the undeveloped oocysts of *E. magna* and *E. perforans* in a watery medium with 2% potassium dichromate is, then, 51°C.

TABLE I.
Comparison of Numbers of Oocysts that Developed and Degenerated at Different Temperatures.

<i>E. magna.</i>				
O°	Hours	Developed	Degenerated	Arrested Development
		%	%	%
10	325	0.0	100.0	0.0
12	226	0.0	90.0	10.0
25	84	50.2	10.0	39.8
30	84	60.2	20.2	19.6
33	72	80.0	10.0	10.0
35	96	40.6	50.4	9.0
36	132	0.0	100.0	0.0
<i>E. perforans.</i>				
O°	Hours	Developed	Degenerated	Arrested Development
		%	%	%
10	60	30.0	10.4	59.6
12	60	50.2	10.0	39.8
25	48	50.0	4.0	46.0
30	48	40.0	4.0	66.0
33	48	100.0	0.0	0.0
36	144	10.0	90.0	0.0

“Arrested development” represents those oöcysts that neither completely developed nor degenerated within the hours listed to the left.

The data obtained in the experiment show that the optimum temperature for the development of *E. magna* and *E. perforans* in a 2% potassium dichromate solution is 33°C., and the thermal death point of the non-sporulated oocysts is surprisingly low, 51°C.