

these males and females. It is interesting to note that the range of spread of hemoglobin is much smaller than that of India ink. This is probably due to the shorter interval between the injection of the hemoglobin and the reading of the spread. Nevertheless, the mean spread of hemoglobin in the males was 728 mm², with a standard deviation of the mean of ± 47 , while the average spread in the females was 937 with a standard deviation of the mean of ± 35 . The critical ratio of the difference is 3.6, which places it in the realm of definite statistical significance. Not enough observations were obtained on each individual family to show a significant difference between the males and females of some families.

It is plain, therefore, that the spread of particulate and diffusible substances in the skin of rabbits is a sex limited character; the females spreading both to a greater degree. The age of the rabbits tested was in all instances above 3 months and reached up to 18 months. In this age range no difference was noted in the spreading capacity of younger and older rabbits.

The sex limited nature of the difference suggested trial of the effect of sex hormones on the spread of these substances. In a few experiments, the addition of as much as 50 international units of theelin to the standard dose of India ink or hemoglobin had no significant enhancing effect on their spread in the skin of male rabbits. Whether the greater spreading capacity of the skin of female rabbits for these substances is associated with a lower resistance to tuberculosis has not yet been determined.

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Oxygen Consumption of the Parts of the Amphibian Gastrula.*

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Interest in the organizer has led to the determination of its oxygen consumption and the results of various investigators do not agree. Brachet,¹ Brachet and Shapiro,² and Fischer and Hartwig,³ agree that the dorsal lip exhibits a higher rate, while Waddington, Need-

* Aided by a grant from the Rockefeller Foundation.

¹ Brachet, J., *Arch. de Biol.*, 1934, **46**, 25.

² Brachet, J., and Shapiro, H., *J. Cell. Comp. Physiol.*, 1936, **10**, 133.

³ Fischer, F. G., and Hartwig, H., *Biol. Zent.*, 1938, **58**, 567.

ham and Brachet,⁴ and Boell and Needham⁵ report that the rates of O₂ consumption of the dorsal lip and ventral ectoderm are identical.

This seeming contradiction of results led to the present investigation. In one set of experiments the early gastrula was opened up and the roof of the blastocoel cut into 4 regions. Piece 1 contained the region just above the dorsal lip; 2 was composed chiefly of presumptive neural plate; 3 was chiefly presumptive epidermis, and 4 some epidermis and some cells which would give rise to the ventral lip. Numbers 1 and 4 were chosen carefully so as to contain about the same number of light-colored yolk cells and the regions were cut out so as to be in the same relative position to the equator of the gastrula. In some cases the oxygen consumption of the mass of large yolk-laden endoderm cells was measured.

In the second series of experiments the roof of the blastocoel was cut into 3 parts. Measurements of O₂ consumption were made by a modified Winklers method and the pieces dried and weighed on a micro balance. The results are given in mm³ of O₂ per hr per 100 mg dry weight.

The results, Tables I and II, show clearly that a gradient in respiration is obtained on the ventral side of the gastrula ranging from 21.2 to 10.3 to 4.1. (Table I, *Rana pipiens* pieces 3, 4, 5). On the dorsal side, however, the respiration rate does not fall off so much with the result that the dorsal lip respire at almost the same rate as the presumptive epidermis. The dorsal lip consumes more oxygen than the ventral lip (Table I, pieces 1 and 4; Table II, pieces 1 and 3). The yolk-laden cells which give rise to endoderm respire at a very low rate.

Since there is a gradient in the amount of yolk in the cells of the gastrula, with the greatest amount present in the cells at the vegetal pole and least amount in the cells at the animal pole, it is not surprising that variable results are obtained when comparing the respiration of the dorsal lip with some other region of the gastrula. The dorsal

TABLE I.

Part extirpated	mm ³ of O ₂ /hr/100 mg dry weight		
	<i>Ambystoma punctatum</i>		<i>Rana pipiens</i>
1. dorsal lip	21.4	19.2	16.9
2. presumptive neural plate	23.8	20.4	28.6
3. presumptive epidermis	20.1	18.2	21.2
4. ventral lip	13.7	10.4	10.3
5. endoderm cells			4.1

⁴ Waddington, C. H., Needham, J., and Brachet, J., *Proc. Roy. Soc. Lond.*, 1936, B **120**, 173.

⁵ Boell, E. J., and Needham, J., *Proc. Roy. Soc. London*, 1939, B **127**, 363.

TABLE II.

Part extirpated	mm ³ of O ₂ /hr/100 mg dry weight			
	<i>Ambystoma punctatum</i>		<i>Rana pipiens</i>	
1. dorsal lip	23.2	33.6 31.6	22.4 19.3 18.5	23.0
2. ectoderm	26.0	27.4 27.9	23.3 23.1 28.0	28.5
3. ventral lip	15.4	20.6 20.6	13.8 14.5 13.8	18.9
4. endoderm cells				7.7

lip forms in the vegetal half of the blastula where the cells contain larger amounts of yolk than in the animal half. This yolk does not respire and so determination of O₂ consumption will necessarily be low in this region. The O₂ consumption of the dorsal lip will then be greater than, equal to, or less than some other region of the gastrula, depending on the amount of yolk in the region which is used for comparison.

It is further clear that little or no interpretation can be placed upon the measurements until the gradient of yolk content is determined so that the oxygen consumption of the active protoplasm may be calculated. All that can be said is that the dorsal lip in spite of its yolk content exhibits a relatively high rate of O₂ consumption.