mals that have recovered from a severe generalized tetanus show practically no antitoxin in their serums, but are immune to the type of organism that produced the primary infection. They are not immune to the other types.

Our results show that antitoxin plays little part in immunity to tetanus, but that there is another immune body or bodies *specific for type* which prevents infection. As yet we have not attempted to determine the nature of these anti-bodies. Tulloch, working with type sera produced by the injection of whole cultures, has shown that they markedly stimulate phagocytosis, and that this property is specific for type. It seems likely that our sera also act by stimulating phagocytosis. It is suggested that serum for the prevention and treatment of tetanus would be of greater value if the animals used for its production were injected with different types of tetanus bacilli in addition to the toxin.

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The hatching phenomena of Clonorchis ova.

By O. K. KHAW. (Introduced by E. C. Faust).

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Ova of *Clonorchis* have a high specific gravity, as they sink in concentrated saline solution within one-half hour, and in pure glycerine (Sp. gr. 1.26) in 48 hours. The shells show markings of an arabesque pattern, best brought out by staining with weak potassium permanganate of toluidine blue. They contain fully developed embryos at the time of discharge from the worm. In spite of these facts, under experimental conditions which may also hold true in nature, they would not hatch out but would degenerate if left undisturbed. Various external factors may operate upon these eggs either singly or in conjunction. The more important of these are as follows:

(a) Mechanical, *e. g.,* pressure of needles in teasing out the eggs; the pressure of cover-glass, or the running in of H_2O under the latter and subsequent streaming with filter-paper. A heavy

pressure short of crushing the embryo, on the cover-glass, will cause the lid to give way and the embryo to be thrown out passively. A light pressure, *e. g.,* touching with the point of a teasing needle, on the other hand, will waken the dormant larva and set its cilia in motion, with the body alternately contracting and extending. Rolling, thrusting and corkscrew movements have been observed, but round-about-turns, as seen in the case of *Schistosoma* larvæ, have never been noticed. The perfectly tight fitting nature of the hard shell would not admit of this. This attempt is often attended with success, but sometimes with failure. In the former case, one side of the operculum would be seen to give way by a forward thrust, aided no doubt by increasing internal pressure, through the opening of which the larva would launch forth, spine foremost, like a torpedo out of a man-of-war.

In nature, the dropping of feces during defecation from a height into the water; the currents carrying the ova to and fro, bringing them into impact with hard objects, and tidal and other washings, if present, may play the rôle of such a mechanical factor.

(b) Physically, the tonicity of the water may help the process of hatching, as evidenced from experiments with saline concentrations. Under natural conditions, the process of concentration, being maximum at water margins of ponds where ova are likely to be deposited, may be brought about by evaporation in the day time. The subsequent dilution by infiltration of tide or of surface water may lead to eggs absorbing the water with consequent popping off of the opercula.

(c) The sudden changes of temperature form another factor. Sudden freezing and thawing, and abrupt raising of temperature from 26° to 36° C. have been shown experimentally to cause spontaneous hatching. This may operate in nature in North China where difference of maximum and minimum temperature is great.

(d) Of the factors working deleteriously on the embryos in the ova, the reaction of the medium is an important one. Alkalinity equivalent to 0.1 per cent NAOH would sterilize the eggs in an hour, as would also acidity corresponding to 0.1 per cent HCl. In alkaline urine and nightsoil mixtures embryonated eggs would perish in two days at room temperature (26° C.) The

fermentative processes found in nature would work in the same way.

Drying is extremely detrimental. A few seconds' exposure would kill the embryos instantaneously. If they were covered with slime, their lives may be a little, though not appreciably prolonged.

Of cheap chemical sterilizers, 5 per cent saturated NaCN would be fatal to embryonated eggs in 90 minutes, and 0.025 saturation of $Ca(ClO)_2$ would suffice in half that time.

In conclusion, spontaneous hatching takes place under the following experimental conditions: (1) alternate freezing and thawing; (2) sudden raising of temperature, *e. g.,* from 26° C. to 36° C.; and (3) the suitable adjustment of the hypertonicity of the medium, *e. g.,* exposure to 6.25 or 3.15 per cent NaCl for a few minutes, followed by dilution with *aqua dist.* to lower it to isotonicity.

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Abnormal development of the nasal cavity of dogs due to interruption of the respiratory current.

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Only one experiment on the influence of the respiratory current on the growth of the nose was found in the literature, and this had been incompletely reported. In clinical material the conditions are too complex to bring into sharp contrast the effects of different factors.

The respiratory current was interrupted on the left side of the nose of eleven puppies by introducing cotton through a window cut at the dorsal end of the hard palate. Freshly weaned animals were used, and the experiment continued in most of the series for 46 days. During this period the face is growing rapidly. Packing was changed daily, and the animals maintained in excellent health.

In six dogs the conchæ showed markedly incomplete develop-