

## Foot-and-Mouth Disease.

THE ravages of foot-and-mouth disease in Great Britain during the past few years, though now, happily, declining, yet lend great importance to the discovery of methods of prevention and cure less drastic than the slaughter of all affected animals. Although in its second progress report,<sup>1</sup> the Foot-and-Mouth Disease Research Committee is unable to prescribe certain means of prevention and cure, the results already achieved suggest that in the future such may be discovered; thus the experiments described on methods of destroying the virus and on immunity to it in animals point the way to possible means by which these ends may be successfully accomplished.

Work on the disease is hampered by the fact that the causative agent has not yet been seen, nor has it been cultivated on artificial media. Further, it appears that there are at least two types of the virus, and infection with one, though producing immunity to this type, usually does not result in immunity to the other. The virus can only be recognised by the effects it produces in a susceptible animal such as the guinea-pig, which is chiefly used for this purpose. The same animal also serves as a useful source of the virus, since after several passages through guinea-pigs, the fluid obtained from the vesicular lesions of the disease contains virus of a very high potency, as shown by the fact that the fluid may still be infective when diluted even to 1 in 10 million.

The spread of infection of foot-and-mouth disease must depend on the natural resistance of the virus and the presence of susceptible animals. Various species which might carry the infection to cattle have been examined: rats and rabbits are relatively resistant; lesions can be produced by inoculation, but the disease does not spread from one animal to another. Cats, dogs, and hedgehogs can also be infected: no contact infections were seen, although the mortality among kittens and puppies was very high. Birds, however, were found to be insusceptible to inoculation. It is therefore probable that infection of cattle does not, at any rate easily, take place by contact with other animals: in fact, cross-infection experiments with guinea-pigs were negative unless the vesicles on the guinea-pig's feet were opened and allowed to discharge over the fodder, etc., of the cattle.

A large number of experiments were performed on

the survival of the virus under a variety of conditions. It was found that in buffered phosphate solutions of neutral reaction, potency was only slowly lost in the cold: in 50 per cent. glycerine, containing a little of the phosphate solution, the virus may also remain active for more than six months. When dried on glass slides the virus soon lost activity, especially if kept in a moist atmosphere, but on other materials the potency might be retained for a longer period, especially on hay or an infusion thereof. Carcasses of guinea-pigs, cattle, and pigs may remain infective for several weeks, especially the bone marrow. Burial with lime or salting of the carcase does not alter the period of infectivity in this tissue. The virus is destroyed by exposure to a temperature of 55° C. for about twenty minutes, by light, but not easily by chemical reagents: the most useful antiseptic is probably 0.1 per cent. commercial formalin, which always destroys it in two days at 26°-27° C.

Immunity is produced by an attack of the disease, which in the guinea-pig lasts about four months and in cattle about a year. After this period, 'partial' immunity is still present, since intracutaneous inoculation of the sole of a foot in the guinea-pig will produce local lesions, whilst intramuscular inoculation is quite ineffective. In the susceptible guinea-pig, as in cattle, there is always a difference between different sites of inoculation in the ease with which infection can be produced: thus intracutaneous inoculation or scarification of the mucous membrane of the mouth is a much more certain means of infecting than intramuscular injection. Complete passive immunity in the guinea-pig has not been produced, the injection of serum from a recovered animal giving only 'partial' immunity. Complete (active) immunity by inoculation of living virus can be produced, but the results are not very certain and an actual attack of the disease may result. On the other hand, inoculation with a formalised vaccine regularly produces 'partial' immunity in the guinea-pig, and 'complete' immunity may follow a further inoculation of living virus: this formalised vaccine is being tested for its protective powers in cattle against natural infection with foot-and-mouth disease. Another method which may be of use in the protection of cattle is to inoculate first with serum and then with the living virus. These observations suggest possibilities of the ultimate protection of farm animals, which are encouraging and may form the basis of future work along these lines.

<sup>1</sup> Ministry of Agriculture and Fisheries. Second Progress Report of the Foot-and-Mouth Disease Research Committee. Pp. 117. (London: H.M. Stationery Office, 1927.) 3s. net.

Recent Studies of Skilled Performances, with Reference to the Transfer of Training.<sup>1</sup>

By Prof. T. H. PEAR.

THE popular descriptions of a person as 'clever with his hands,' or 'clever with his head,' raise some intricate problems for physiology and psychology, and in the sphere of applied science, for education, industry, and sport. For the latter vague phrase the concept of 'intelligence' has been substituted, with substantial empirical support. Tests of intelligence give results which correlate highly with each other. For the former phrase, attempts to substitute the concept of 'motor ability' (strictly speaking, of motor capacity) have met with unforeseen

and interesting difficulties. For while there seems ample evidence for the existence of a 'general intelligence,' the results of simple tests for isolated motor performances as far as possible excluding intelligence, show extremely low or even negative correlations with each other. Results along these lines corroborating earlier work by Wissler have been obtained by F. A. C. Perrin and Bernard Muscio. Moreover, in these investigations there seems to be no support for a belief in the correlation between simple motor abilities and 'intelligence.'

From such results, far-reaching inferences have been drawn, as that there is no 'general motor

<sup>1</sup> Substance of a paper read before the Manchester Literary and Philosophical Society on April 26.