FOOT-AND-MOUTH DISEASE; ROLE OF SWINE AS RESERVOIR OF VIRUS; DIAGNOSTIC AND CONTROL METHODS FOR FOOT-AND-MOUTH DISEASE OF SWINE

by

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I) THE EXTENT OF FOOT-AND-MOUTH DISEASE IN PIGS

Foot-and-mouth disease (FMD) attacks cloven-footed animals (Ungulata, Artiodactyla). The Bovidae (cattle, zebu, buffalo) are the most susceptible but swine are by no means immune. In all European countries where the disease is of more or less regular occurrence, as in Belgium, France, Germany, Great Britain Greece, Italy, the Netherlands, Poland, Portugal, Turkey, U.S.S.R. and Yugoslavia, it is usual to meet with epizootics involving swine. In south-east Asia, however, swine FMD, particularly when compared with that among cattle. is relatively rare. Except at Hong Kong, where industrial-scale herds on the European model are to be found in many cases, using tankage or garbage from human food in the feed, outbreaks of the disease are few and far between. In 1960-61, there were only 242 cases of swine FMD in Thailand, 100 in Vietnam, and the odd case in Indonesia. During the same period, 142 outbreaks were reported at Hong Kong, involving 2627 swine. In 1962 Thailand had only 4 outbreaks, (total of 483 animals affected, while in the same period Hong Kong had 188 outbreaks among swine (707 affected) as compared with 14 outbreaks among cattle (involving 300 head).

There is no doubt that this apparent infrequency of the disease among swine, in countries where it is enzootic among cattle, is in some way related to the conditions in which the animals are raised. Indigenous Asiatic swine, just as, obviously, the improved European breeds (imported or bred locally), are normally susceptible, a fact which has many times been verified in the Nong Sarai foot-and-mouth disease laboratory. The enzootics occurring in Hong Kong remain a conclusive example of such susceptibility.

But stock-raising conditions are in perpetual process of change. The food needs of a constantly expanding population inevitably call for industrial-scale stock raising, in which all slaughterhouse by-products and all the refuse from food for human consumption (waste waters and swill) are put to use. In other

words, swine FMD is a potential danger in the Far East, being one of that group of diseases which Charles Nicolle prophetically, as so many events have shown– once called "**diseases of the future**". So much so that before long, it will, in all likelihood, be impossible (as this would demand too radical a change in ingrained habits, and only experience acquired on the spot can dictate the form such a revolution would have to take to combat the dangers of the persistence of FMD virus in meat whether fresh, chilled, frozen or even salted- a truth which has been demonstrated by so many research workers over the last decade.

II) CHARACTERISTICS OF SWINE FOOT-AND-MOUTH DISEASE

It is a well known clinical phenomenon that swine FMD, particularly as found in the Far East, principally affects the animal's hoofs. The aphthae usually appear around the coronary bands of the main claws and even on the dew claws, as also on the footpads. The claws even fall out in many cases. Aphthae are sometimes found in the snout as well, though few animals are affected in this way. Vesicles in the mouth or on the tongue are exceptional, a fact which has been observed in Hong Kong as well as in Thailand and in connection with types O and A or Asia I virus. At the Nong Sarai laboratory, experimental evidence goes counter to the above clinical observations; intradermolingual injection of Asia I virus in swine has never been followed by local reaction at the injection site, though this has not prevented secondary vesicles appearing on the feet.

In 1958 Brooksby, in a paper synthesizing what was then known about FMD, pointed out that the virus could become adapted to swine. The earliest record in this connection was made in Germany by Wildmann, who observed that certain strains infecting swine had little effect on cattle. Brooksby sums up his own experience by saying that the degrees of adaptation cover the entire range from the exclusively bovine to the exclusively porcine strains. Host adaptation in the case of swine is again demonstrated by a whole series of phenomena: higher infectivity titer in swine than in cattle, and the impossibility of (a) keeping the strain isolated from swine alive by means of serial passaging in cattle, (b) infecting cattle by contact with swine (the converse also being the case) and (c) infecting swine, in the case of certain strains, by contact with cattle that have the disease.

The above assertions find abiding corroboration at Hong Kong. Thus, in 1962 alone there were four epizootics originating from swine and affecting cattle and five of bovine origin affecting swine. A further six epizootics affecting

one or other of these two species, **but not both**, in the same village were recorded.

More recently, in 1962, Lucan, Dhenin and Fedida noted that there seemed to exist in a given swine population a certain number of **non-susceptible animals** where the FMD virus was concerned, the phenomenon being explained by a sort of non-receptivity rather than by immunity conferred by an earlier infection or the possession of passive immunity transmitted through the colostrum. The same authors cite an observation of Bohne's to the same effect, showing that in an area in which a swine FMD epizootics was raging, 25 percent of the non-vaccinated animals did not contract the disease. A similar case occurred in Thailand in 1962. Four outbreaks were recorded, involving 483 out of 838 involved animals, i.e. only 57 percent.

It is curious how, in an area where the disease is enzootic, swine FMD may **take on a sporadic, even individual character such as to make its diagnosis unlikely unless the laboratory were able to type the virus involved.** This has been brought out at Hong Kong by Riddel-Swan. Thus, during 1962 at the Castle Peak animal husbandry station run by the government, a boar in a pen with 142 other swine was found, on 24 Obtober, to have FMD. On 30 october a second case was reported among their number, thus making 2 out of 142, everything thereafter becoming normal again. The contamination was traceable to a nearby village. Many similar observations were made: thus: Ho Chung village: there was 1 animal with FMD among 1250; Dairy Farm: 1 affected (type 0 virus) among 16 sharing the same pen and 4 out of a total of 63 on the entire farm, Chuk Yuen village: 13 out of 870 with type O; Lin Fa Tei village: 20 affected out of 580. At all events, many outbreaks affected only a very limited number of animals (outside the cases quoted above, only 275 out of 3150 swine, i.e. 8 percent, were diagnosed as having the disease).

Lastly–and this is a more alarming matter–Werner Uhlmann reported that type C virus, which was most prevalent in the epizootic in Germany in 1962 was responsible for the disease among swine, **without typical FMD lesions**, so that, as the same author emphasizes, the ailment is often not recognized as foot-and-mouth disease, engendering the illusion, therefore, in areas hitherto unaffected, that it does not even exist. And yet it has been proved that slaughtering swine in those areas has contributed to the spread of FMD, both via the placing of the pork meat on the market and due to the fact that

slaughtering is a task performed **by human beiugs** who in some way become carriers of the disease. Thus, Uhlmann adduces ungainsayable proof that swine may be a reservoir of the virus, the more dangerous in some cases by the very fact that it gives rise to no outward symptoms.

This hypothesis of apparently healthy swine as a reservoir of the virus is abundantly verified in that both in Belgium and at the Pan–American Foot–and–Mouth Disease Center, Rio de Janeiro, it has proved possible to isolate many times over the FMD virus from kidney tissue cultures from (seemingly) healthy swine.

III) SWINE VACCINATION

Now, if swine react in peculiar ways to the actual disease, the same is true when it comes to vaccinating them against FMD. For a long time now, the European Commisson for the Control of Foot–and-Mouth Disease, an FAO–sponsored body, has been driving home this point of the difficulties described here in the attempt to arrive at some means of effective protection of swine against FMD Thus, in the Report of its Fifth Session, Rome 1958, attention was drawn "to the spread of foot–and-mouth disease in pigs in areas in different countries in which the cattle population has been vaccinated and (had) not shown evidenee of the disease. The need for an efficient vaccine for the immunisation of pigs (was) again stressed."

At its Ninth Conference, in 1960, the International Office of Epizootics, OIE, Foot and Mouth Disease Commission, placed the question of the vaccination of swine against FMD on the Agenda. On that occasion, Willems pointed out the divergence between field practice and laboratory practice. Fogedby went further, and said that even in the laboratory it was virtually impossible to render swine immune.

Again the European Commission for the Control of Foot-and-Mouth Disease recorded in the report, this time of its Eighth Session in 1961, "the (Executive) Committee again directs attention to the part played by pigs in the spread of foot–and–mouth disease and to the difficulty of immunising pigs with the current vaccines."

The same Commission, at its Ninth Session, in 1962, reported: "Results of the use in pigs of vaccine prepared from virus of bovine origin (were) somewhat conflicting. For example, while vaccine types A and C were quite unsatisfactory in Italy, there was evidence from Belgium that vaccine C was

effective in suppressing an epizootic in pigs, although immunity was of relatively short duration." Again, experimental work in Denmark with a new (oil) adjuvant gave cause for considerable optimism, though the aluminium hydroxide–absorbed vaccine at sufficient concentration gave satisfactory results. The Commission nevertheless emphasized that no effort should be spared in developing a suitable vaccine for swine.

While attempt is now being made to treat swine with attenuated cattle virus–vaccines, it is clear that the latter retain all their pathogenicity for swine, as Cunha and Guerreiro report in the case of lapinized virus. The same is true, according to Schmidt. with virus adapted to embryonated eggs. Palacios and Fuentes maintained that virus adapted to day-old chicks would be infectious for swine, even by contact. Finally, according to Brooksby, the same is true for virus attenuated by passaging in mice, though this worker excepts a mouse–attenuated SAT 2 strain as being completely innocuous, at the same time offering a high immunizing power for swine.

At the Nong Sarai foot-and-mouth disease laboratory, experiments on swine vaccination are currently being conducted. Provisional conclusions confirm the difficulty of providing complete protection for swine with the classic attenuated vaccine in spite of the latter being completely effective for cattle. It should be noted, however, that double vaccination (a second injection one week after the first) has achieved protection of three quarters of the swine against very severe laboratory challenges.

While on the subject of attenuated virus, it should be remembered that Nong Sarai has developed a saponinated virus-vaccine against Asia I which is very active when inoculated in cattle. The same virus-vaccine has also proved **innocuous to and able to immunize swine.**

IV) DIAGNOSIS

While swine FMD in the Far East (except in Hong Kong) is not a serious matter from the economic standpoint, it may well become so. Veterinarians must therefore be able to diagnose it early both from the standpoint of the animal species involved (the outbreak requiring to be identified), and of taking general prophylactic measures, the latter being concerned chiefly with the protection of large livestock. It is absolutely essential therefore, for one to be very much alive to the peculiar characteristics of the disease among swine. Here it must

be emphasized that swine FMD principally affects the claws, and generally claims as its victims only some of the animals in a given place-even to the point of of affecting only "individuals" and not the herd in areas where it is enzootic. It may sometimes appear in an atypical form. "Herztod" disease (cardiac degeneration), or in a non-apparent form, though in either case is still contagious for large animals. Therefore, at all times, and particularly in suspected cases, clinical dianosis must be backed up by laboratory tests. Usually, one whould send to the veterinary laboratory samples taken from the vesicles, whatever their site; and, in doubtful cases, the laboratory must be sent one of the long bones for clinical examination.

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อยากได้ดี	ไม่ทำดี	นิ่มมาก
ดีแต่อยาก	หากไม่ทำ	หน้าขำหนอ
อยากมีดี	ต้องทำดี	อย่ารีรอ
ดีแต่ขอ	รอแต่ดี	ไม่มีเลย

ลอกจาก "อย่ากดี"

ของ

พระธรรมวโรดม

วัดสังเวชวิศยาราม