REPORT OF THE

MEETING OF THE INFORMAL WORKING GROUP ON THE REGIONALIZATION OF FOOT-AND-MOUTH DISEASE VACCINE PRODUCTION

Held in Rome, Italy
8-10 July 1974

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Meeting Report AGA 1974/4

REPORT

of the

Meeting of the Informal Working Group on the Regionalization

of Foot-and-Mouth Disease Vaccine Production

held in

Rome, Italy

8-10 July 1974

Food and Agriculture Organization of the United Nations

Rome, 1974

A meeting of an Informal Working Group on the Regionalization of Foot-and-Mouth Disease Vaccine Production was convened by FAO and held at FAO Headquarters, Rome, Italy, from 8-10 July 1974.

The Working Group consisted of Dr. J.B. Brooksby (United Kingdom), Dr. M. Jensen (Denmark), Dr. N. Muntiu (Romania) and Dr. L. Nardelli (Italy), with Dr. M. Contardo (EEC) and Dr. R. Vittoz (OIE) present as observers.

FAO was represented by Dr. H.A. Jasiorowski, Director, Animal Production and Health Division; Dr. R.B. Griffiths, Chief, Animal Health Service; Dr. G.M. Boldrini, Secretary, European Commission for the Control of Foot-and-Mouth Disease; and Miss Doris D. Guarino, Administrative Assistant to the Commission. Dr. H. Girard, Project Manager, FMD Institute, Ankara, Turkey, was also present.

Dr. J.B. Brooksby was elected Chairman of the Meeting.

I. The following agenda, as presented, was adopted:

1. Adoption of Agenda

2. Position of foot-and-mouth disease control and prophylaxis in various regions of Asia (including the Near East), Africa, southeastern Europe, South America

3. Proposed strategy of action by sponsoring and supporting diagnostic and vaccine production centres; the problem of recruitment and training of vaccine production specialists

4. Approximate costs of technical installations for:

   (a) diagnostic and epidemiological work

   (b) pilot unit for vaccine production

   (c) industrial production of vaccine

5. Any other business.

The meeting was called to provide guidance for FAO on policies to be adopted for the regionalization of foot-and-mouth disease (FMD) vaccine production. Whereas it has been possible in the past for a very few production centres to meet the requirements of the developing countries in the various regions of the world outside South America, the situation is changing. Expanding livestock improvement programmes, involving the breeding and multiplication of more productive stock, and the interest of many developing countries in exporting live animals and meat, are causing serious attention to be paid to FMD by countries which hitherto have not practised any significant control. It seems likely, therefore, that the demand for FMD vaccines will rise markedly over the next few years.

While it may be argued that production capacities in existing laboratories could be increased to meet this future demand, some of these laboratories supply more than one region of the world. There are political, economic and animal health aspects which make self-sufficiency in vaccine production desirable on a national, subregional or regional basis in each world region. This does not imply that all developing countries are in a position to embark on vaccine production since it entails complicated laboratory procedures, including innocuity and potency testing.

The criteria governing national vaccine production are:

i. the existence of a national diagnostic facility and adequate surveillance of the types/strains of FMD virus occurring in the country;

ii. sufficient demand for vaccine to ensure economic production;

iii. a capability to undertake vaccine production by modern methods;

iv. an infrastructure of field services to enable the vaccines to be applied in a controlled and continuing campaign.

Where conditions (i) and (ii) cannot be met, countries should call on regional or subregional centres equipped to provide diagnostic services and vaccines for the limited prophylactic programmes which such countries may be able to undertake.

Regional or subregional centres should be established in countries where there is an acceptable,but not necessarily complete, national capability for dealing with FMD. Where necessary, external finance should be sought to ensure that total national needs are satisfied and that additional funds are available in order to meet regional or subregional requirements. There are considerable possibilities for support from various development funds and from the international banking system.

The importance of vaccine production by private commercial firms must also be recognized. It is important that these vaccine manufacturers shall be allowed to operate in regions where the vaccine requirements cannot be met by national production centres.

II. Position of FMD Control and Prophylaxis in Various Regions of the World

The meeting considered the present position of FMD control and prophylaxis throughout the world with a view to assessing the needs of various regions both for assistance in their campaigns against the disease and for the initiation of new campaigns in those countries which have become aware of the problem facing them. The diversity of situations encountered is illustrated in the review which follows.

North America

With no outbreak since the Canadian episode of 1952, the situation is good and every effort is being made to keep the disease out of the North American continent. Nevertheless, it is realised that under conditions of intensive livestock management outbreaks would create a very difficult situation. Therefore, the Government of the U.S.A. have made plans to produce vaccine against such an emergency.

Central America

Central American needs are covered by the OIRSA Agreement. Initial diagnosis would be the responsibility of the Pan American Foot-and-Mouth Disease Center in Rio de Janeiro.

South America

Programmes in South America are dealt with by the Pan American Health Organization (PAHO) and COSALFA (Comisión Sud-Americana para la Lucha contra la Fiebre Aftosa). Diagnosis and vaccine production are the responsibility of individual countries, while training and coordination are provided by the Pan American Foot-and-Mouth Disease Center and COSALFA.

Europe

European countries undertake their own campaigns against FMD. The major problem at present is that posed by the threat of invasion particularly into eastern and southeastern countries, including Turkey, by exotic strains or types of virus.

Self-sufficiency in vaccine production should be the aim of the southeastern countries of the European continent, especially those which are more likely to be involved in exotic virus infections such as Bulgaria, Romania, Greece and Turkey. Self-sufficiency is understood to be the development of a production capacity of monovalent vaccine to cover, within a three month period, the entire susceptible population of a country. The decision by Turkey and Romania to attain a production capacity of 100 million and 72 million monovalent doses respectively was supported by the Working Group.

Africa

The continent was not discussed country by country but rather in broad regional terms.

In North and North-west Africa (e.g. Tunis, Algeria and Morocco) the disease has received relatively little attention. Sporadic outbreaks have occurred but typing of the viruses has so far not revealed any exotic strains. Vaccines of European origin have been used to a small extent. The apparent low economic importance of the disease in the region coupled with low incidence suggest that no additional action is required at present.

Egypt is developing FMD control on a national basis and is assisted in this by FAO in a project supported financially by the United Nations Development Programme. This programme which is important for the agricultural development of the Nile Delta is to be expanded.

Sudan is anxious to develop a control programme and to create a disease-free zone. The capability shown by Sudan in the production of vaccine against other animal diseases suggest that FMD vaccine should be prepared without much difficulty. The Sudan might in due course provide a subregional centre to supply vaccines to countries in the area where little or no facilities have yet been developed.

In Ethiopia, FMD control can only be envisaged in limited areas because of the lack of veterinary manpower and because of the magnitude of the problem. There has been some local development of diagnostic facilities and some vaccine has been obtained from other countries.

The situation in Kenya is encouraging. FMD diagnosis and vaccine production are carried out efficiently and the application of vaccine in the field is well controlled. A zone free from FMD has been established. Kenya could considerably expand her vaccine production. Security arrangements have been strengthened, making it possible to produce vaccines other than those from indigenous strains. Such action is to be recommended, and this could provide a source of vaccine for many countries in the region.

Tanzania has shown interest in developing a disease-free zone and in producing vaccine locally. Limited diagnostic facilities exist at a laboratory concerned with general diagnosis and miscellaneous vaccine production. It would be preferable to have a separate laboratory for vaccine production. Difficulties may arise in providing staff for field campaigns.

Central Africa

In countries such as Zambia, Malawi, Mozambique and Angola, information on virus types is available in the records of the World Reference Laboratory for Foot-and-Mouth Disease, Pirbright, United Kingdom. Vaccination has been limited and is unlikely to be expanded in the near future. This is a case where a regional source of supply, e.g. Kenya, would be of great advantage.

Southern Africa

South Africa will establish a diagnostic and vaccine production laboratory within the next few years. This project should aid both South Africa and neighbouring countries.

West Africa

A recent increase of incidence of the disease in West Africa is causing some concern in the countries of the area.

Asia

Near East. This is a complex and important area in FMD control. In general, the interest shown in the region, especially between epizootics, is not great. Diagnostic and typing facilities exist only in Iran and in Israel; and the same applies to vaccine production. Iran is in the process of establishing new facilities which will enable the examination of samples from all countries in the area to be undertaken. Vaccine production capacity for other countries in the region is also planned as new security measures come into operation.

Iraq intends to construct facilities for both diagnosis and vaccine production.

Afghanistan uses limited quantities of vaccine and there seems to be little prospect of extended campaigns until livestock improvement is further advanced. A similar situation prevails in the Lebanon, Jordan and Syria.

There is a prospect of increasing surveillance in the region as a result of the continuation of the activities of the Near East Animal Production and Health Development Centre. With this, and further Iranian participation in the programme, improved control and prophylaxis should be achieved.

Pakistan, India and Sri Lanka

In Pakistan, control is receiving the attention of the Government with the establishment of diagnostic facilities and plans for vaccine production. The problem is, however, extensive and little immediate progress can be expected.

India has made a systematic attempt at control in recent years with assistance from Denmark. In Bangalore and Poona, laboratories with respective capacities of 16 and 24 million monovalent doses a year should be in operation by 1976. Three other projects have been planned. Multiple diagnostic centres are being set up; but it would be advisable for a reference laboratory to be established to coordinate their efforts. This could be located in Bangalore and technical assistance should be sought.

Nepal, Sikkim and Bhutan should not be considered until results are obtained from the project in India.

Sri Lanka. A limited campaign may be financed by SIDA. This would have value as a demonstration trial.

Thailand has already established diagnosis and production laboratories. These have functioned well in providing information on the virus types present and in supplying vaccine to protect the free areas in the south. The campaign could with advantage be intensified, working towards eradication of the disease and providing assistance for other countries in the region. The Government of Japan are providing assistance for the production of vaccine.

Burma is not yet in a position to launch a large-scale control programme. The situation in the Khmer Republic, Viet Nam and Laos is somewhat similar and it is unlikely that there will be a need in the short-term to establish centres in these countries. In these circumstances, the expansion of the laboratory in Thailand to equip it to serve as a regional centre is strongly recommended.

Indonesia is at present considering a renewed campaign to eradicate the disease from the island of Bali and later from other areas. Initially, it is proposed to purchase vaccine while local production facilities are being established at the laboratory at Surabaya. This programme will be supported by the Government of Australia and training is also to be provided by the World Reference Laboratory for Foot-and-Mouth Disease.

In the Philippines a campaign for control of the disease on Luzon is under consideration. It is important to establish the status of the other islands as disease-free zones for export of meat to countries such as Japan. The Philippine project should be seen essentially as a local operation.

Australasia

Australia and New Zealand are free from FMD but Australia has new laboratories planned for exotic disease problems and will have facilities for diagnosis and training within a few years. In the meantime these countries would depend on overseas help, especially from the World Reference Laboratory for Foot-and-Mouth Disease, for aid in any emergency.

This review highlights the great differences which exist at present among countries in the status of their different FMD programmes. In the context of the present discussion, the free areas need no further mention.

It should be noted that the development of a policy for control of FMD follows a fairly well-defined sequence.

(1) Realization by the Government that the disease is important because:

   (a) livestock improvement schemes call for the protection of valuable breeding animals and their progeny;

   (b) meat exports to clean areas are prohibited;

   (c) the adverse economic effects of FMD become more obvious as other diseases are brought under control.

(2) Epizootiological data are collected, including typing/subtyping of strains

(3) If the disease pattern allows, vaccination is planned first with vaccine from other countries and then by establishing local production.

The review suggests that the majority of countries in Africa and Asia are as yet either unconcerned about the disease or have only reached stage (1) or (2) above. The realization of the difficulties in establishing many new campaigns leads to the view that the best way of dealing with the situation is to use countries with established diagnosis and production facilities as regional or subregional centres to assist neighbouring countries. The best examples of this arrangement are: (a) Iran for the Near East; and (b) Thailand for southeast Asia. In other areas where countries are now developing or have developed facilities for their own use it is likely that some will emerge as regional or subregional centres, but because of political and ecological factors it is difficult to be specific as to the countries concerned. In the view of the Working Group aid should be contingent upon a clear programme following the criteria set out in the introduction to this report.

Guidance on cost factors is set out in the appendix to this document.

III. General considerations and proposed strategy

The broad strategy for improving FMD control can be summarized as support for soundly-based programmes put forward by countries that are aware of their problems and willing to make the considerable effort needed to implement campaigns.

When the grouping of countries is such as to allow the establishment of laboratories to serve subregions or regions this should be encouraged; but it must be emphasized that the conduct of a field campaign is still a national responsibility.

Regional or subregional laboratories should be designed to prevent the escape of virus so that they may safely handle viruses from all countries within their ambit.

Regional and subregional laboratories should liaise with the World Reference Laboratory for Foot-and-Mouth Disease so that a complete picture of the world situation is always available and any new emergency is at once apparent.

Information is lacking on possible future programmes in some subregions, for example in West Africa. It is recommended that the Secretariat should collect as much data as possible in these areas. If this cannot be achieved through present staff resources available to FAO at its Regional Offices or in its field programme, a study group should be established to visit selected countries to assess the situation and make recommendations.

While self-sufficiency in FMD vaccine production is the immediate aim in developed countries of particular areas, especially Europe, the first objective in most developing countries should be to establish pilot plants or small production units in order to gain experience in vaccine production.

Training

The group noted the serious problem encountered in providing suitably trained personnel for new units. It is unlikely that this need will be met without specially designed courses. While countries of South America have access to training facilities at the Pan American Foot-and-Mouth Disease Center, countries of other regions are largely dependent on training opportunities in Europe and will remain so until regional centres become fully functional.

The group considers that FAO should explore the possibilities of establishing a training centre to provide the following:

(i) diagnostic training: duration 4 months: 6 participants per course;

(ii) training in vaccine production: 9 months: 6 participants per course.

This project should have an initial duration of 5 years. Two diagnostic training courses and one vaccine production course should be conducted annually. The training staff should be employed by FAO and funds should be provided to allow the training staff to carry out advisory and supervisory follow-up missions to the countries of origin of the trainees.

Specialization by individual research workers should be supported within the limits of the trust funds made available to FAO for FMD control and prophylaxis.

RECOMMENDATIONS

The Working Group made the following recommendations for immediate action by FAO:

1) FAO should approach the Government of Iran to determine the role which the Razi Institute, Iran, might fulfil in the Near East in the diagnosis of FMD and in the production of FMD vaccines.

2) FAO should approach the Government of Thailand to determine the extent to which the Foot-and-Mouth Disease Laboratory, Nong Sarai, Thailand, might serve as a centre for foot-and-mouth disease diagnosis and vaccine production in southeast Asia.

3) FAO should explore the possibilities of establishing a training centre to provide courses in diagnosis and in vaccine production, as outlined in the report.

4) In view of the lack of information on future programmes and possibilities in some regions, FAO should arrange to collect as much data as possible, using the staff resources at its disposal in its Regional Offices and its field programme, e.g. the Near East Animal Production and Health Development Centre and the UNDP-supported project: RAS/72/023 - Livestock Development Survey.
Where necessary, a study group should be established to visit selected countries to assess the situation and make recommendations.

Appendix I

ANIMAL VIRUS RESEARCH INSTITUTE, PIRBRIGHT

PROVISIONAL EQUIPMENT LIST FOR A TYPING LABORATORY

Large Equipment

1. Autoclave
2. Hot air sterilizing oven
3. 1 centrifuge with 250 ml buckets (e.g. M.S.E. Major)
4. 2 centrifuges small (e.g. M.S.E. Minor)
5. 1 distilled water still or demineralized water apparatus (i.e. Elgastat)
6. 1 set scales for balancing centrifuge parts
7. 1 magnetic stirrer (Voss S. Mag/30 or Baird & Tatlock 373/0016/04)
8. 1 water bath (e.g. Tempunit, Arcon, Grant)
9. 1 microscope for scanning tubes, cell counts and bacteriology
10. Matbern roller apparatus with integral incubator
11. 14 x 30 obs. test tube racks for calf thyroid cultivation
12. Formalin cupboard switches, heaters, humidifiers, time clock, etc.
13. Laboratory stools. Office equipment, desks, filing cabinets, typewriters, etc.

Small Equipment

1. Scissors, not cat toothed forceps, dissecting forceps, Cornwall automatic syringes (1 & 2 cc)
2. Cell dispensing units
3. Gland collecting units
4. Fuchs-Rosenthall counting chambers
5. W.H.O. Typing plates and diluters, etc.
6.

Glassware

1. Bottles - Universal to 500 ml
2. Pipettes
3. Petri-dishes
4. 6" x 5/8" test tubes and bungs
5. Beakers
6. Measuring cylinders
7. Trypsinization flasks and magnets
8. Centrifuge tubes and pots

Clothing

1. Internal clothing and protective aprons, etc.

ANIMAL VIRUS RESEARCH INSTITUTE, PIRBRIGHT

LIST OF EQUIPMENT FOR PROPOSED F.M.D. VACCINE PLANT

Item	Number	Approximate Cost U.K. £ 1973
Bottles		
10-litre	200	1,000
4-litre	100	150
Wash	50	100
Centrifuge (1-litre)	72	100
Various		500
Fittings, etc.		
Bar magnets for	50	50
Filters (Mackay)	144	150
Aerators	60	120
Pipettes and measuring cylinders		1,000
Washing facilities		
Sinks	6	250
Drying Chamber		500
Bottle washer		3,000
Bottle dryer		500
Sterilization		
Autoclaves: 30 cu. ft.	2	12,000
5 cu. ft.	1	2,000
Condenser		
For Boiler	1	500
Cooler		
For distilled water	1	500
Temperature-controlled spaces		
+4°C (media)		Existing
+4°C (virus)		Existing
+4°C (product)		2,000
-70°C (cells)		2,000
-70°C (virus)		2,000
-20°C (medium components)		1,000
+37°C (cells)	}	1,000
+37°C (virus)	}	
Services		
Distilled water stills	2	400
Boiler (2500 lb steam/hour)		7,000
Compressor (air), 200 litre, 150 psig		2,000
Aluminium cans for bottle movements		
10-litre	60	150
4-litre	25	50
Piping and Valves		5,000
	Total carried forward £	45,020

Item		Number	Approximate Cost U.K. £ 1973
	Total brought forward		45,020
Filters			
20 x 20		24	200
20 x 20		24	200
40 x 40		24	300
30 cm diameter		20	300
Centrifuges			
Mistral		2	3,000
Alfa Laval BPB 204		1	1,700
Bench		2	200
Pumps			
Magnetic coupled		4	800
Media			300
Jacketed vessels			
750-litre	(distilled water)		1,000
600-litre	Media preparation		1,000
150-litre			500
50-litre			250
Jacketed sterilizable vessels			
250-litre			1,300
100-litre			600
250-litre	Vaccine preparation		1,300
100-litre			600
1500-litre			3,000
500-litre			1,300
Vessels, unjacketed			
750-litre	Boiler condensate		440
150-litre			130
150-litre	Serum preparation		130
150-litre			130
Vessels, sterilizable			
600-litre			1,500
100-litre	Media holding tanks		250
100-litre			250
25-litre			100
200-litre	Virus pool		400
50-litre			150
Other equipment			
Chiller (40 amp)			2,000
Bottler (2000 bottles/day)			8,250
Laminar flow hoods (6 ft. x 2½ ft.)		3	5,000
Dispensing line			250
Trolleys		6	150
Clot disposer			250
Temperature control systems		3	2,250
Bottle labeller			8,250
Bottle stirrer rigs		8	2,400
	TOTAL		95,150

Appendix II

STATE VETERINARY INSTITUTE FOR VIRUS RESEARCH, LINDHOLM, KALVEHAVE, DENMARK

ROUGH ESTIMATE OF EXPENDITURE FOR EQUIPMENT FOR PRODUCTION OF VACCINE AGAINST FOOT-AND-MOUTH DISEASE

			U.S. Dollars
A.	General laboratory equipment		100,000
B.	Facilities for cold storage of cells and virus, based on liquid nitrogen:		
	1. Liquid Nitrogen Generator	40,000	
	2. Storage containers	15,000	55,000
C.	Pilot production unit. Per week: 100 litres of virus, 150 litres of vaccine or 30,000 monovalent doses á 5 ml		
	1. Water treatment		10,000
	2. One 100 litres medium mixing tank, Seitz		4,000
	3. Two Seitz "Orion" filters		20,000
	4. Two 100 litres fermentors		120,000
	5. 36 degrees water unit for fermentors		31,500
	6. Supply of oilfree, dry, compressed air		3,500
	7. Supply of ice-water. 1000 kg of ice on coil in 10 hours		17,000
	8. Supply of clean steam		15,000
	9. One 700 litres tank for chloroform treatment. Stirring by pump		12,000
	10. One hermetically sealed, clarifying centr.		15,000
	11. One 700 litres tank for vaccine inactivation. Stirring by pump		13,000
	12. 26 degrees water unit for inactivation		31,500
	13. One hundred 50 litres storage containers		3,300
	14. One autoclave		16,000
	15. Miscellaneous		20,000
			331,800
D.	Production unit, as extension of pilot prod. unit. Per week: 900 litres of virus, 1400 litres of vaccine or 280,000 monovalent doses á 5 ml		
	1. Extension of water treatment		15,000
	2. Establishment of main steam supply		15,000
	3. One 2000 litres storage tank for water for medium preparation (heated)		6,000
	4. Two medium mixing units. Capacity: each 1000 litres		20,000
	5. Five 300 litres fermentor units		335,000
	6. Two 1000 litres tanks for chloroform treatment. Stirring by pump		17,000
	7. One hermetically sealed, clarifying centr.		15,000
	8. Four 1400 litres vaccine inactivation tanks. Stirring by pump		43,000
	9. Three hundred 50 litres storage containers		10,000
	10. One autoclave		16,000
	11. Miscellaneous		30,000
			522,000

Total for A, B, C and D	U.S. Dollars 1,008,800

Please note that the following items are not included in the estimate: Land, buildings, water supply, electricity supply, air-conditioning, coldrooms, facilities for treatment of effluent water and facilities for testing, bottling and distribution of vaccine.