Foot-and-Mouth Disease: Britain Strives to Curb Epidemic

London. Spreading like a plague, foot-and-mouth disease caused a quarter of a million animals to be killed in England and Wales in the 5 weeks after the first outbreak was reported in Cheshire, late in October. The epidemic is the worst recorded since serious national efforts to control the disease were first made, in 1870.

The seriousness of the present outbreak has caused the government to negotiate a voluntary ban on imports of meat from countries where the disease is endemic, in order to shut off a possible source of new infection. Such a ban has serious economic and diplomatic implications for Britain. An even more difficult decision faces the government: the choice between (i) adhering to its policy of slaughtering infected animals and those in contact with them and (ii) adopting a policy of vaccinating against the disease.

Foot-and-mouth is a highly infectious virus disease which affects cloven-footed animals—cattle, pigs, sheep, and goats, among domestic animals. Cloven-footed wild animals are also susceptible, and so are hedgehogs and very young rats. Besides being transmitted by diseased animals or carriers, the virus can be carried in meat or milk products, or by birds or other animals, on vehicles, or on the clothing or shoes of humans. It is also believed that the virus may spread by being airborne over fairly short distances.

The disease is seldom fatal. The most familiar symptoms are lesions of the tongue—particularly in cattle—and of the feet, and high fever. Some strains of the virus can be fatal to young animals, but mature animals usually survive. In the case of cattle, however, meat production and milk yield are seriously impaired, and some animals suffer damage to vital organs.

Britain has sought to keep the country free of the disease by a strict policy of slaughter when outbreaks have occurred. The United States and Canada have successfully followed the same policy, and so have Ireland, Australia, and New Zealand. The disease-free countries, however, are in a minority, and other countries—such as those on the continent of Europe, and Argentina, which is a major exporter of meat to Britain—follow a vaccination policy. This means that foot-and-mouth disease is endemic in the vaccinating countries.

As losses have mounted in Britain (farmers are reimbursed by the government for slaughtered animals at market value), a debate over the wisdom of maintaining a slaughter policy has mounted. At the end of November the Minister of Agriculture, Fred Peart, announced that the government was acquiring stocks of the vaccine sufficient for 5 million doses, but that vaccine would be used only as a last resort if the control program broke down completely.

Supporters of the slaughter policy criticize vaccination on the grounds of both cost and effectiveness. Annual vaccination is required and, with a population of susceptible domestic animals of about 45 million, a vaccination program would be extremely costly. Objections to present vaccines are that they do not protect young animals, do not make pigs immune, and do not give any stock complete protection.

On economic grounds it is argued that adoption of a vaccination policy, which would mean that foot-and-mouth disease would become endemic in Brit-

Draft Proposal Favors Science Fields

Draft deferments for graduate students in natural science, mathematics, engineering, and health have been recommended by a federal interagency advisory committee, according to press reports. If the recommendations are accepted by the National Security Council, about half of some 144,000 first-year graduate students, it is estimated, will continue to be deferred after blanket graduate school deferments expire next year. The advisory proposal is also said to contain vague wording that would permit local draft boards to defer graduate students outside scientific and technical fields should the board decide that teachers in these other fields are vitally needed in its own area. If put into effect, the recommendations would take some of the sting out of provisions of the new draft law, passed last summer, that provided for the eventual elimination of most graduate school deferments (*Science*, 21 July and 10 November).

The recommendations were prepared for the National Security Council by the Interagency Advisory Committee on Critical Occupations and Essential Activities, composed of representatives from Selective Service and the departments of Labor, Commerce, Agriculture, Defense, Interior, and Health, Education and Welfare. The committee's report was leaked to the press and has not been made public, but sources who helped prepare it acknowledge that the published summaries are accurate. The National Security Council, which has the power, under the new draft law, to defer graduate students in any fields deemed vital to the national interest, is expected to make a final decision by the end of the year or shortly thereafter. The council is headed by President Johnson and includes the Vice President, Secretary of State, Secretary of Defense, and Director of the Office of Emergency Planning.

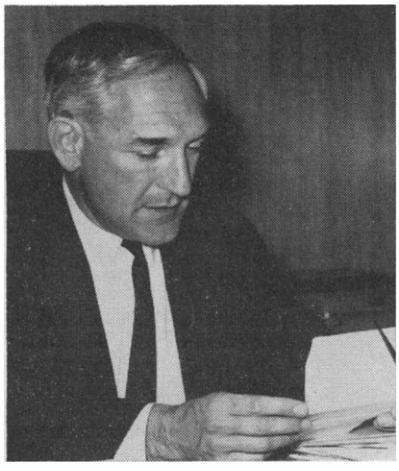
The recommendations, which would defer graduate students in the sciences while ignoring those in the social sciences, humanities, and such professional schools as business and law, are sure to provoke controversy. Senator Edward M. Kennedy (D–Mass.), a leading advocate of draft reform, has attacked the proposals and demanded that all graduate students "be exposed equally to the draft."—P.M.B.

ain, would bring an end to the lucrative export of pedigree animals to the United States, Canada, and other disease-free areas.

Farmers' organizations have in general supported the slaughter policy, even as the toll of slaughtered animals has mounted. They have been prominent also in lobbying for a ban on meat imported from countries where the disease is endemic—in effect, Argentina and Uruguay, which export an estimated 11 percent of beef and 3½ percent of the lamb consumed in Britain. These imports, though a small portion of the total supply, are important, since the meat is relatively inexpensive and provides competition that helps control prices for meat from domestic and other overseas sources.

Argentine and Uruguayan meat is

International Programs: Frankel Resigns from State



Charles Frankel

Largely obscured by excitement over the sudden announcement of Defense Secretary McNamara's impending departure from government was the announcement that one of the key figures in this country's international cultural relations also intends to leave federal service.

He is Charles Frankel, who took leave from the Columbia University philosophy department in September 1965 to become Assistant Secretary of State for Educational and Cultural Affairs. Situated at the third level of the State Department hierarchy, and responsible for activities that are, at best, peripheral to the most pressing foreign policy problems, Frankel drew relatively little public notice, in office or en route to departure. As it turns out, this probably had more to do with the mysterious priorities of press coverage than with his widely admired performance as the government's chief officer for promoting international cooperation in scholarly and cultural activities. But, whatever the case, Frankel, on the eve of departure (he is scheduled to leave at the end of this month), provides an interesting case study of the troubled state of affairs that now prevails between the Johnson administration and many of the nation's intellectual leaders.

Since resignation in anger is no longer an accepted mode of behavior in American public life, it is generally commonplace for departing administration figures, whatever their views on the overriding issue of Vietnam, to go in silence. Frankel did not altogether depart from this mode, but in one way or another it has become known that, in large part, because of the U.S. role in Vietnam and the administration's preoccupation with the war there, he has no appetite for remaining in Washington.

At the same time, Frankel is too much the team player, too concerned about the divisiveness that is spreading in this country, and too grateful for the opportunities that he had to accomplish things of importance to him in international cultural affairs, to speak out against the Johnson administration. So he points out that, during his service at State, he had considerable success, he feels, in spreading the concept that in international relations this country's cultural life is as important as its economic or military strength. He says he feels that in the State Department, in the White House, and in other departments of government there is now a greater awareness of the value of a thriving cultural interchange between the U.S. and other nations. He says he feels that he succeeded in enlarging the role of private individuals and organizations in the international cultural activities, and in getting the government "behind these activities rather than in the middle of them." And he adds that he has nothing to complain about in his relationship with Secretary of State Dean Rusk or any other officials of the Department. "I'm not angry at anybody," Frankel says emphatically. "I was not hired to talk about Vietnam, and it has to be understood that there are multiple reasons for [my] getting out."

But Frankel chooses not to comment on reports, some in the press, others from acquaintances, that a major part of his decision to leave is simply opposition to the administration's Vietnam policies and a feeling that, amidst the Vietnam war, there is little opportunity for further progress in his area of responsibility. It is also said that he feels that in the "present wartime atmosphere, and with an election impending, the prospects are not good" for the further promotion of international cultural activities.

He states, "the reasons for my departure are ambiguous because the situation is ambiguous." However, amidst the ambiguities there is perhaps one firm clue to his reasons for departure. In 1965 Frankel published *The Neglected Aspect of Foreign Affairs*, a book-length study of U.S. cultural and educational policies abroad. In that work he observed, "Over the long run, a major nation's foreign policy is unlikely to succeed, or will, at any rate, become more costly and more completely dependent on violence and the threat of violence, if it loses the understanding and sympathy of intellectuals in other countries and in its own."

Frankel says he plans to spend the first part of next year as a scholar in residence at Aspen, Colorado, and then return to Columbia.—D.S.G.

blamed, because the foot-and-mouth disease virus can survive in the refrigerated carcass for up to 4 months. The virus concentrates not in the muscle, for example, where increasing acidity creates inhospitable conditions, but in the lymph nodes, blood, and bone marrow. The common theory is that scraps of infected, uncooked meat find their way into pig swill, which negligent pigkeepers fail to boil, as the law requires. A dog going into the fields with a bone containing infected bone marrow could also spread the virus.

The strain of virus identified in the present outbreak has not, however, been traced to Argentine meat. The virus seems to be one originally identified in 1943 in Germany. It first appeared in Britain in an outbreak in England in 1966, and again appeared in two separate outbreaks, in January and August of this year. The origins of the present epidemic are unknown.

Unfortunately the foot-and-mouth virus is a hardy one. Tests have shown that it can survive on boots for nearly 3 months, and on hay for 15 weeks. With its nucleic acid core and protein coating, the virus can be inactivated by heat and sunlight, but Britain's cool wet autumn provides conditions in which it flourishes. The virus strain involved in the present epidemic is said not to be among the most severe in its effects, but it has one particularly insidious characteristic: its incubation period is said to be an unusually long 8 days, as compared with the 3- to 6-day period typical for many strains. Animals are infected with the disease for longer periods before they show symptoms, and the chances of transmitting it are therefore increased.

British research on foot-and-mouth disease is concentrated at the Animal Virus Research Institute in Pirbright, Surrey, located near the fringe of the commuter belt south of London. Government research on foot-and-mouth was started in 1924 at Pirbright, and in 1951 the laboratory was reconstituted under its own governing body. The institute is financed through the Agricultural Research Council, under the Department of Education and Science. The council oversees the institute's scientific program.

Development and production of anti-foot-and-mouth vaccine has been a main effort at Pirbright. To free staff for research, an agreement was reached in 1961 with the Wellcome Foundation, under which the foundation undertakes the production of vaccines on a commercial scale for sale abroad. There is some irony in the situation, since, when the government decided to acquire a standby stock of vaccine, Pirbright could not increase production fast enough to fill the demand and supplies had to be ordered from laboratories established by the British abroad.

The institute, which is the counterpart of the United States research facility on animal virus diseases on Plum Island, off Long Island, has a staff of about 250 persons, 30 of them professionals. Research at Pirbright includes studies in the pathology of the disease, biochemical and biophysical investigations of the virus, and studies in viral genetics. About 75 percent of the research effort pertains to foot-and-mouth disease, and about 25 percent to other viral diseases, such as African swine fever and African horse sickness, which are regarded as potential dangers to animals in Britain.

The seriousness of the present outbreak has brought criticism both of control methods and of the slaughter policy itself. Heavy financial damage to farmers who lose their animals and, in some cases, literally their livelihood has hit British agriculture hard. As this was written, however, sentiment among farmers, scientists, and government officials appeared to be still decidedly for maintenance of a slaughter policy. Although foot-and-mouth has radiated outward and, particularly, southward from the West Midlands area where it began, the disease remains concentrated in that region. Unless major flare-ups occur in new areas, it is unlikely that officials will shift to vaccination.

There is growing recognition, however, that changing circumstances are making Britain more vulnerable to foot-and-mouth. Population growth and increasing mobility have made rural areas less isolated and the difficulty of preventing the spread of the disease greater.

The first outbreak of the current epidemic occurred in an area where some of the best and most efficiently run dairy herds are found. Farmers successfully operate with a high number of animals per acre, and this increases the chances of infection. Artificial insemination has bred big milk-producers for British dairy herds, but some observers suggest that inbreeding has made the animals more susceptible to foot-and-mouth disease.

Other countries which follow strict slaughter policies are, for the most part, self-sufficient meat producers, but Britain's imports of Argentine meat are economically important.

Over the years, a slaughter policy has probably been less expensive for Britain than vaccination would have been. The present epidemic and the outbreaks that preceded it have raised the question of whether the slaughter policy may grow more expensive and less effective. Minister of Agriculture Peart has announced that there will be a major examination of present policies and methods of control. The last time this was done was in the wake of a serious outbreak of foot-and-mouth disease in 1951. The result of that inquiry was a reaffirmation of the slaughter policy. Despite rapid improvement in the effectiveness, and a significant downward trend in the costs of vaccine, there is a deep-seated reluctance in Britain to accept the disadvantages which would accompany a vaccination policy. But it is possible that, as with devaluation, the undesirable may in the long run become inevitable.—JOHN WALSH

APPOINTMENTS

Mortimer H. Appley, dean of the faculty of graduate studies and director of the Institute for Behavioral Research, York University, Toronto, to head of the department of psychology, University of Massachusetts. . . . **David H. Kurtzman**, chancellor emeritus of University of Pittsburgh, to superintendent of public instruction for Pennsylvania. He succeeds **J. Ralph Rackley**, who has returned to Pennsylvania State University as provost. . . . **Robert F. Packard**, director, Office of Outer Space Affairs, Department of State, to director of the newly established Office of Space and Environmental Science Affairs, International Scientific and Technological Affairs, State Department. . . . The following have been appointed to the Advisory Committee on Research in the Biological and Physical Sciences, FDA: **William D. Cooke**, dean of the graduate school, Cornell University; **Julius M. Coon**, head of the pharmacology