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EPIDEMIOLOGY

Intensified Battle Against Foot And Mouth Appears to Pay Off

In late March, three teams of epidemiologists took their latest computer model results on foot-and-mouth disease (FMD) to the British Ministry of Agriculture, Fisheries, and Food and the country's chief science adviser, David King. Their numbers held a grim message: Britain's attempts to control the disease weren't working, the epidemic was still growing exponentially, and, if nothing changed, would spiral out of control.

In response, the government adopted a more aggressive campaign to stamp out the catastrophic outbreak—a strategy that seems to be paying off. Last week, the daily number of newly infected farms was dropping, and some researchers were predicting that the epidemic may be past its peak. The studies "certainly had more of an immediate impact than any previous mathematical model of an infectious disease," says Neil Ferguson of Imperial College in London, one of the researchers. Meanwhile, as data on the economic costs of the outbreak emerge, FMD experts in other countries are reassessing whether the no-vaccination policy adopted by the European Union (E.U.) still makes sense.

At the outset of the United Kingdom's FMD crisis, as many as 3 or 4 days typically elapsed between the identification of an infected farm and the slaughter and destruction of its herd. That delay, said the modeling teams, one made up of ministry scientists, one led by Ferguson, and the third by Mark Woolhouse of the University of Edinburgh, enabled the fiercely infectious FMD to spread. (*Science* published the Ferguson group's results online last week at www.sciencexpress.org.) At a joint meeting of the ministry and the Food Standards Agency on 21 March, the researchers also argued that "ring culling" at farms adjacent to each infected farm was necessary to halt the outbreak. Now, with the help of the army, most infected herds are culled within 24 hours—more than 1.1 million livestock have been destroyed—and ring culling has become standard.

The models proved especially persuasive, says Woolhouse, because they showed essentially the same results, as did yet another simulation by the University of Cambridge. "That has helped the government believe them." Woolhouse cautions, however, that it's still too early to be certain that the current decline really marks a turning point in the epidemic. An aggressive ring-culling policy would always reduce the number of new cases, he says, because some of those farms undoubtedly housed animals that were infected though asymptomatic.

Farm wars. In the Netherlands, angry farmers suspended dead livestock from trees to protest preventive culling.

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At the same time, the current outbreak is rekindling the debate over an old question: whether to vaccinate. Until 1991, farmers in most European countries had their cattle vaccinated yearly to prevent FMD outbreaks. That year, however, the E.U. banned the use of vaccines and switched to its current policy of stamping out outbreaks to enable E.U. countries to export to the United States and Japan. Both countries, which are FMD-free, refuse to import meat or animals from countries that allow vaccination because vaccinated animals could be silent carriers of the disease (*Science*, 23 March, p. 2298).

The Dutch government, which faces its own small outbreak—25 cases, so far—is arguing that once this epidemic is over, the E.U. should reconsider its ban on preventive vaccination. Surprisingly little research has been done on the ban's costs and benefits, says Paul Berentsen, an agricultural economist at Wageningen University in the Netherlands. When Berentsen and his colleagues undertook such a study in 1989, they concluded that not vaccinating made economic sense. But the government is currently waging a much more aggressive and costly campaign than the researchers estimated, says Berentsen. In addition, other European countries appear to be more averse to importing animal products from the Netherlands than expected. Those two factors alone could tip the economic balance back toward vaccination, he says. He adds, however, that a reversal of the vaccination policy would have to be agreed upon by the entire E.U.—which by definition means nothing will change anytime soon.

To cope with the current outbreak, the E.U. is permitting "emergency vaccination" of animals in the most affected area in the Netherlands. The goal is not to save the animals but to stop the spread of the disease quickly while allowing more time for disposal of the carcasses. All the vaccinated animals will eventually be killed. Although the British models conclude that such emergency vaccination is a less effective way to prevent the spread of the disease, virologist Aldo Dekker of the Dutch Institute for Animal Science and Health in Lelystad says it avoids a potential risk associated with culling: The teams and heavy equipment moving about the countryside to slaughter animals may themselves contribute to the spread of the virus. Vaccinating a herd is a much simpler and less risky task, he says.

The emergency vaccination strategy may also minimize public resistance to the control measures. Already, fierce protests from small groups of farmers against the destruction of apparently healthy herds has delayed culling efforts in the Netherlands. By avoiding the grisly funeral pyres now commonplace in the United Kingdom, the Dutch government hopes to prevent a further escalation of the current protests and to stamp out the disease more effectively. **–MARTIN ENSERINK**