Morbillivirus in dolphins

SIR—Since late July many striped dolphins (*Stenella coeruleoalba*) in the Mediterranean Sea have died. This epizootic began on the coast of Valencia, including the Balearic Islands, and then spread to the north and south Spanish Mediterranean coasts. More than 100 dolphins have been found stranded on the Catalonian coast of Spain, and the total number of adult, juvenile and newborn dolphins stranded on the Spanish Mediterranean coast is estimated to be more than 400. The epizootic is now spreading to the north African and French Mediterranean coasts.

We have taken samples from 47 dead dolphins found stranded on the coast of Catalonia. The main findings are pneumonia and encephalitis. The histopathological lesions in the animals' lungs are characteristic of a viral disease and comprise a diffuse interstitial pneumonia. We saw many multinucleated syncytia in alveolar lumina, and eosinophilic intranuclear and intracytoplasmic inclusion bodies in alveolar and bronchiolar epithelial cells (Fig. 1). Changes in the brain include neuronal degeneration and necrosis, perivascular mononuclear cell infiltration, focal malacia and syncytia formation. Many neurons and glial cells contain eosinophilic intranuclear and intracytoplasmic inclusion bodies, and there are many syncytia and severe depletion of lymphoid cells in the lymph nodes.

We examined paraffin sections of tissues from four dolphins for morbillivirus antigen by immunoperoxidase techniques. We used a polyclonal antiserum and a monoclonal antibody against phocine distemper virus (PDV)[1] as primary antibodies, and tissues from morbillivirus-infected and healthy porpoises (*Phocoena phocoena*) as positive and negative controls, respectively. We found morbillivirus antigen in lung, brain, lymph node and biliary epithelium from all four Mediterranean dolphins using both methods. There is specific intracytoplasmic and intranuclear staining in lymphocytes and syncytia in lymph nodes (Fig. 2).

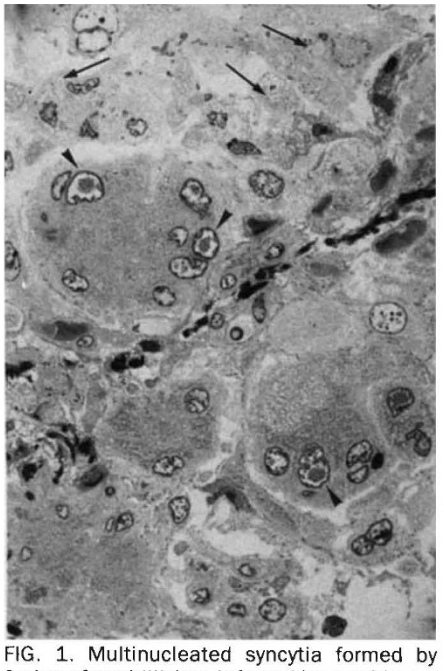

FIG. 1. Multinucleated syncytia formed by fusion of morbillivirus-infected lung epithelial cells. Intranuclear (arrowheads) and intracytoplasmic (arrows) inclusion bodies are seen. Toluidine blue stain. × 700.

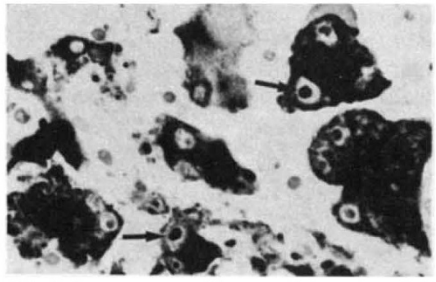

FIG. 2. Immunoperoxidase staining of morbillivirus antigen in cytoplasm and nuclei (arrows) of syncytia in lymph node using a monoclonal antibody against PDV. × 510.

Antigen also occurs in bronchial and bronchiolar epithelial cells, pneumocytes and syncytia in the lungs, and in neurons and glial cells in the brain. Electron microscopic examination of lung tissue from affected dolphins reveals viral particles morphologically consistent with a paramyxovirus in the cytoplasm of lung epithelial cells and syncytia.

We attempted to isolate viruses from the tissues of three dolphins. A cytopathic virus was cultivated from brain, lung and mediastinal lymph nodes of all three animals. Bovine and canine kidney cell lines infected with this virus contain eosinophilic intracytoplasmic and occasionally intranuclear inclusions, and give a positive immunoperoxidase reaction when incubated with hyperimmune serum against CDV from a dog, confirming that the isolated virus is a morbillivirus.

The microscopic changes in these dolphins are similar to those found in common seals (*Phoca vitulina*[1,2]) and porpoises[3] during the northern European seal morbillivirus epizootic in 1988, and in dogs with canine distemper[4]. Our demonstration of morbillivirus antigen in diseased tissues provides conclusive evidence for a primary aetiological role of PDV (or a closely related morbillivirus) in development of the lesions.

This is the first report of morbillivirus infection in dolphins. Further studies to characterize the isolated virus and to compare it with isolates of seal[5] and porpoise[3] morbillivirus are in progress which should determine if there is a link between the 1988 and 1990 epizootics. Further, the presence of morbillivirus infection in striped dolphins may be a serious threat to the survival of the small population of Mediterranean monk seals (*Monacus monacus*), already considered an endangered species.

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Fallout in snow

SIR—Dibb *et al.* in their recent Scientific Correspondence[1] questioned the origin of a caesium-137 peak measured in a snow sample collected near the South Pole and corresponding to deposition during the summer of 1987–88. Because they found no ^{134}Cs, characteristic of Chernobyl fallout, in their samples they were not sure that the Chernobyl accident could explain the observed radioactivity.

I believe that the radioactive contamination is certainly due to the Chernobyl accident. Indeed, my colleagues and I have detected ^{134}Cs in atmospheric dust samples taken from two stations in the Southern Hemisphere, Tahiti and La Réunion, during January 1987. The levels of radioactivity were low (a few microbecquerels per m^3) but the $^{134}Cs/^{137}Cs$ ratio was similar to the ratio observed in European countries affected by the accident. Furthermore, observations made in Poland by Jaworowski *et al.*[2] indicate that aerosols emitted during the accident were present in stratospheric air.

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