Foot and mouth disease in the mountain gazelle in Israel

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Summary: A severe outbreak of infection with type O, aphthovirus occurred in the Ramot Yissakhar nature reserve (Israel) in April 1985, resulting in the death of about half of a population of some 3,300 mountain gazelles (Gazella gazella). A smaller outbreak occurred in the southern Golan nature reserve among about 6,500 gazelles. Both outbreaks were controlled by shooting gazelles in a buffer zone around the outbreaks. The importance of preventing overpopulation of protected species is emphasised.

KEYWORDS: Foot and mouth disease - Gazella gazella - Israel - Population density - Wild animals.

Mountain gazelles (Gazella gazella) have been present in Israel and its environs since prehistoric times. The species became almost extinct during the late forties. To prevent its total extinction by hunting or poisoning, the mountain gazelle was officially declared a protected species in Israel as of 1955. Consequently, the population began to multiply swiftly in its natural habitat in north-eastern Israel, due to the absence of effective predators and of hunting. The gazelle population reached a record density in 1984. During the annual wildlife count, carried out by the Nature Reserves Authority in February 1985, approx. 10,000 individuals were counted, including some 3,300 in the Ramot Yissakhar nature reserve and some 6,500 in the southern Golan reserve (Figure 1). Both nature reserves adjoin the Jordanian frontier; the southern Golan borders Syria as well.

CASE REPORT

On 10 April 1985, two gazelles from the Ramot Yissakhar nature reserve, one dead and one in extremis, were presented for veterinary examination by ranchers of the Nature Reserves Authority.

On examination, buccal changes typical of foot and mouth disease (FMD) were observed in both animals. Two samples were sent to the Kimron Veterinary Institute at Beit-Dagan, and FMD virus was isolated from both of them. It was later typed by the World Reference Laboratory at Pirbright (UK) as FMD virus type O and designated ISR 1/85.

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Location of FMD outbreaks among mountain gazelles in Israel, 1985
It soon became apparent that the outbreak in the densely populated herd of mountain gazelles had become extensive. Many lame or immobile animals as well as fatalities were reported. Sick and dead animals were concentrated in and around water sources and under vegetation (Figure 2). When sick animals were approached they gave little resistance to examination. Some animals showed locomotory disorders, probably resulting from muscular lesions; no diarrhoea was seen.

During one visit, on 17 April 1985, 36 recently dead animals were examined and numerous post-mortem examinations were carried out (6). The disease affected all age groups and both sexes. Surprisingly, no fawns were observed, although many had been seen during previous visits. It was assumed that unweaned fawns, normally visited at least twice daily by their dams in their hiding places under the vegetation, had died of disease or starvation after the commencement of the epizootic.

Typical, severe oral lesions were observed in all animals examined. They consisted of necrotic lesions on the dorsum of the tongue in some cases, and the lips and gums in others. The ventral side of the tongue was not affected. Foot lesions characterised by interdigital elongated erupted vesicles were seen in many cases. Vesicular coronal lesions were found on the lateral and posterior part of the hooves of some gazelles. Separation of the hooves was frequent. Some animals lost their horns, leaving bleeding cores.
Macroscopic muscular lesions were clearly seen in the heart of most animals examined, as well as in the diaphragm, lingual muscle and other skeletal muscles. In some cases, slight but distinct lesions were seen on omasal folds. Other changes included pneumonia and splenomegaly. Most animals examined were in excellent nutritional condition indicating that the course of the disease was peracute. Some animals, although adjacent to water, manifested severe dehydration. This was probably because of an inability to drink, caused by lingual muscular changes. FMD virus type O was also isolated from a sample of affected heart muscle.

Two weeks later, the disease affected mountain gazelles in a circumscribed area in the southern Golan. This outbreak was much smaller.

The outbreak in Ramot Yissakhar subsided towards the beginning of May 1985. Following a count performed by the Nature Reserves Authority, it was estimated that at least 1,500-2,000 animals of all age groups died in this reserve, representing a mortality rate of at least 50%. The case mortality rate was probably even higher. The outbreak in southern Golan was found to have caused considerably less than 10% mortality.

Except for a few cases in young, unvaccinated cattle, sheep and goats in adjacent farms, the disease did not spread. This was probably a result of the strict disease control measures taken, and the immune status of the local domestic livestock, which had been vaccinated. The strain of virus isolated from infected cattle was found by the World Reference Laboratory (WRL) to be indistinguishable from the gazelle strain. The disease in domesticated livestock took a very mild course with no mortalities being recorded.

CONTROL MEASURES

It is assumed that the origin of the infection in the mountain gazelles was outbreaks of FMD in Jordan, reported there between January and March 1985 and identified by the WRL as type O. Both nature reserves were officially declared infected, with protection zones of 5 km around them.

Massive activities were conducted to stamp out susceptible gazelles from the protection zones as well as to reduce the number of gazelles within the overpopulated reserves. From April to December 1985, 1,420 gazelles were shot in the two areas, most of them in southern Golan, where the disease infected a circumscribed area of 50 km². In order to prevent the spread of the disease to contiguous areas, especially southward where the gazelle population is densest in the Golan (40 per km²), a shooting zone, 10 km in width, was established as a buffer south of the infected region. Every individual seen was shot in the buffer zone. The controlled shooting which lasted for eight weeks reduced the population in the buffer zone from 45 per km² to 5-6, thus effectively reducing chances of gazelle contact from either side of the zone and preventing chances of FMD spread southward (2). By the end of June, no sick individuals were spotted in the Golan.

The control measures in gazelles were pursued during 1986 and 1987, following modifications in the Wildlife Protection Laws which were necessary to meet the required reduction in the population density. About 1,900 gazelles were shot during 1986 and 1,500 during 1987.
This action was taken after discussions involving representatives of various disciplines, and under strong opposition from the nature protection societies. The Veterinary Services requested information from various member countries of the OIE regarding the prevailing legal status of protected animal species in the event of an epizootic. The detailed replies, promptly received, were of great assistance during the deliberations which took place in the media and the Knesset (parliament).

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SURVEILLANCE ACTIVITIES

The Veterinary Services made a special effort to survey the rate of infection within the gazelle populations. Between September 1985 and October 1986, 107 samples of pharynx and bone marrow and 106 serum samples of gazelles, shot randomly at night in southern Golan, were forwarded to the Kimron Veterinary Institute for serological tests and virus isolation attempts. All pharynx and bone marrow samples were negative for FMD virus; 8 of 106 (7.5%) serum samples tested by serum neutralisation (SN) were positive for FMD virus type O1 (5).

Since 1987, all shot gazelles are brought for veterinary examination to regional inspection posts, where they are individually inspected by State Veterinarians and randomly sampled.

In southern Golan, all 52 pharynx samples collected during 1987 were negative for FMD virus; 7 of 191 serum samples (3.7%) were positive (SN > 1:8). In Ramot Yissakhar, all 48 pharynx samples were negative for FMD virus; 15 of the 114 serum samples (13.2%) were positive (SN > 1:8) (H. Yadin, personal communication).

DISCUSSION

It was concluded that this unusually malignant form of FMD resulted from the high virulence of the particular virus strain combined with an extremely susceptible host, present in a very high population density. The gazelle population of the Ramot Yissakhar nature reserve had increased considerably during the past thirty years, after being on the verge of extinction. This population growth was achieved by intensive inbreeding, since this species is rather sedentary and no external genetic material had been introduced. Consequently, the population involved might have had a genetically linked hypersusceptibility to the disease (6).

The susceptibility of Gazella gazella to the O ISR 1/85 FMD virus strain was verified by two challenge trials at the Kimron Veterinary Institute.

Altogether, 17 susceptible ruminants have been challenged in the FMD safety containment unit with the gazelle virus strain. 7 of 11 infected gazelles died within fifteen days of infection and 2 died about four months later.

In contrast, the clinical symptoms in two cattle, two sheep and two goats which were challenged by the same FMD virus strain, were very mild and none of them died.
The pathological and histopathological changes in the challenged gazelles are summarised elsewhere (4). In addition to typical changes in the squamous epithelia and myocardium in the acute cases, striking pancreatic changes were found in the two gazelles which died later. This indicates that the major losses during the outbreak in 1985 could have resulted from a combination of acute FMD, with severe myocardial and other lesions, and of a more chronic form of the disease, leading to losses which were probably accelerated by diabetes mellitus. Similar changes have previously been described in Italy, in female bovines of the “Chianino Perugina” cattle line (3), and they deserve further study.

The challenged gazelles had high SN titres (± 1:256) for at least five months after infection. This agrees with the results of the field serological survey, which demonstrated that adult animals were positive, in contrast to young ones, even thirty months after the outbreak (H. Yadin, personal communication).

The major outbreak of FMD in mountain gazelles in the Ramot Yissakhar nature reserve should receive special attention by all those who deal with wildlife preservation. Protected species should be maintained according to scientific principles, namely, a calculated and well-controlled management system. To this end, a comprehensive ecological study was undertaken by the Israeli Nature Reserves Authority in collaboration with the Veterinary Services. Its preliminary results are summarised elsewhere (1), and its recommendations have recently been officially adopted by the Minister of Agriculture, and will be implemented.

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LA FIÈVRE APHTEUSE CHEZ LES GAZELLES DES MONTAGNES EN ISRAËL. – A. Shimshony.

Résumé : En avril 1985, une grave épidémie de fièvre aphteuse, causée par le type O, du virus, a éclaté dans la Réserve naturelle de Ramot Yissakhar (Israël), tuant près de la moitié d’une population d’environ 3 300 gazelles des montagnes (Gazella gazella). Une épidémie de moindre importance s’est produite dans la Réserve naturelle du Sud-Golan parmi 6 500 gazelles environ. Ces deux épidémies ont été jugulées par l’abattage au fusil des gazelles dans une zone-tampon entourant les foyers. L’auteur souligne qu’il importe d’éviter la surpopulation des espèces protégées.

MOTS-CLÉS : Animaux sauvages - Densité de population - Fièvre aphteuse - Gazella gazella - Israël.

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FIEBRE AFTOSA EN LAS GACELAS MONTAÑESAS EN ISRAEL. – A. Shimshony.

Resumen: En abril de 1985, se declaró un grave brote epizootico de fiebre aftosa, ocasionada por el tipo O, del virus, en la reserva natural de Ramot Yissakhar (Israel), que mató casi la mitad de una población de aproximadamente 3.300 gacelas montañesas (Gazella gazella). Una epizootia de menor importancia se produjo en la reserva natural de Golán del Sur entre unas 6.500 gacelas. Estas dos epizootias se controlaron mediante el sacrificio, con escopeta, de las gacelas
en una zona tapón que rodeaba los focos. El autor subraya la importancia de evitar la sobrepoblación de las especies protegidas.

PALABRAS CLAVE: Animales salvajes - Densidad de población - Fiebre aftosa - Gazella gazella - Israel.

**REFERENCES**


