



PROPOSALS FOR THE PREVENTION AND CONTROL OF
DERMATOPHYTOSES COMMON TO MAN AND ANIMALS

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1. Introduction

At the WHO/ISHAM Consultation on Dermatophytoses Common to Man and Animals held in Palmerston North, New Zealand from 6 to 7 February 1982^a there was a very valuable discussion of the problems of zoonotic dermatophytoses. The aim of this document is to put forward proposals for the prevention and control of zoonotic dermatophytoses by vaccination.

Dermatophytoses form a very large group of fungal diseases, many of which are transmitted from animals to man. Humans infected by these fungi are likely to suffer for long periods since the disease is very difficult to cure. All species of farm and fur-bearing animals are infected by dermatophytoses. In pet animals, cats and dogs are the most susceptible to the diseases. Laboratory animals, such as rabbits, guinea-pigs and mice may also be infected. Cases of this type of zoonoses have been recorded in zoo animals (tigers, cheetahs, etc.), and in camels and reindeer. All dermatophytoses in animals are pathogenic for man. However,

^a Report of WHO/ISHAM Consultation on Dermatophytoses Common to Man and Animals (WHO Document VPH/82.35).

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not all the human pathogens are pathogenic for animals. Both rural and urban populations in countries throughout the world may be infected by these zoonoses. In rural conditions the main sources of infection for man are farm and pet animals. In urban areas the main source of human infection is from pet animals. Contact with pets (dogs, cats, etc) infected by dermatophytoses often leads to infection of children and eventually the whole household may be infected. Contact with stray animals is often the cause of dermatophytoses in children.

Environment plays a role in the distribution of dermatophytoses. Dermatophytosis lesions, containing a tremendous amount of infectious material, falling from the skin surface of the animal, infect installations - stables, cowsheds, animal houses, equipment and tools, grazing areas, territories adjacent to the farm, shrubs and watering places. Crusts, hair bunches, containing parasitic forms of dermatophytes falling from animal skin lesions, are viable for 5-7 years and can be a constant source of infection to susceptible animals and to man. This explains the occurrence of spontaneous cases of dermatophytoses in healthy animals in areas where dermatophytoses had been reported many years before. Environmental resistance of dermatophytes is explained by the peculiar composition of their spores. The destruction of the pathogenic dermatophytes in the environment is a complex task which is not always successful. The pathogenic zoophilic dermatophytes for man are shown in Table 1.

TABLE 1

Zoophilic dermatophytes	Susceptible animals
<u>Trichophyton verrucosum</u> (syn. <u>T. faviforme</u>)	Cattle, sheep, goats, fur-bearing animals, camel, reindeer
<u>Trichophyton mentagrophytes</u> (syn. <u>T. gypseum</u>)	Fur-bearing animals (foxes, polar foxes) rabbits, horses, dogs, cats, nutria
<u>Trichophyton equinum</u>	Horses
<u>Microsporum equinum</u>	Horses
<u>Microsporum canis</u> (syn. <u>M. lanosum</u>)	Cats, dogs, rabbits, fur-bearing animals, horses

Information has still to be obtained in many countries on the epidemiology of dermatophytoses in man and animals. However, it is clear that this group of fungal diseases, (especially trichophytoses) are widespread throughout the world.

Infection has been introduced into some countries through the importation of cattle already affected by the disease. In some developed countries where many zoonoses, such as brucellosis and tuberculosis, have been eradicated, dermatophytoses continue to present great public and animal health problems. The infection has also been recognized in laboratory animal facilities where animals are used for biomedical research. Dermatophytoses were often found in race horses. Although not lethal, these zoonotic diseases cause considerable economic losses and human suffering. For example, in animal husbandry losses may be incurred due to the high cost of medicaments and animal treatment, weight gain/loss among sick animals, decrease in milk production and the poor quality of raw hide material in view of skin affected and destroyed by dermatophytes. The fur from infected animals is of inferior quality. It is impossible to describe all the ill effects to man such as itching and the anxiety of infected persons and those who fear the risk of infection.

For a long time existing methods of dermatophytoses control in animals as the main source of human infection (drug treatment, disinfection, quarantine, etc.) proved unsatisfactory. A revision of the traditional dermatophytoses control techniques was called for. In the USSR, for example, eradication of dermatophytoses in farm animals has been achieved by the wide use of vaccines produced in the country. A description of the vaccine production and its use is given below.

2. Prevention and control of dermatophytoses in man and animals

2.1 General principles for elaboration and use of vaccine against dermatophytoses

The process of creating vaccines is complicated and a more detailed knowledge with regard to pathogens and to the immunity of infected animals is required. Research has shown that in 98% of cases of dermatophytoses in cattle, T. verrucosum is the main pathogenic agent, and in horses mainly T. equinum and to a lesser degree T. mentagrophytes. In fur-bearing animals and rabbits the main causative agents are T. mentagrophytes, and to a lesser degree T. verrucosum (see Table 1). On the basis of available knowledge on these pathogenic fungi, a potent vaccine was created in the USSR against the diseases.

With regard to the immunity of animals infected with dermatophytoses, it is important to note that animals which recover from the disease (cattle and horses) have immunity for the rest of their lives. The same degree of immunity is demonstrated in fur-bearing animals (foxes, polar foxes, rabbits, etc.).

Both young and adult animals are susceptible to infection by dermatophytoses. Therefore, the appearance of infection on a farm with both young and adult animals poses a threat to the whole herd. Additional research is still needed with regard to the immunity to dermatophytoses of sheep, camel and reindeer, as well as of dogs and cats.

Vaccination results in the production of humoral and cell-mediated immunity. However, the serological reactions (complement-fixation and agglutination) do not reflect the level of longevity and intensity of immunity and, therefore, do not serve as a test for evaluation of efficiency of the vaccine.

2.2 Vaccine LTF-130 for cattle

The creation of a safe vaccine against dermatophytoses in many countries of the world remained unsolved for decades. In 1967 a vaccine was produced in the USSR. This vaccine was produced from live immunogenic cells of an attenuated strain of 130 T. verrucosum.⁽¹⁻⁴⁾

The vaccine is safe for animals as well as for the veterinary specialists and technicians who perform the vaccinations. The vaccine exists in liquid and lyophilized form. The latter is the most convenient with regard to duration and storage temperature as well as usage. Vaccination is compulsory in the USSR and demonstrates a high degree of efficiency, long potency and good immunity. It is important to note that vaccination of cattle during the latter stages of pregnancy does not cause complications; however, the new-borne calves do not have immunity to infection. On a farm where dermatophytoses was prevalent in cattle, the timely vaccination of the new-borne calves with LTF-130 considerably reduced the infection on the farm. The eradication of dermatophytoses from a farm can be achieved in about one year.

During the 10-year period in which the vaccine has been used for immunization in the USSR, about 300 million animals have been vaccinated. As a result there has been a one-hundred-fold decrease in the number of cases of dermatophytoses in cattle,⁽¹⁻⁴⁾ (Fig. 1). Therefore, dermatophytoses in cattle in the USSR can be considered eradicated.

The vaccine was tested in connexion with T. verrucosum isolated from infected animals imported from different countries (UK, Netherlands, Denmark, Cuba, Mongolia, Czechoslovakia, and Yugoslavia). Animals immunized by vaccine LTF-130 were not affected by pathogenic strains T. verrucosum isolated from the infected animals. Some countries (Yugoslavia, Hungary and the German Democratic Republic) have already begun immunization programmes with the vaccine. (5-10)

In one area of Czechoslovakia more than seven million animals were immunized with the vaccine between 1976 and 1980, resulting in a decrease in the number of reported cases of the disease and many farms became completely free from the infection. Eventually these measures played a significant role in the decrease of dermatophytosis infection in man. For example, before immunization in this region of Czechoslovakia, 637 cases of human dermatophytoses were recorded but in 1980, after immunization of animals, the cases of human infection decreased threefold. (17)

In the Gausdal region of Norway the vaccine was used and many farms which had been infected for long periods were freed from infection. In many countries in western and in eastern Europe, and in Scandinavian countries, the vaccine LTF-130 has been registered for practical use. (11)

The above-mentioned data indicating the prophylactic efficiency of the vaccine LTF-130 serve to recommend its use elsewhere for the control of dermatophytoses in cattle.

2.3 Vaccine S-P-1 for horses

Dried vaccine S-P-1 (Sarkisov et al.)⁽¹²⁻¹⁴⁾ contains live cells of an attenuated strain of T. equinum and has a high immunogenic activity on dermatophytoses in horses. The vaccine is introduced by intramuscular injection and provides immunity for six to seven years (period of surveillance). The vaccine is recommended in the USSR for use at horse breeding farms, racing stables, etc.

2.4 Vaccine MENTAVAK for fur-bearing animals and rabbits

The vaccine Mentavak (Sarkisov et al.)⁽¹⁵⁻¹⁶⁾ is a dried culture of an attenuated strain of T. mentagrophytes. It has a high immunogenic activity for dermatophytoses of fox, polar fox, nutria and rabbits. The vaccine is non-reactogenic and is injected intramuscularly. The vaccine has been recommended for practical use in the USSR. The period of immunity is two to three years. Fur-bearing animal farms in the USSR affected by dermatophytoses have been freed from infection by the use of the vaccine Mentavak. It is important to note that of the zoophilic dermatophytes, T. mentagrophytes is the most pathogenic for man. Therefore, in farms affected by this fungus, a number of cases are recorded in man, especially among people in direct contact with the animals. The vaccination of all animals on these farms reduces the risk of infection in man. The vaccine Mentavak is also immunogenic for nutria and rabbits which is important on farms where these animals are bred on an industrial scale.

3. Economic efficiency of vaccination against zoonotic dermatophytoses

Efficient immunization of cattle saves the expense of drugs, decreases three-fold the time needed by specialists for control and preventive measures, prevents flesh losses in animals and decreases spoilage of skins. For example, before the introduction of vaccines in the USSR about nine million roubles per annum were spent on the drug treatment of dermatophytoses. Drug treatment is no longer necessary because of the eradication of the disease as a result of vaccination. Data with regard to economic efficacy is limited. It is known that the cost of vaccination of one calf is 3.5 times less than the cost of drug treatment. Also a greater flesh gain was reached in calves in comparison with calves suffering from dermatophytoses. The prevention of dermatophytoses in horses has also shown economic efficacy since it permits the use of horses for sport, does away with the need for quarantine, and eliminates drug treatment. With regard to fur-bearing animals and rabbits, their vaccination with Mentavak will free farms from infection, thus eliminating the expenditure on drugs and disinfection of sheds, and preventing spoilage in fur production. In rabbits it is also important to note that use of vaccine prevents flesh loss and spoilage of skins.

Quarantine measures and the prohibition of the sale of fur from affected animals and rabbits can be dispensed with when eradication is successful. The vaccination of animals helps to prevent these diseases in man, principally in those who care for animals and members of their families. Vaccination eventually leads to prevention of distribution and contamination of the environment by the pathogens of dermatophytoses which, as previously stated are very resistant and survive for a long period.

4. Conclusions and recommendations

Dermatophytoses are distributed throughout the world and create significant health problems for man. It is intended to plan and organize ways and means of preventing and controlling the disease in animals, thereby reducing the risk of infection in man. The development of measures for the prevention and control of dermatophytoses is particularly important for industrial animal husbandry where dermatophytoses can become a widespread disease, presenting a risk of mass contamination to man.

Vaccination is one of the primary measures to bring about prevention and control of this zoonotic disease in farm animals which are the main source of dermatophytoses in man. With regard to the vaccination of animals, it is necessary to organize good epidemiological surveillance of these diseases with an accurate diagnosis of the type of fungi.

The Member States of FAO, WHO and OIE should be requested to report regularly on the prevalence of the disease in order to establish the epidemiological situation with regard to this zoonosis in different parts of the world. In the programmes of FAO, WHO and OIE, it is advisable to organize a meeting of consultants to elaborate in detail the programme on immunization of animals against zoonotic dermatophytoses.

A regional FAO/WHO seminar should be organized on planning and organization of measures for prevention and control of dermatophytoses by use of the vaccine. The role of this seminar would be to inform specialists from different countries about the principles and methods for the use of anti-dermatophytoses vaccines.

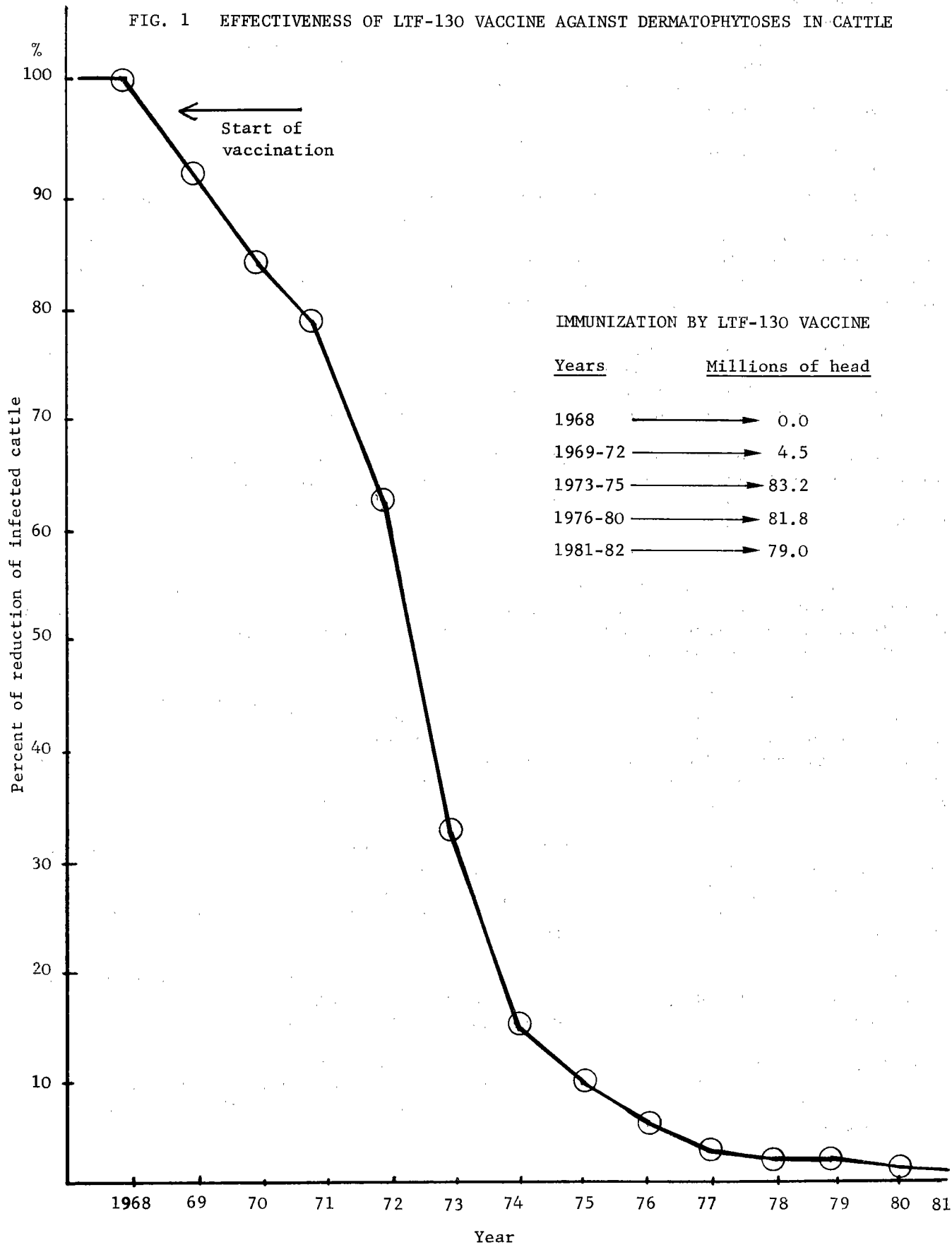
It is advisable to establish reference centres in the different regions of the world for the identification of pathogenic fungi and causative agents of the dermatophytoses. The laboratories involved in the diagnosis of the disease in man and animals should be supplied with adequate equipment and reagents to carry out mycological investigations and in particular for the isolation of the causative agents of the dermatophytoses. FAO/WHO guidelines on dermatophytoses for the specialists in the different countries of the world are needed.

The curricula of the medical and veterinary schools should include teaching with regard to mycology. It is advisable to train a specialist in each of these establishments who will be informed about the problems of dermatophytoses. Post-graduate training for medical and veterinary officers should be a permanent activity in WHO collaborating centres and other specialized scientific establishments in this field.

Further research work should be done with regard to specific vaccination prophylaxis of the dermatophytoses of the different species of animals, including dogs and cats which are the most dangerous sources of infection for man, especially children.

It is expected that the wide use of vaccine for prevention and control of this disease will lead to a significant decrease in the number of cases in the human population of the world, creation of animal farms free from the disease and improvement in the economy in animal husbandry.

FIG. 1 EFFECTIVENESS OF LTF-130 VACCINE AGAINST DERMATOPHYTOSES IN CATTLE



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