



# Rinderpest Surveillance

Rinderpest is probably the most lethal virus disease of cattle and buffalo and can destroy whole populations; damaging economies; undermining food security and ruining the livelihood of farmers and pastoralists. The disease can be eradicated by vaccination and control of livestock movement. The Department of Technical Co-operation is sponsoring a programme, with technical support from the Joint FAO/IAEA Division to provide advice, training and materials to thirteen states through the "Support for Rinderpest Surveillance in West Asia" project.



Surveillance is essential for rinderpest eradication

## A dreaded disease

Rinderpest epidemics have time and again swept across Europe, Africa and Asia. The virus is contagious and the disease is usually fatal with up to 90% mortality. Infected animals develop high temperature and have eye and nose discharges which are followed by necrotic ulcer-like lesions in the nose and mouth. The disease also affects the intestines causing great damage which produces severe diarrhoea and frequently death. Over the past 15 years epidemics have devastated herds in East and West Africa and South and West Asia. Despite national and regional attempts to eradicate the disease, rinderpest has in many countries reappeared after a lapse of a few years. However, the lessons learned from the past and the refinements of methodologies offer a real prospect for global eradication by the year 2010. There is presently a concerted action to provide funding to eradicate the disease by outside agencies including the EU and FAO. This Model Project plays a strong part in the eradication process.

## Control and eradication

Control of rinderpest is possible through the use of the available potent live virus vaccine (contains an attenuated strain which does not cause disease). A single injection gives lifelong immunity when administered properly and when the vaccine has not suffered environmental degradation. The efficiency of a vaccination campaign depends therefore on vaccinating the majority of livestock with a vaccine which still contains live virus. A level of immunity in a herd of approximately 80-85% is regarded as being required to prevent disease. Where this level is achieved, the virus cannot survive and the disease dies out. To check whether vaccination has been successful it is necessary to take blood samples from a selected

number of livestock vaccinated (sero-sampling) and test the serum for antibodies against rinderpest virus. The IAEA is able to offer procedures and materials for this purpose through the supply of kits based on the Enzyme Linked Immunosorbent Assay (ELISA) an analogous technique to Radio Immuno Assay (RIA). The estimation of the total number of animals in a herd with antibodies gives a measure of the likely protection of the herd produced after vaccination and is termed sero-monitoring. The IAEA also supplies tests which can confirm diagnosis of rinderpest which allows differentiation of other diseases causing similar symptoms. Past campaigns have failed to maintain initial successes due to the absence of monitoring of vaccination and sustaining disease surveillance.

## The Model Project

Through the Model Project for Support for Rinderpest Surveillance in West Asia, the IAEA Department of Technical Co-operation with the FAO/IAEA Joint Division's Animal Production and Health Section provides support to the following countries:

Afghanistan  
Iran  
Iraq  
Jordan  
Kazakhstan  
Kuwait  
Lebanon  
Saudi Arabia  
Syria  
Turkey  
United Arab Emirates  
Uzbekistan  
Yemen



The objective is to establish a regional sero-monitoring and sero-surveillance network based on the ELISA technology (see box) through the provision of ELISA kits, laboratory equipment and training in their use. The procedures are:

1. IAEA funded experts consult on sampling strategies for collection of serum samples before and after vaccination.
2. IAEA provides laboratory equipment including ELISA kits for antibody detection and virus detection, ELISA readers, storage facilities for samples, computers and software for analysis and storage of data.
3. IAEA arranges and funds external training on epidemiology and ELISA technology (and training courses within the region).
4. IAEA and national counterparts hold regular regional co-ordination meetings.

# Rinderpest Surveillance

## ELISA

The Enzyme-Linked Immuno-Sorbent Assay (ELISA) has been exploited by the Joint FAO/IAEA Division's Animal Production and Health Section to examine the major epizootics of livestock through the identification of the disease agent as well as the measurement of specific antibodies against specific diseases. ELISAs are relatively simple to perform, use small amounts of reagents and offer great flexibility in test design. The end product is a colour reaction which can be read with multichannel spectro-photometers and data can be quantified and compared. In the field of animal health in the past eight years, ELISA technology has been transferred to over 70 national and regional veterinary diagnostic and research laboratories to assist animal disease diagnosis and surveillance.

## Factors favouring eradication

Although highly infectious, rinderpest was eradicated in Europe mainly through animal movement control and slaughter of infected and contact animals. Mass vaccination, with good surveillance for disease, is a sound policy and has had considerable success. A large campaign in Africa, sponsored by the EU, called the Pan African Rinderpest Campaign (PARC)



A farmer's survival may depend on the health of his draft animals

has made substantial inroads into the eradication of rinderpest in Africa. The disease has not been reported in West Africa for more than six years. All but three countries in East Africa are now free of rinderpest. The approach of sero-monitoring and surveillance by ELISA was maintained throughout the African campaign by the Agency with a total of 22

laboratories supported. Under EMPRES (Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases, FAO is providing technical leadership for GREP, the Global Rinderpest Eradication Campaign. The intention is to eradicate rinderpest completely by 2010. GREP consists of interlinked, regionally focussed eradication campaigns including PARC, WAREC (West Asia Eradication Campaign) and SAREC (South Asian Rinderpest Eradication Campaign).

Despite the infectious nature of the virus and the high mortality inherent in the disease, there are a number of factors that lead to optimism concerning eradication:

- there must be close contact with diseased animals to cause spread;
- affected animals shed virus in all secretions but the time of shedding is brief;
- the economic benefits of eradication are obvious;
- improved serological and molecular biological techniques now provide assays, some available as kits (ELISA) which can unequivocally diagnose rinderpest and differentiate it from related virus diseases;

- dip stick technologies are being developed giving the possibility of diagnosing at the cow side using eye-swab materials.
- diagnosis can be made using the Polymerase Chain Reaction (PCR) technology which has a potentially high sensitivity and which may be needed in the latter stages of eradication when countries have to prove the absence of the disease agent in the animal population;
- the PCR, through the use of gene probes, can amplify nucleic acid which can be sequenced and thus allow the exact source of strains to be identified.

## Progress

**Lebanon.** Following a visit by a Joint FAO/IAEA Division's expert to advise on sampling strategy, two national meetings of the veterinary authorities were held and control procedures were implemented within two months. The Agency supplied the equipment and reagents necessary for the initial surveillance of antibodies against rinderpest in the cattle population to proceed.

**Iran.** Rinderpest is largely controlled but the country is under constant threat of re-infection. Iran is a vital buffer for the prevention of spread of disease from Afghanistan and Pakistan and is undertaking the daunting task of maintaining control of rinderpest partly through the use of the kits provided by the Agency.

**Iraq, Kazakhstan, Saudi Arabia, the UAE and Uzbekistan.** As new active members of the Regional Model Project these countries will now be supplied with appropriate equipment by the Agency to undertake sero-monitoring and surveillance. The ex-CIS states are strategically very important to regional eradication and are under some threat. They suffer from a lack of diagnostic facilities and have some problems in vaccinating large areas. It is vital that they have the facilities to determine the current immunity status of their herds and to detect rinderpest in its early stages. These countries welcome the help provided under the Model Project. In particular, the Model Project offers a level of international recognition of laboratory work through the use of External Quality Assurance exercises.

## Future developments

- The model Project offers an External Quality Assurance (EQA) system for the kits involved in assessment of anti-rinderpest antibodies in serum samples. Through the IAEA's Seibersdorf Laboratory and the Animal Production and Health Section, test samples are sent to participating laboratories. Results are sent back and analysed and, based on these, the laboratory is assessed as being able to perform the required assay. Such an exercise highlights laboratories which need attention, standardizes an approach where the same kit is being used, identifies weak areas in the kit design or reagent formulation and serves to build confidence in competence of testing at national and international levels. Such an approach is vital in the current atmosphere of World Trade conditions.
- The Model Project provides a forum for the interchange of ideas and unifies approaches between member countries. The co-ordination meetings are the only liaison with other countries in West Asia concerning rinderpest.

Department of Technical Co-operation Programmes  
International Atomic Energy Agency, Wagramerstrasse 5, PO Box 100, A-1400 Vienna, Austria  
Telephone (+43 1) 2060 ● Fax (+43 1) 20607  
<http://www.iaea.or.at:80/programs/tc/index.htm>

