Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

An end to cattle plague

How nuclear related technologies contributed to the eradication of rinderpest

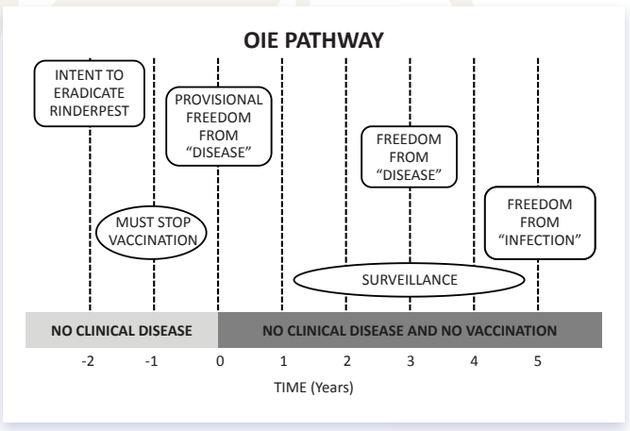
The International Atomic Energy Agency (IAEA) was established in 1957 as the world´s "Atoms for Peace" organization within the United Nations family. It works with its Member States and multiple partners worldwide to ensure the peaceful, safe and secure use of nuclear technologies. In 1964, the IAEA and the Food and Agriculture Organization of the United Nations (FAO) established the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture to help countries use nuclear science and related technologies to promote sustainable agricultural development. Through its technical cooperation (TC) programme and the Joint FAO/IAEA Division, the IAEA helps Member States to develop sustainable capacity in this area, including the training and analytical services necessary for the efficient use of these technologies.

For decades, one of the major constraints to food security in Africa and Asia was the viral disease rinderpest, which became the focus of a concerted international effort aimed at its control and eradication. Rinderpest (also known as cattle plague) is a highly contagious disease of cattle, buffalo, yak and several wildlife species. The IAEA, together with FAO and the World Organisation for Animal Health (OIE), has made significant technical contributions to rinderpest eradication through the development, evaluation, validation and distribution of immunological and molecular nuclear and nuclear related technologies for the diagnosis and control of rinderpest.

The main mechanism for providing assistance to Member States is the IAEA's TC programme, which supports the transfer of nuclear and nuclear related technologies to developing countries. The TC programme is funded by the voluntary Technical Cooperation Fund and delivers equipment, expert services, training and fellowships through national and regional projects. Support is also provided through the regular programmes of FAO and IAEA, which fund coordinated research projects (CRPs) for research and development and to promote the practical application of these technologies for peaceful purposes, and for fostering the exchange of scientific and technical information as well as the exchange of scientists.

The first step in the 20-year plus IAEA programme to control rinderpest was taken in 1986 (as part of the Global Rinderpest Eradication Programme (GREP)/Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) programme of FAO). Consultations with veterinary officials in many developing countries, visits to national veterinary laboratories and discussions with their staff had revealed that many laboratories were simply unable to provide either the quality or level of services required to support field programmes directed at controlling livestock diseases. In 1986, the serum neutralization assay used to detect antibodies against the rinderpest virus was deemed too demanding in terms of resources and technical expertise, as well as being relatively expensive, and was slow and difficult to fully standardize. Furthermore, the assay required collection of clinical samples, growing of the virus in tissue culture under sterile conditions, and finally identification and characterization using rinderpest virus-specific neutralizing anti-sera, also under a sterile environment. This approach required the maintenance of tissue culture which most laboratories in Africa involved in the Pan African Rinderpest Campaign (PARC) did not have. Hence, another approach was needed.

To proceed with the planned rinderpest eradication campaign, initially in Africa and later on a global level, a new approach

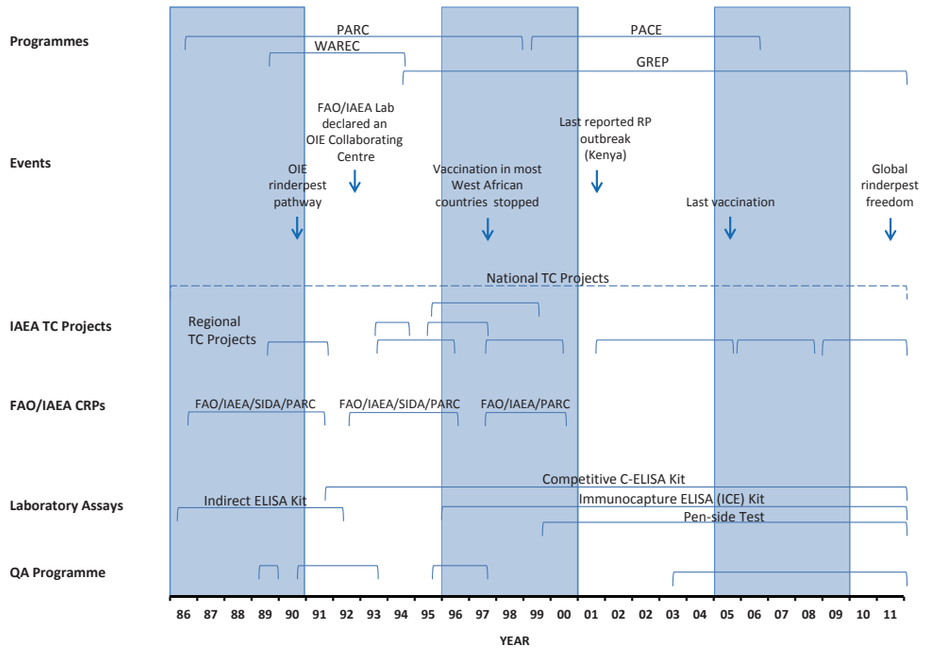


to animal disease diagnosis was needed. Thus, following the recommendations of an international consultative group, the Joint FAO/IAEA Division changed the focus of its animal health activities and began to develop programmes promoting the new, nuclear related enzyme linked immunosorbent assay (ELISA) technology – based on the radio immunoassay platform – for the diagnosis, monitoring and surveillance of livestock diseases. The ELISA technology is based on the specific binding of rinderpest antibodies (that are present in field sera from rinderpest infected animals) to inactivated rinderpest antigens that are fixed to a plastic plate. The percentage of binding between the rinderpest antigens and antibodies can be visualized by an enzymatic reaction. The more rinderpest antibodies bind to the stationary rinderpest antigens, the more enzymatic colour can be detected. The main advantages of ELISA were that there was no need to work under sterile conditions and that it had a higher throughput. This technology had a great deal to offer the diagnostician in developing countries charged with controlling rinderpest – assays were safe, relatively simple to use, low cost compared with alternatives, large numbers of samples could be tested in a short time, and the technology could, in principle, be applied both for the detection of antibodies as well as the pathogen.

ELISA was, therefore, ideally suited to meet the diagnostic needs of PARC, the Pan African Programme of the Control of Epizootics (PACE) and, later, the South Asian Rinderpest Eradication Campaign (SAREC), the West Asian Rinderpest Eradication Campaign (WAREC) as well as FAO's GREP programme and its efforts in assisting countries through its vast field programme. The rapid deployment of the rinderpest ELISA was possible due to an existing prototype assay which was under field evaluation in ten Member States participating in a CRP. This research tool was adapted into a kit format, incorporating quality assurance tools that took into account its scope for fitness of purpose and the needs of the diagnostician. The funding for these innovations, as well as the transfer and training in the counterpart laboratories, was covered through TC and CRP activities until commercial entities took over the production and procurement of the kits, thereby ensuring sustainability of the programme. The advent of this new tool allowed all veterinary laboratories to engage in rinderpest surveillance activities. In addition, it offered an economically viable diagnostic procedure for other diseases as well, and thus was readily implemented by the veterinary authorities or research institutes.

The Joint FAO/IAEA Division and the IAEA's TC programme were pivotal in ensuring that the relevant technical expertise, training and support in the use of ELISA technologies for the diagnosis of rinderpest were provided to Member States. This long term support was made possible not only through the IAEA's own CRPs and TC projects, but also with financial and technical support from other organizations, including Swedish International Development Aid (SIDA), FAO, OIE, the European Commission/Union, the Institute for Animal Health (United Kingdom), and the Agricultural Research Centre for International Development (France). A time frame of the various components of the eradication programme is detailed below.

IAEA's contribution to the rinderpest eradication campaign



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