SURVEILLANCE, DIAGNOSIS AND MONITORING SYSTEMS FOR VESICULAR STOMATITIS

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Summary: Even though a system for providing periodic information about vesicular diseases has been in place in South America since 1961, it has always clearly been aimed at recording foot and mouth disease, with vesicular stomatitis only forming part of the process of differential diagnosis for foot and mouth disease. It is therefore possible to confirm that no specific vesicular stomatitis information system exists at the continental level with the ability to consolidate all of the information required to carry out full epidemiological surveillance of the disease. The epidemiological surveillance of vesicular stomatitis involves integrating information from both the field and the laboratory. The establishment of any epidemiological surveillance system must take into consideration that knowledge about the environmental structures that allow the maintenance and circulation of the disease agents is incomplete and that the existence of a large number of infections has been confirmed with no clinical manifestations. The structure of any such system should include components that permit an active search for the agents’ activity in domestic animals, whether apparent or otherwise, as well as in wildlife and insect populations. The establishment of programmes to control the disease depends on this information being available to guide control measures.

1. INTRODUCTION

Although records exist that lead us to suppose that vesicular stomatitis emerged in Africa in the late nineteenth century and in Europe in particular during the First World War, it is in fact a disease that is confined to the American continent. It is generally agreed that the first documented report of its occurrence in the Americas was an incident which was described by Teidebold at the 20th Annual Meeting of the United States Livestock Association and which affected horses in the United States in 1916 (11). Nevertheless, many references exist to indicate the existence of incidents of the disease prior to this (8).

The viral nature of its agents was proven when, in 1925, the disease emerged in Richmond, Indiana, and the virus known as the Indiana serotype was isolated (subsequently Indiana-1). The following year, another serotype was identified in a further incident detected in New Jersey, which was antigenically distinct from the earlier serotype, and was called New Jersey (8).

In South America, vesicular stomatitis was clinically diagnosed in Colombia in 1929 (9); in Argentina in 1935 (10) and in Venezuela in 1941 (5). In addition to those mentioned, other agents of the disease were identified in the region, such as the Salto virus in the province of Buenos Aires (Argentina), in 1963 (7) and the Alagoas virus in Brazil in 1964 (1).

2. SURVEILLANCE SYSTEMS

In general it can be confirmed that South America has had a system of epidemiological information about vesicular diseases for almost fifty years now. Starting in 1961, the Pan-American Centre for Foot and Mouth Disease (Panaftosa) periodically published information about the field samples characterised at the Reference Laboratory. In 1962, with the addition of data from Argentina, Brazil, Chile, Paraguay and Uruguay about outbreaks of vesicular disease, publication of a periodic bulletin began (6). In 1969, the Second Inter-American Ministerial Level Meeting recommended that Panaftosa draw up a surveillance programme for foot and mouth disease and vesicular stomatitis on the continent.
In late 1971, a pilot system started operating in the Brazilian state of Rio Grande do Sul and was subsequently set up in Paraguay and Uruguay, starting a process that was to culminate in 1974 when, during the Second Meeting of the South American Committee for the Control of Foot and Mouth Disease, all the countries of South America formally agreed to join the Vesicular Disease Information and Epidemiological Surveillance System of the Americas (6).

Based on a map divided into a numerically codified grid, each country agreed to submit a weekly report to Panafotosa on the location of the quadrants where there were confirmed or suspected incidents of any type of vesicular disease. This system was so clearly oriented towards reporting foot and mouth disease that one of the first evaluations to be made of its operation confirmed its usefulness and raised the possibility of extending the system to include other diseases, citing vesicular stomatitis as an example (4).

The usefulness of the Continental System in evaluating the geographical distribution of foot and mouth disease was repeatedly confirmed, making it possible on numerous occasions to warn of the existence of epidemic waves of the disease. However, its results with regard to vesicular stomatitis were very different. This decline in the System’s effectiveness became evident at the International Conference on Vesicular Stomatitis, held in Mexico City in September 1984, at which an analysis was presented of the incidence of vesicular stomatitis in Colombia, Ecuador, Peru and Venezuela. The conclusions drawn by the said study were limited to the aggregation of data from the Continental Vesicular Disease Information System (3) since, in view of the priority assigned by the countries in the region to foot and mouth disease, information on vesicular stomatitis was gathered only as part of the differential diagnosis process in a monthly report (2).

Therefore, at the continental level there is no specific system of information about vesicular stomatitis able to consolidate all of the information needed to ensure full epidemiological surveillance of the disease. The disease in animals was always considered to be secondary to foot and mouth disease because of the latter’s greater impact on international trade in livestock products and, at the same time, its importance in humans is lost due to the imprecision of clinical diagnosis.

Information about stomatitis should not solely form part of a differential diagnosis with foot and mouth disease but rather be oriented towards being able to characterise the epidemiological behaviour of the disease and to identify its determining factors. Feedback of the said information into the system would make it possible to rectify the system’s orientation and to gradually increase its effectiveness and efficiency.

The development of an epidemiological surveillance system specifically for vesicular stomatitis does not have to start virtually from scratch, as was the case with foot and mouth disease. The current system for vesicular diseases provides the essential basic data required for carrying out epidemiological studies that will make it possible to understand the structures that help to maintain the agents in the environment.

In most countries where the disease is present there are systems for collecting data but, more importantly, there is experience of the systematics of data collection. Although all systems of epidemiological surveillance in general have been seriously eroded as a result of the sharp reduction in resources allocated to the official services, it is possible to recoup their effectiveness by encouraging community participation, as understood in the broadest sense of the term.

As with many other diseases, the epidemiological surveillance of vesicular stomatitis involves integrating information from both the field and the laboratory. The establishment of a system of epidemiological surveillance must take into account the fact that there is no full knowledge of the environmental structures that allow the maintenance and circulation of the disease agents, and that the existence of a large number of infections has been confirmed without any clinical manifestations.

The systems currently in operation in the various countries are defined as being of the passive type, for the most part limited to collecting data about the location of the clinical presence of the disease, insofar as the latter reaches the system via one means or another.

In areas with a past history of the disease, or which are recognised as endemic, or where there are reasonable grounds to suspect them of being so, or where there have been repeated incidents of vesicular stomatitis, components should be set up to facilitate an active search for identifying the parameters governing fluctuation in the agents’ activity in domestic animals, whether apparent or non-apparent, as well as in wildlife and in insect populations.
3. LABORATORY DIAGNOSIS

The aim of laboratory diagnosis in vesicular stomatitis is to identify the viruses at work, the viral antigens, the viral ribonucleic acid (RNA) or the presence of specific antibodies for vesicular stomatitis.

Rapid diagnosis of the agent is based on identifying the viral antigens by analysing field samples using 50% complement fixation tests (CFT) in the test tube and/or enzyme-linked immunosorbent assay (ELISA). The laboratory of the Pan-American Centre for Foot and Mouth Disease has a battery of hyperimmune sera that make it possible to type the serotype involved if it is New Jersey or Indiana and to sub-type in the case of the Indiana viruses. In cases where good quality field samples of epithelium are available, it is possible to obtain a diagnosis within 4-5 hours. In the event of a negative result using the fast diagnostic test, cell inoculation is carried out in order to try to isolate the infectious agent.

The said isolation is carried out using conventional techniques in BHK (baby hamster kidney) monolayer cell cultures in roller bottles. The use of this type of bottle permits greater sensitivity and allows infectious particles to be recovered. Up to three passages are made, each of 48-72 hours, after which, if there has been no cytopathogenic effect, negativity is confirmed using the 50% complement fixation test in samples of suspended matter collected from each of the three passages. If a cytopathogenic effect is observed, it is typed and sub-typed, as the case may be, as mentioned above.

Recently Panaftosa started to develop and apply reverse transcriptase polymerase chain reaction (RT-PCR) in order to amplify the nucleic acid of the vesicular stomatitis virus. This technique is being used to study the genetic sequences of the various strains, in collaboration with the Plum Island Laboratory (Agricultural Research Service, United States Department of Agriculture). In the near future it will be possible to use this test for diagnosing the disease.

Specific antibodies for vesicular stomatitis are identified by means of the ELISA-CFL test, using purified glycoproteins as a test antigen. South America has a network of official laboratories for diagnosing vesicular diseases and they all receive standard reagents from the Centre in order to carry out this test. This ensures uniformity of the results throughout the continent, which is especially important when dealing with trade in live animals or epidemiological studies of the disease.

The virus neutralisation test continues to be used to confirm those cases where results from the ELISA test prove difficult to interpret. In addition, Panaftosa is producing monoclonal antibodies for the various vesicular stomatitis viruses for use in studies of pathogenesis and two antibodies for the New Jersey virus are currently being characterised. It is hoped that antibodies will shortly be available for the Indiana 3 serotype.

4. MONITORING

The success achieved by programmes for eradicating foot and mouth disease in Argentina, Chile, Paraguay, Uruguay and the States of central and southern Brazil heightens the need to fill existing gaps in knowledge concerning the epidemiological behaviour of vesicular stomatitis. The outbreaks recorded in the Brazilian States of Paraná and Santa Catarina in 1998 confirm the importance of the disease as a health problem that can reach major proportions, since it is a factor that disrupts early detection and warning systems in regions declared to be free from foot and mouth disease.

The establishment of monitoring programmes is dependent on first being able to obtain proper epidemiological information to guide their actions. Setting up an information and surveillance system specifically for the disease is therefore something that will need to be addressed in the near future, taking advantage of the experience gained in the fight to control foot and mouth disease, whilst at the same time paying attention to the special characteristics of vesicular stomatitis.
REFERENCES


