



PAN AMERICAN HEALTH ORGANIZATION  
WORLD HEALTH ORGANIZATION



## **XII INTER-AMERICAN MEETING, AT THE MINISTERIAL LEVEL, ON HEALTH AND AGRICULTURE**

*São Paulo, Brazil, 2 - 4 May 2001*

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*Provisional Agenda Item 11.4*

RIMSA12/18 (Eng.)

19 March 2001

ORIGINAL: SPANISH

### **PANEL: ZONOSSES OF IMPORTANCE FOR THE ECONOMY AND FOR PUBLIC HEALTH**

#### **IMPACT OF EMERGING ZONOSSES ON HUMAN AND ANIMAL HEALTH**

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## 1. Introduction

As the Minister of Health and Social Welfare of Bolivia, I would like to thank the Director of the Pan American Health Organization for the privilege of his invitation to participate in the discussions of this XII Inter-American Meeting, at the Ministerial Level, on Health and Agriculture (XII RIMSA) on “Emerging Zoonoses: Their Impact on Human and Animal Health.” This is one of the most important and troubling issues of our times. From the standpoint of epidemiological control, the diseases that are transmitted from animals to man (viral, bacterial, parasitic, and prion) require an enhanced response capacity, under an integrated strategy that includes the strengthening both of networks for epidemiological surveillance and of laboratories to support such surveillance. It requires a thorough, evidence-based approach, which seeks to implement the findings of practical and realistic research. International and local infrastructure must be adapted to ensure they are capable of responding in a timely and efficient manner.

These requirements call for working in a coordinated fashion, and with an intersectoral approach. It is essential to remember that economic globalization and free trade mean that domestic and international trade activity is rapidly expanding.

It is thus highly appropriate for the Pan American Health Organization to include this topic in the agenda of this meeting. This Inter-American forum provides us an opportunity for a joint effort to tighten our Pan American bonds and should play an active role in building the new model of country development, driven by the premise of universal health as a vital component of development, in which issues of public health and animal health are predominant. When viewed as a link between political and social concerns, health issues are of extraordinary importance and are emerging as the most important indicator of well-being, the ultimate purpose of development. The relationship between health and production must be recognized as a special condition for activities to be effective and efficient. Emerging zoonotic infections, such as Hantavirus, hemorrhagic febrile syndromes, tuberculosis, plague, and Venezuelan equine encephalitis, all have an animal origin.

In this field, it is increasingly necessary to forge strategic partnerships for subregional integration at the regional level if the Pan American Health Organization is to fulfill its common objective: to raise the level of health and development of the people. If we are ever to resolve the problems of inequity, poverty, and misery—the principal indicators of the so-called “social deficit”—it will require the effort and participation of all.

Despite major progress in Latin America, and particularly in Bolivia, we still have an arduous task ahead of us: for both the control of foot-and-mouth disease as an animal health problem that affect the production of food and the elimination of human and canine rabies in the principal cities as a major public health problem. Diseases transmitted through food, such as those induced by *Escherichia coli* O157:H7, are also a problem; likewise, those caused by neurocysticercosis, resulting from eating pork and vegetables infested with *T. solium* ova. Swine are the major reservoir of the disease, and transmission is through contaminated food and person-to-person contact.

## **2. Conceptual Aspects of Emerging Diseases**

The U.S. Center for Disease Control (CDC) has referred to these as infectious diseases whose incidence in humans has risen over the last two decades, or threatens to do so in the near future. Ever since the first description of the cholera outbreak in England, it has been evident that the appearance of a disease is not a sudden event, as shown by Snow's application of the epidemiological method. We now know that the causality and accumulation of risk factors, when coupled with a deterioration in living conditions, can lead to the emergence of the diseases that we now think of as "emerging zoonoses."

## **3. Characterization of the Principal Emerging Zoonoses in the Americas and Other Regions of the World**

### **3.1 *Hantavirus***

Eurasia reports nearly 200,000 cases annually of hemorrhagic fever with renal syndrome (HFRS). More than half of these occur in China, and are linked to the rice harvest. It is known that mortality varies as a function of the viral type in the region: it ranges from 0.1% with the Pumala viruses to nearly 10% with the Hantavirus.

Up to 1993, HFRS was the only known disease caused by Hantavirus and it was confined to Asia and Europe. In 1993 a new clinical entity surfaced in the United States characterized by a serious acute respiratory insufficiency, and a 50% mortality rate, whose etiologic agent was identified as a new Hantavirus, the so-called "No Name virus," and to the Hantavirus pulmonary syndrome (HPS). Subsequently, this clinical syndrome was recognized in several countries of the Americas and cases of HPS were reported.

Latin American countries, including Argentina, Bolivia, and Chile, as well as Canada, have recently reported cases of the disease, which produces serious respiratory disturbances, transmitted by water and food contaminated by mouse excrement.

Chile, at the beginning of the 2001, reported 15 patients, and registered 5 deaths from the disease.

This year, a Bolivian living in Oran, in Salta, Argentina, while visiting Bermejo, Tarija on the Argentine border, was diagnosed by laboratories of the National Center of Tropical Diseases (CENETROP) of Santa Cruz. This case was recorded in epidemiological week 7 (14/02/01).

### **3.2 *Arenavirus***

Arenaviral hemorrhagic fevers in South America, such as Junín hemorrhagic fever (Argentina), Machupo hemorrhagic fever (FHB - Bolivia), Guanarito hemorrhagic fever (Venezuela), Sabiá hemorrhagic fever (Brazilian), are all caused by arenavirus and transmitted by rodents. These constitute examples of emerging diseases resulting from the settlement of new areas and the expansion of the agricultural frontier.

### **3.3 *Escherichia coli* O157: H7**

Recent research on the evolution of bacterial pathogens is revealing new clinical entities whose frequency and severity have disconcerted physicians and microbiologists. Examples include hemolytic uremic syndrome associated with *Escherichia coli* O157:H7, necrotizing ascites by *Streptococci pyogenes*, and toxic shock caused by *Staphylococcus aureus*. As noted by Musser, these are processes in which the predominance of clones endowed with genes for hypervirulence has been recognized.

The most important reservoir is cattle; transmission occurs through contaminated food and person-to-person contact.

Bolivia is committed to conducting surveillance of *E. coli* O157: H7 within the framework on food marketing of MERCOSUR and Southern Cone. This is accomplished through the Plan for epidemiological surveillance of emerging and reemerging diseases, as a joint effort between the General Bureau of Epidemiology and the National Laboratory Health Institute (INLASA). This commitment was undertaken at the most recent meeting of the Laboratory Network for Epidemiological Monitoring of the Southern Cone in Atlanta, USA, July 2000, and the Buenos Aires Workshop of June 2000.

### **3.4 *Bovine Spongiform Encephalopathy***

Bovine Spongiform Encephalopathy (BSE), better known as mad cow disease, appeared in 1986 in the United Kingdom, affecting thousands of animals. This disease, which has spread to many countries in Europe, is of deep concern to researchers worldwide, since there is currently no vaccine or treatment. Of course, it also concerns us as health and agriculture authorities, since we must prevent this scourge from entering Latin America by implementing measures for epidemiological surveillance with regard to the possible entry of low-, medium-, and high-risk animals and products. Bolivia has issued a list of prohibited imports of live animals and products from overseas, per resolution 017 of February 2001, of the National Service of Agriculture and Livestock Health of the Ministry of Agriculture, Livestock, and Rural Development.

### **3.5 *Plague***

Plague is a specific zoonotic disease that affects rodents and their fleas, and is transmissible to man and other domestic animals. The causative agent is *Yersinia pestis*.

In centuries past it was one of the pandemics that decimated the populations of Europe and Asia. Currently, it exists in the wild rodents of several regions of the world: in the United States; in northern, central, eastern, and southern Africa; in central and south east Asia, and Indonesia; and in South America, in Brazil, Bolivia, and Peru. In Bolivia there are two endemic/enzootic foci, in the northeast of the department of La Paz and in the south, in the departments of Tarija, Chuquisaca, and Santa Cruz. The most recent outbreak was reported in December 1996, in San Pedro de Apolo, in the department of La Paz, with 4 deaths out of a total of 17 investigated cases. In 1992, it resurfaced in northern Peru, following a decade of bubonic plague outbreaks which in little less than 4 years produced nearly 2,000 cases and 91 deaths in humans.

Research showed that the outbreak was attributable to bumper grain harvests in the area, which were stored under improper conditions that propitiated a marked increase in the rodent population, and by extension, of their fleas, the transmitters of *Yersinia pestis*, which causes the disease.

## **4. Principal Zoonoses in Bolivia and Their History**

### **4.1 *Rabies***

The VIII Meeting of Directors of Rabies Programs, REDIPRA, held in Lima, Peru, on 16-18 October 2000, took up the document “Regional Program for the Elimination of Human Rabies Transmitted by Dogs: Progress report 1990–1998” presented at the XI Inter-American Meeting, at the Ministerial Level, on Animal Health (RIMSA11/INF/20), Washington, D.C., 1999, whose conclusions can be summarized in the following points: there is a clear downward trend in human rabies transmitted by dogs in the Americas, and a significant drop in the number of human and canine cases since 1990, but the goal of elimination has not yet been attained.

Urban population growth and the migration of people to the cities with their dogs leads to the emergence of areas with a high risk of rabies in the suburbs, where the population density is higher and there are larger numbers of stray dogs. This situation calls for strategic surveillance in the cities, involving municipal authorities and the community itself.

The destruction of sylvatic ecosystems because of development has given rise to new risks of rabies in humans, as wild animals wander into cities or towns seeking refuge and food.

The recognition of rabies-free municipios is a major strategy to make the program for the surveillance and prevention of rabies sustainable. The strategy of mass vaccination of dogs in risk areas has been effective in interrupting the cycle of rabies transmission through dogs, and, thus, in preventing human rabies. This strategy should be continued as a responsibility of the ministries of health and of the municipalities until the risk has disappeared. This effort should be coupled with educational programs (which should be the responsibility of the community) in order to ensure the vaccination of dogs and keep them from roaming the streets.

#### 4.1.1 *Situation of the Program in Bolivia*

The situation of the Program in Bolivia during its early years (1980-1989), can be divided into two periods: before and after the Program. At the beginning of the 1980s, the program lacked sustainable financing from national or international sources due “to the relative neglect of health policies.” There was support only for emergency control actions in cases involving human deaths caused by rabies transmitted by dogs.

At the beginning of the 1990s, through a project presented to the Executive Secretary of the PL-480, of USAID, a decade of sustainable financial support was obtained in order to provide coverage for each component of the National Program (Surveillance, Control, Diagnosis, Production of Rabies Vaccine). Additionally, PAHO/WHO, provided technical support, starting from the very organization of the Program.

As of the close of 2000, the Executive Secretary PL-480 ended its cycle of economic cooperation for communicable disease control programs (malaria, tuberculosis, rabies). There have been positive results in terms of the program's impact on rates of human rabies. Without financing, the mortality from human rabies was 25 deaths (in 1992) or 0.36 x 100,000; this decreased, by the end of 2000, to 7 deaths, a rate of 0.08 x 100,000 population. This was achieved over nearly 16 years of continuous support for the Program.

#### 4.1.2 *Epidemiological Situation*

##### *Human Rabies*

From a historical perspective, the epidemiological period of 1992 was the most critical, with 25 cases of human rabies, a rate of 0.36 per 100,000 population. By contrast, there were only 7 cases in 2000, a rate of 0.08 per 100,000 population. These were broken down as follows: 3 in Cochabamba (2 rural, 1 urban), 1 urban case in La Paz, 1 rural case in Santa Cruz, 1 rural case in Potosí, and 1 rural case in Tarija.

Ten deaths were recorded in 1999, 8 of which were in the Department of Cochabamba (7 rural and 1 urban). The other two cases were in Santa Cruz and Potosí (both rural, in municipios with less than 10,000 inhabitants). The overall rate for Bolivia this year was of 0.12 x 100,000 population.

##### *Canine Rabies*

The year 1992 also was critical, with 1,712 cases and a rate of 18.93 x 10,000 dogs. By the end of the decade, in 2000, there were 303 cases registered for a rate of 1.8 x 10,000 dogs. Nonetheless, this year reflected a significant increase, of 39%, over 1999, when there were 184 cases, for a rate of 1.19 x 10,000 dogs.

#### 4.2 *Taeniasis/Cysticercosis*

Taeniasis and cysticercosis are diseases of poverty, as confirmed by the statistics of areas with a low standard of living. The rural and semi-urban nature of communities in Latin America exacerbate the problem: these feature traditional household raising of pigs, but lack technical support for raising swine, officially-sanctioned slaughterhouses, sanitary inspection by municipal authorities, or control of compliance with laws on the breeding and slaughtering of pigs.

Bolivia has one of the highest rates of prevalence in the world, along with Brazil, Ecuador, Mexico, and Peru in Latin America (in accordance with PAHO criteria, countries with rates over 1% are considered to have a high rate of prevalence). The departments most affected in the country are Chuquisaca, Cochabamba, La Paz, and Tarija.

The high incidence detected in hospitals demonstrates the importance of one of the forms of cysticercosis –neurocysticercosis, especially in children; for instance, at H.O. N° 1 of the City of La Paz, where 3 out of 10 children admitted for occupative cerebral lesions corresponded to neurocysticercosis.

The Program for Surveillance and Control was established in 1994 with PL-480 funds. It has prioritized activities of community education, training of interinstitutional health workers, and disparasitizing of population groups in areas identified as high-risk. This all transpires under a framework of broad coordination with institutions involved in the issue: the Ministry of Agriculture, mayoralties, and veterinarians from other institutions or NGOs.

A preliminary evaluation (ongoing under the current administration) conducted with CENETROP determined that in the localities of Chuquisaca and Santa Cruz the prevalence of the disease diminished over a 5-year period. For example, in Monteagudo, the prevalence of taeniasis has dropped from 6.1% to 1.7%. As with many countries of the Region, much work is still needed in order to ascertain the true extent of the diseases' incidence and prevalence, since the studies conducted to date are insufficient. Research to date nonetheless has made it possible for us to understand the existence of the problem in the population, and to develop educational campaigns geared to the economically active population and consumers, market vendors, and people engaged in the legal or illegal slaughter of swine, especially at the household level. It must be remembered that the “universe” of persons engaged in such activities is quite large, because of how easy it is to raise and slaughter swine, the economic situation, and the general impact of unemployment on society.

### **4.3 *Hantavirus***

Bolivia recorded 6 cases in 2000, in epidemiological weeks 13, 18, 22 and 26. All of them occurred in the Department of Tarija, in localities near Bermejo, on the border with Argentina.

Surveys of seroprevalence and rodents, conducted with the support of the National Center of Tropical Diseases, NAMRID of Peru, and the CDC of the United States, have made it possible to reach the following conclusions: the circulation of the Hantavirus is not recent, since IgG anti-Hanta antibodies have been detected in the inhabitants of the affected area, suggesting that at some point in their life they were in contact with the virus. The captured rodents were classified and belong to 10 species now being studied by CDC-Atlanta in order to conduct viral isolation and studies by the PCR.

#### **4.4 *Fasciola hepatica***

Until the 1990s, fascioliasis was considered a parasitic disease of major importance in animal and human health. The outbreaks that were registered were localized, and affected a small number of people. However, during the current decade, the World Health Organization (WHO) has begun to recognize worldwide medical interest in the problem.

Research on prevalence conducted in Bolivia since the 1970s in localities of the department of La Paz, bordering Peru, have revealed that up to 71% of rural populations are affected (provinces of Omasuyos, Manco Kapac, and Los Andes).

Based on stool examinations conducted in 1997 (Mas Coma, et al.), the aforementioned provinces present the following characterizations:

- (a) High prevalence: Batallas, Cullucachi, Chijipata, Cotusuma, Pantini, with 67%; Lacaya, Chojasihui, Huacullani, Kallutaca, and Quiripuju, with 38%.
- (b) Medium prevalence: Aygachi, Corapata, Calasaya, Chambi Grande, Kajchiri, Kharapata, Oketiti, with 18%.
- (c) Low prevalence: Achacachi, Achocalla, Anconcagua, Belén, Caleria, Cohana, Cuyahuanai, Los Altos, Iquiaca, Pucarani, Tauca, Yanarico, and Viacha, with 9%.

The statistical distribution of prevalence by age turned out to be higher in the 9 to 19 year old groups than in children between the ages of 5 and 8; persons older than age 9 were the ones most exposed to the infection. Research on the general population has demonstrated that the infant population shows a prevalence of 75%, significantly higher than that of the adult population, which is 41.7%.

For the administrative period of 2001–2002, there is a project and resources allocated by health authorities, and a TCC is being sought, possibly with Peru.

## **5. Principal Determining and Risk Factors**

The complex economic, social, and biological processes, as well as the tremendous genetic variability of the bacteria, virus, and parasites, are leading to adaptations that may well be important in determining risk factors for balanced human and animal health.

### **5.1 *Globalization***

The world is going through a period of economic globalization. This is not restricted to exchanges of capital and goods, but rather increasingly involves the entire cycle of the food chain, from production to processing to marketing of foods of plant and animal origin, including genetically modified foodstuffs. Bovine spongiform encephalopathy may well serve as evidence of an irrational globalization of the manipulation of foodstuffs which turn out to be biopathogens. Our own human behavior, as manifested in dietary culture, can be a risk factor in the spread of disease.

In fact, living conditions in Latin America still have difficulties in achieving improved levels of basic sanitation, education, and health.

### **5.2 *Climate Changes***

It is undeniable that environmental climate changes are playing an important role in the emergence of diseases, with a probable increase on diseases transmitted through food. There are inadequate methods for the preservation and protection of food in warm climates.

Climate changes should be understood as providing context for events induced by natural disasters, such as floods, droughts, and earthquakes, as well as technological phenomena, for instance in agriculture, where aerosols in a variety of yield-boosting agribusiness products used on plants and animals may subtly diverge from ethical and bioethical aspects related to equilibrium in our ecosystem.

Man-made changes may in turn lead to changes in ecosystems, for example, leading to the appearance of leishmaniasis (due to irrational deforestation, which is promoting the emergence of the peridomestic sand fly from jungle niches) or malaria, due to the construction of rainwater reservoirs for use in times of drought.

## **6. Factors Related to the Emerging Diseases**

Our countries still have populations that live in extreme poverty. Unfortunately, this is a major factor in the emergence of diseases, particularly those related to habits of hygiene, and the handling, preservation, and sale of food.

Furthermore, in countries with aging populations, there is a marked increase in pet ownership. The ongoing, rapid improvements in transportation, and the rapidly changing relationships between countries are facilitating the transfer of carriers and susceptible hosts, and the movement of agents from one end of the earth to the other, resulting in the emergence of diseases.

### **6.1 *Sociodemographic Factors***

Critical living conditions, with an annual growth rate of 2% in most countries, encouraging the search for new opportunity, and lead families to migrate from the country to the cities. This in turn results in overcrowding and promiscuity that encourages the spread of infectious agents; likewise, changes in the distribution of populations puts people in contact with new pathogens and vectors.

The migration of wild animals to urban areas, because of changes in the environment, is another issue of concern.

It is estimated that by 2025 the world population will reach 8.5 billion, with 1.062 billion in the Americas. The largest increases in population will occur in the developing countries.

## **7. Government Policies**

The breadth, diversity, and complexity of the factors involved in the appearance and spread of the emerging zoonoses means that intersectoral coordination is required. The Health and the Agriculture sectors need to coordinate their intervention policies in the fields of agriculture and livestock health and public health. Epidemiological control infrastructure at the various levels of delivery of services to the population (local, regional, and national) should be optimized. It must also be supported by health and agriculture laboratory networks specializing in food protection, toxicology, and occupational health.

### **7.1 *Community and Private Sector Participation***

We should promote the participation of civil society (the community) through its natural and institutionalized organizations, as the Health Posts [*Defensorías de la Salud*] in Bolivia, which have helped resolve problems and facilitate decision-making at the local level.

Community participation provides an opportunity to encourage action, and will allow for better use of resources. Judicious use of the media, with the right intensity, will make it possible to provide proper support for measures to encourage the adoption of positive attitudes by the population.

### **7.2 *Coordination among Countries***

Exhaustive research, along with a review of interventional strategies, is needed on the incidence of the emerging zoonoses—especially those with determining factors that cover environmentally similar or compatible areas, and which may occasionally encompass the territories and populations of two or more countries.

### **7.3 *Role of Institutions for International Cooperation***

The United Nations is a forum that we most definitely should take advantage of, through its various agencies. For example, there are sources of technical and scientific information such as the Institute for Food Protection and Zoonosis (INPPAZ), and the Pan American Foot-and-Mouth Disease Center (PANAFTOSA), which play a major role in the promotion and implementation of research on a variety of diseases of humans, plants, and animals.

Institutions such as these, and others of an international nature, are where we should seek support to continue strengthening our ability to prevent and control diseases while pursuing the intersectoral and interinstitutional approach.

Such institutions could intensify their activities in the evaluation and characterization of areas and risk situations in development, the adaptation and incorporation of technologies, scientific and technical conditions and realities. They could also be of assistance in coordinating subregional programs and designing criteria adapted to the economies of our countries, that would make it possible to prioritize problems and evaluate alternative solutions, as required in order to ensure the health of our people.

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