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REEMERGENCE OF DISEASES IN PUBLIC HEALTH: THE AEDES AEGYPTI VECTOR AND THE ENVIRONMENT

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INTRODUCTION

The last two decades of the 20th century was marked by the resurgence of numerous diseases previously controlled in our country and the emergence of new viral species. This phenomenon, which began around forty years ago, is a reality in the Brazilian public health scenario at the beginning of the 21st century. Currently, in Brazil, the diseases transmitted by Aedes aegypti, namely dengue, chikungunya, zika and, potentially, yellow fever, are the most worrying due to the difficulty of environmental control of this vector.

The colonization process that occurred in the Americas in the 16th century brought cities similar to those in Europe to this continent and, with them, all the environmental problems resulting from this model of urbanism as well as the harmful consequences for human health. In the first decades of the 20th century, interventions were necessary on the part of the government, which instituted the work of public health scientists Oswaldo Cruz and Carlos Chagas, among others, to control the epidemics that were ravaging the country and especially the State of Rio de Janeiro. These measures were necessary because the precarious health conditions in our country compromised foreign trade. Actions to combat vectors and other preventive measures have had an effect and the quality of life has improved in Brazil with relative control of communicable diseases. At the beginning of the 21st Century, however, we are witnessing the process of re-emergence of controlled diseases and this phenomenon is strongly associated with the dispersion of the Aedes aegipty mosquito.

REVIEW OF LITERATURE

CONCEPTS

The WHO (1948), shortly after the Second World War, developed a concept in which "Health is the state of complete physical, mental and social well-being of individuals" and not just the absence of illness. Having defined "health", it remains to understand the meaning of public health, which for a large part of the population is understood as health "given by the government, governmental, public" as opposed to that health paid for by citizens, "private" health. Although etymologically this understanding is not wrong, technically, public health is a term that applies to "population health" or "public health", so public health refers to the health of all people, whether they are served in the public network, government, is covered by the privately paid health plan. A useful concept for analyzing the factors that affect health, and on which public health actions must be based, is the concept of health field (Lalonde, 1974 in Verdi, 2005). According to this concept, the field of health covers, among others, the environment, which includes soil, water, air, housing and the workplace.

In this context, the World Health Organization develops a concept of sanitation in which it is described as the control of all factors in man's physical environment, which have or may have harmful effects on physical, mental and social well-being. In other words, it can be said that sanitation characterizes the set of socioeconomic actions that aim to achieve Environmental Health.

In Brazil, Federal Law 6938/81, which provides for the National Environmental Policy, in its Article 3 defines: "The Environment is the set of conditions, laws, influences and interactions of a physical, chemical and biological nature, which allows, shelters and governs life in all its forms". In

the same Law, degradation of environmental quality is defined as the adverse change in the characteristics of the environment.

Conama Resolution No. 001/86 defines environmental impact and, according to this resolution, environmental impact is "any change in the physical, chemical and biological properties of the environment, caused by any form of matter or energy resulting from human activities that, directly or indirectly, affect: the health, safety and well-being of the population; social and economic activities; the biota; the aesthetic and sanitary conditions of the environment; the quality of environmental resources.

THE EPIDEMIOLOGICAL TRANSITION, THE EMERGENCE OF NEW DISEASES AND THE RE-EMERGENCE OF CONTROLLED DISEASES

Infectious and parasitic diseases have dominated humanity's disease burden for millennia. Between the 19th and 20th centuries, most of these diseases were controlled through government actions, improvements in the quality of life of human populations and the demographic transition with all its characteristics. Chronic diseases, in this scenario, have reached the level of the main cause of death in developed countries and this phenomenon has become known as epidemiological transition. In the last quarter of the 20th century, the emergence of acquired immunodeficiency syndrome - AIDS - brought back the debate on the control of communicable diseases as a cause of morbidity and mortality. In Brazil, the aforementioned epidemiological transition was incomplete due to the emergence of new diseases such as AIDS and the re-emergence of previously controlled diseases such as dengue (Forattini, 1992).

Emerging and re-emerging diseases are largely the result of changes in the ecosystem and human economic, social and cultural behaviors. These diseases emerge as an important public health problem, both in rural and urban areas, and are of concern to health authorities around the world. The warming of the planet favors the proliferation of arthropod vectors such as Aedes aegypti, which has greater geographic dispersion in a wetter and warmer environment provided by this warming and can inhabit regions that would previously have been inhospitable to this type of vector.

There is complexity in this problem of emerging and re-emerging diseases, but it is possible to recognize that the majority of them are triggered by anthropogenic changes in the environment, largely resulting from demographic pressure in urban centers (Schatzmayr, 2001).

With growing concern about this problem, the US Centers for Disease Control (CDC) launched a program to monitor and mitigate new diseases focused on the evolution of new pathogens and the resurgence of old ones. This program has the following objectives: surveillance to monitor emerging pathogens, diseases caused by them and the factors involved that led to this emergence; integration of laboratories and epidemiological studies; prevention and control; and the strengthening of the public health infrastructure at all levels, including the control of sanitary conditions in the environment (Epstein, 1995).

The need for arthropod vectors for the transmission of several new viruses brings ecological factors into the discussion and, in countries with a tropical climate, this discussion becomes urgent (Schatzmayr, 2001).

According to the Evandro Chagas Institute website (2017), there are approximately 450 latent viruses in the Amazon, of which 150 are capable of causing disease in humans

and other warm-blooded mammals. This virus, therefore, can emerge in the burden of diseases in Brazil and the world at any time, as long as a transmission cycle is established.

This new public health problem is very serious and requires immediate responses and actions. In a technical note on February 2, 2016, the Brazilian Public Health Association emphasizes that environmental sanitation measures must be prioritized in the fight against the vector.

DENGUE, CHIKUNGUNYA, ZIKA AND YELLOW FEVER - SOME OF THE ARBOVIRUSES OF PUBLIC HEALTH IMPORTANCE

According to Lopes et al (2014), arboviruses are diseases caused by viruses transmitted by hematophagous arthropods (Arthropod-borne viruses) and are called this way not only due to the presence of the arthropod vector, but also due to the fact that part of their cycle occurs in these insects. that transmit them. Arboviruses that cause disease are classified into five viral families: Bunyaviridae, Togaviridae, Flaviviridae, Reoviridae and Rhabdoviridae.

Among all arboviruses, four constitute public health problems in Brazil: dengue, chikungunya, zika and, potentially, yellow fever. Its mode of transmission is through the bite of the infected Aedes aegypti mosquito and, less commonly, by the Aedes albopictus mosquito.

Caused by a virus from the Flaviviridae family, dengue is a viral disease that spreads rapidly around the world. In the last 50 years, the incidence has increased 30 times, with geographic expansion expanding to new countries and, in the present decade, to small cities and rural areas. It is estimated that 50 million dengue infections occur annually and that approximately 2.5 billion people live in countries where dengue is endemic.

In the Americas, the disease has spread with cyclical outbreaks occurring every 3/5 years. In Brazil, transmission has been occurring continuously since 1986, interspersed with the occurrence of epidemics, generally associated with the introduction of new serotypes in previously free areas or changes in the predominant serotype. The largest outbreak in Brazil occurred in 2013, with approximately 2 million cases reported. Currently, four serotypes of the disease circulate in the country (Instituto Evandro Chagas, 2017 online).

According to the World Health Organization, approximately 100 million dengue virus infections occur annually, in which approximately 550,000 patients require hospitalization and at least 20,000 die as a result of the disease. According to the Pan American Health Organization, in the Americas, Brazil is responsible for 70% of cases and is one of the countries with the highest death rates from dengue hemorrhagic fever, which in more recent years has reached a percentage of over 10% (Moraes & Duarte, 2009).

Chikungunya Fever is a disease caused by a virus from the Togaviridae family that was first isolated in 1950, in Tanzania. It received this name because chikungunya means "those who bend" in the Makonde dialect of Tanzania, a term used to designate those who suffered from pain caused by illness. The disease, although not very lethal, is very limiting. The patient has difficulty in movement and mobility due to inflamed and painful joints, hence the "hunched walk". The virus circulates in some countries in Africa and Asia. According to the World Health Organization, since 2004 the virus has been identified in 19 countries. That year, an outbreak off the coast of Kenya spread the virus to Comoros, Reunion Island and other islands in the Indian Ocean, reaching, in 2006, India, Sri Lanka, the Maldives, Singapore,

Malaysia and Indonesia. During this period, approximately 1.9 million cases were recorded – the majority in India. In 2007, the virus was identified in Italy. In 2010, cases were reported in India, Indonesia, Myanmar, Thailand, the Maldives, Reunion Islands and Taiwan – all with sustained transmission. France and the United States also registered cases in 2010, but without indigenous transmission. The virus was recently identified in the Americas. In Brazil, the first three imported cases were identified in 2010. In 2014, the first indigenous cases were reported in the country.

In 2015, we had the introduction of the fever caused by the Zika virus in Brazil. It is a flavivirus (family Flaviviridae) that was originally isolated from a febrile female Rhesus monkey in the Zika Forest (hence the name of the virus), located near Entebbe in Uganda, on April 20, 1947 (Dick, 1952). This virus is related to the yellow fever virus and the dengue virus that cause hemorrhagic fever. Recognized almost simultaneously, in February 2015 in Bahia and São Paulo, the circulation of the disease caused by the Zika virus was quickly confirmed by the use of molecular methods and, later, in Rio Grande do Norte, Alagoas, Maranhão, Pará and Rio de Janeiro, showing an impressive dispersal capacity, only seen in Chikungunya in the last two years in the Americas (Vasconcelos, 2015). The World Health Organization has reported newborns or fetuses with microcephaly or other malformations - presumably associated with Zika virus infection - being described in the following countries and territories: Brazil (1271 cases); Cape Verde (3 cases); Colombia (7 cases); French Polynesia (8 cases); Martinique (2 cases) and Panama (4 cases), data updated until May 5, 2016 (WHO, 2016).

Yellow Fever is an infectious, acute febrile disease caused by an arbovirus of the Flaviridae family and transmitted by the bite of infected mosquitoes belonging to the genus Aedes, mainly Aedes aegypti, in urban areas, and those of the genera Haemagogus and Sabathes in wild areas. Monkeys (non-human primates) are the only reservoirs in the wild cycle and man is the only host in the urban cycle, which has not recorded cases since 1942. Recently reported cases have always been related to the wild cycle and the biggest concern of health authorities is to avoid that the urban cycle is reestablished. Control has been carried out based on the occurrence of cases in the animal reservoir, primates, through the control of epizootics.

Yellow fever in Brazil is endemic, mainly in the Amazon region. Outside the Amazon region, outbreaks of the disease are recorded sporadically when the virus encounters a susceptible population. The occurrence of human cases has been compatible with the seasonal period of the disease (December to May), however, epizootics have been observed in non-human primates in periods considered to be of low occurrence, an indication that the conditions for yellow fever transmission are favorable and that Additional efforts are needed for disease surveillance, prevention and control actions.

Brazil registered cases of wild yellow fever in tourist regions in the states of Goiás and Mato Grosso do Sul and also in areas of Pará, Tocantins, Distrito Federal, Minas Gerais and São Paulo. The proximity to urbanized regions and the high population density in these places put surveillance systems on alert and encourage the intensification of preventive vaccination actions. To date, 792 cases of yellow fever have been confirmed in Brazil according to the website of the Strategic Management Support Room of the Ministry of Health SAGE (on line, 2017).

AEDES AEGYPTI

According to Triplehorn & Johnson (2011), the Culicidae family, to which the genus Aedes belongs, is classified in the order Diptera, Suborder Nematocera. Diptera, which include flies and mosquitoes, constitute one of the largest orders of insects and their members are abundant in both the number of individuals and the number of species. They undergo complete metamorphosis and the larvae, in general, are apodial and vermiform. The larvae, for the most part, prefer the aquatic environment for their development.

According to Forattini (1992), mosquito vectors are part of the group of animals that have presented a process of domiciliation or synanthropy, that is, they have adapted to living in artificial niches resulting from human activity, without this niche having been planned by man for his occupation. The blood meal necessary for oviposition in Aedes aegypti is related to the evolutionary success of living in an anthropic environment.

Attempts to eradicate the Aedes aegypti mosquito on the continent began in 1947 with an action by the Pan American Health Organization and the World Health Organization through a program called "Aedes aegypti Eradication Program in the Western Hemisphere". Efficient control measures were adopted against the vector in all Latin American countries, between the end of the 1940s and the 1950s. This species was eliminated in almost all of America, and in Brazil, which participated in this continental eradication campaign. of Aedes aegypti, success was achieved in 1955 with the first elimination of this vector. The last outbreak of the mosquito was extinguished on April 2 of that year, in the rural area of the Municipality of Santa Terezinha, Bahia and in 1958, at the XV Pan-American Sanitary Conference, in Puerto Rico, it was officially declared that the country had managed to eradicate the mosquito. vector. In 1967, the reintroduction of Aedes aegypti was confirmed in the country, in the State of Pará, and two years later, in 1969, in the State of Maranhão, demonstrating the difficult maintenance of this eradication due to the great adaptability of this vector to human environments (Braga, 2007).

Although dipterans occupy almost every space on the planet, as a general rule, the warmer and wetter an environment, the greater the biological diversity of individuals of all species. Mosquitoes of the genus Aedes are known to occupy tropical and equatorial environments. The warming of the planet, due to natural causes or as a result of human action, promotes the dispersion of this vector to areas previously inhospitable to it due to low temperatures and intensifies its presence in areas where it was previously found.

VECTOR CONTROL, CURRENTLY, BY THE GOVERNMENT

Vector control in Public Health encompasses a series of methodologies to limit or eliminate insects or other arthropods that transmit disease-causing pathogens. Vector control can be mainly divided into biological, mechanical or environmental and chemical control. In Brazil, the measures listed below are adopted:

LARVICIDES

Currently, the World Health Organization recommends the use of larvicides from five groups: bacterial (Bacillus thuringiensis israelis - CEPA AM 65-82); Benzoylureas (diflubenzuron and novaluron); juvenile hormone analogue (pyriproxyfen); spinosyns (spinosynad); and organophosphates.

Temefós was the main larvicide used to control Aedes aegypti in recent decades. However, in 1999 vector resistance to this larvicide was identified and in 2012 its use was reduced. It was used in a restricted

manner in 2013 associated with the larvicides Diflubenzuron and Novaluron and from 2014 it was no longer used and was replaced by Pyriproxyfen.

SPATIAL APPLICATION OF INSECTICIDES

In Brazil, the spatial application of Ultra-Low Volume (UBV) insecticides is recommended using backpack nebulizers or equipment attached to vehicles. Ultra-Low Volume applications are recommended for controlling the Aedes aegypti vector only when there is a need to control dengue outbreaks and epidemics, as established in the National Guidelines for Prevention and Control of Dengue (2009).

INSECTICIDES FOR RESIDUAL APPLICATION

Residual application of insecticides consists of spraying insecticides on walls or other surfaces using backpack equipment that leaves a certain amount of insecticide per square meter. This methodology is used to control vectors of Chagas disease, malaria and leishmaniasis. It is also used to control dengue in specific situations, such as perifocal treatment at strategic points.

Currently, the National Dengue Control Program is recommending the use of the insecticide Bendiocarb to control the vector in strategic points.

PREVENTION MEASURES ADOPTED BY THE POPULATION

Regardless of the measures adopted by health managers to control the vector, it is estimated that the population has adopted measures on a personal level, fearful of contracting arboviruses that have severe consequences. The use of household insecticides and repellents has been reported in different media.

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