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Technologies for Mitigating Dengue via Monitoring Positive Cases, Water Deposit and Chemical Addition

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Abstract
Interest in sustainable and effective methods to face dengue, a mosquito-borne virus and the need for natural chemicals to be employed constitute a challenge under sanitary and environmental constrains.Dengue, in the family Flaviviridae, classified into four serotypes, which are endemic to many Tropical and subtropical regions.

Introduction

Dengue, in the family Flaviviridae, is classified into four serotypes (DENV 1- 4), which are endemic to many of the tropical and subtropical regions of the world. Near 50% of the global population (4 billion people) are at risk of anual infection and outbreaks of dengue disease cases are growing in some countries where was not previously detected and thus, there is an acceleration of the occurrence of this problematic disease. Dengue virus is transmitted to humans through the bite of infected mosquitoes. As the symptoms of dengue often overlap those of many other diseases, the emergence of new mosquito-borne viruses within dengue-endemic regions can often be difficult to detect. An example is Zika virus (ZIKV), another flavivirus which circulated in Brazil for more than a year before apparent human infections reached a point of being detected by surveillance systems. Zoonoses are incessantly related with other organisms in their habitat and they are increasing. In the last years current sanitary practices employed unsuitable pesticides, creating environmental problems, also for human health. To maximize the manipulation of chemicals to decrease the populations of mosquitos, monitoring populations was established in some states. As annual dengue incidence in Brazil varies along years, a precise monitoring of houses and inhabiting humans practices, as well as the capacity to improve the control of acumulated water in the cities is showed as crucial, and thus, in the last years new more effective microbial products were discovered and used. The aim of this work is to present the current information on the dengue monitoring systems focusing on chemicals used along Brazil. Research on field is highlighted.

Keywords: Chemicals Zoonoses Dengue Flavivirus, Sanitary Surveillance

Introduction

Nowadays, dengue records increased 85% in Brazil, compared to 2021 attaining an incidence of 151.8 per 100 000 habitants, (Brazil Health Ministry, 2024). Moreover, 85 deaths, 73% more than in 2021. Experts warn of the advance of the Aedes aegypti mosquito in the South of the country, where the frequency of the virus used to be inferior due to the lower temperatures. In the south, Santa Catarina state has a record of confirmed deaths (11), after São Paulo (30) and together with Goiás state. Followed by Rio Grande do Sul and Paraná totalizing ten states with more cases. Near 159 deaths were under investigation in Brazil More than 26 cities from Santa Catarina informed epidemy, three included Florianopolis emergencies. Moreover, some municipalities have called volunteers to intensify the fight against Aedes. The number of cases in the south was very high for the season of the year as it's not common the presence of dengue

when the cold season starts. for some researchers, probably the proliferation of the mosquito was at the time when the temperature was more favorable. Another hypothesis is that people, worried about covid-19, neglected domestic outbreaks of dengue. The rise in temperatures favors the spread of Aedes where before it did not have as much space, such as the South. Thus, the disease is advancing mainly in the north of the state. The City Votuporanga had the highest incidence of dengue in the country, with 4,971 cases. The World Health Organization defines epidemic transmission when the rate exceeds 300 cases per 100,000 habitants. The main preventive measures are to remove objects that accumulate water In this regard Brazil has a monitoring program for the disease. As field work to combat the mosquito is the responsibility of the municipalities, the field agents periodically visit selected houses localized in the blocks (using a map) programmed for surveillance.

In São Paulo, the number of cases increased in 2021, but it was not as complex as in 2014, 2017 and 2018. Among measures, the application of Smoke was one of the first technics. In Brazil, insecticide launchers are commonly used when there is a high concentration levels of vectors (mosquito) and human cases. Drons are not usually used, due to their high cost, but are employed serving to control unaccess locals such as abandoned pools. The Ministry of Health periodically sends to the States larvicidal tablets for water containers and inseticide for residual treatment in strategic points, such as tire shops and junkyards., as well as high quantities of insecticide solution (named "Cielo") for use via smoke or spray. Recently, the use of Wolbachia, a natural bacteria, is being using for controlling larvae in water to decrease the number of human cases. Thus, to combat dengue and other arboviruses municipes intend to interrupt the proliferation cycle of the mosquito vector of these diseases the Aedes Aegypti through preventive actions carried out by endemic disease control agents to eliminate the accumulation of standing water, which favors the mosquito's life cycle. In recent years, annual dengue control has been refined worldwide. Dengue incidence varies by year, being higher in tropical zones [1]. knowledge on the potentiality of endemics associated to mosquito for new chemical production openned new occasions for the proposal of effective larvicides and insecticides. Anthropological, ecological, and immunological factors could explain the decline of dengue incidence following Zika epidemics. Human interventions, changes in human behavior in response to the Zika epidemic could explain the decline in reported dengue cases. Ecological factors, such as local humidity and temperature, may also impact the transmission dynamics of arboviral diseases.

Operational research is needed in generating reliable, cost-effective and practical evidence for innovative decision policy and approaches to combat dengue and other emerging infectious diseases reservoirs, understanding dengue vector competence determinants and disease etiology, improving more sensitivity and field adaptable rapid diagnostic techniques. Necesities of plants such as Citronela together with other organisms, which release volatile organic compounds produced by different parts and different substances [2]. This brings different possibilities for the use of microbes that influence disease existing agriculture practices employ improper pesticides and fertilizers, creating great environmental and human wellbeing problems. They adversely affects soil quality modifying the vegetation and ecosystems, which also influencethe occurrence of diseases. The aim of this work is to explore the last evidences on the benefits of the national program for control of Dengue in Brazil, chemicals applied to the infected areas.

Larval Control

Chemicals are costly due to the high amount required for commercial production. the use of more natural products such as Natular-Clarke(natular Dt Espinosade -Pragminas l) replaced (in 2022) the toxic pyriproxyfen which was previously applied in view of the absence of a more efficient natural chemicals.

Control Measures

A better way to prevent dengue is to maintain a systematic surveillance of vectors to detect early at the entrance to the municipality and act immediately on its elimination and control. The participation of the community in environmental management and household sanitation is essential and must be done eliminating useless containers such as cans, discarded materials, shells of eggs, lids of bottles and other material. Monitoring old urban practices like waste accumulation must be verified through inspection of deposits: by the field agent who surveille the sites. In the case of traps, the water must be poured in a transparent basin. And ten larvae or pupae collected with pipette and transferred to a shell. With a pipette, all larvae have to be removed and transferred to a tube with alcohol 70 %. Early detection of the presence of the Aedes mosquito. As larvitraps are small deposits made with motorcycle tires. There is a control system which includes a software called vigilantos, where the field agents introduce observedos data e also the monitoring technics and biologist read and check for data to summarize reports and prepare supervisions of the informed by each municipality each year.

Transmission Blocking (TB) the carrying out of vector control in function of the notification of dengue case(autoctone or imported) in areas infested by the vector and includes: larval control when existence of suspicious case, elimination of removable deposits and focal treatment of non-removable deposits within a radius of 50 m from the place where the suspected case was within the period of viremy. Aerial vector control, performed only in confirmed indigenous or imported cases of dengue,chikungunya e/ou zika vírus in an infected using motorized backpack equipment. The application of ultra low volume(ULV) in the local continuing in the adjacent areas, considering a radius of 150 m. However, a more holistic approach for can help to carry out a better disease management.

Atention, A new Focus has been registered in the system: Nº Focus:ARM No., Municípe: Locality: Data A. aegypti aquátic Forms(number)

Table 1: Example of Vigilantos System Notification for Dengue in Brazil

Successful measures will reflect decrease in dengue cases. In 2022 an increased number in the number of probable cases increased130%cases of dengue, zika e chikungunya in Brazil, besides cases of Zika e Chikungunya increased more than 50% [3]. The progress of efficient analytic techniques will facilitate the use of chemicals. Inexpensive methods could also help for investigating the holistic perspective of the plant microbiome. Nowadays, due to the difficulty in making specific recommendations of plants to combat dengue need to be more studied. The importance to scare away mosquitoes demands understanding of plant oils and substances released to the environment..

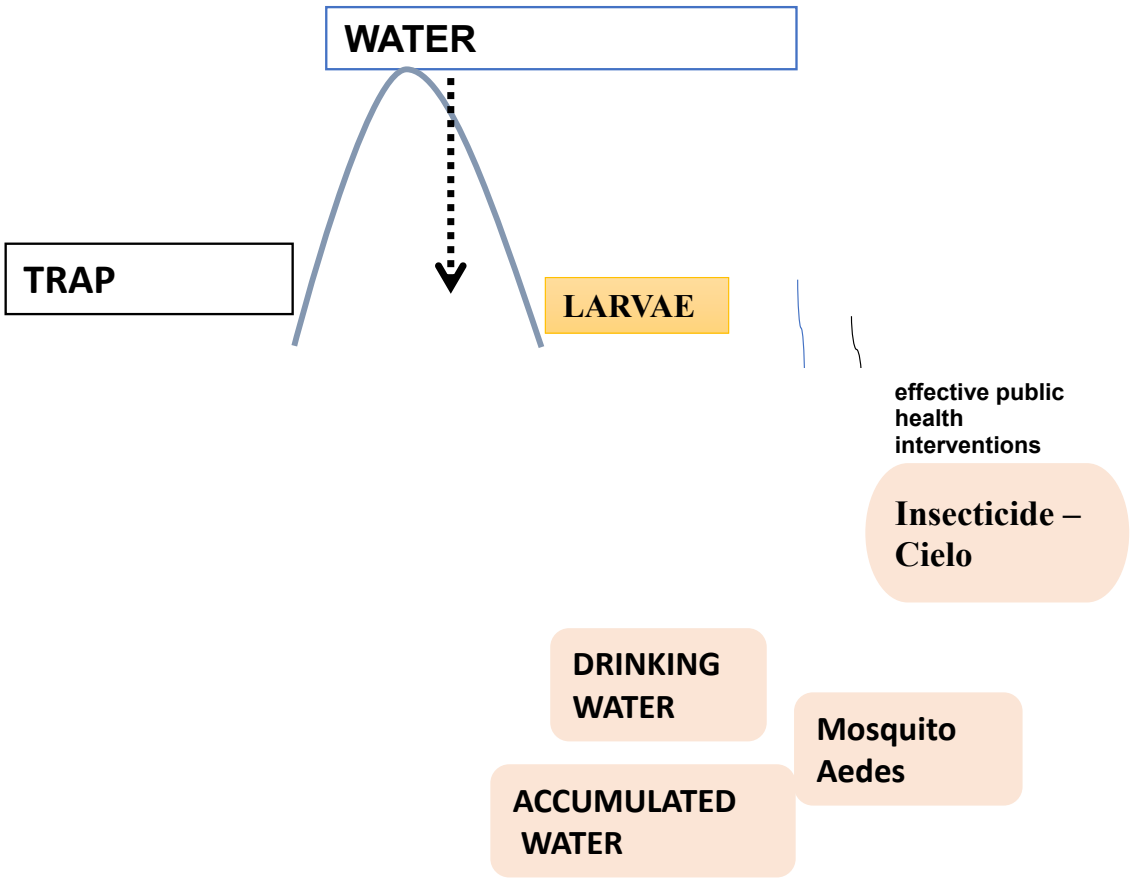

Figure 1: The Mosquito Control (Holistic Approach)

Conclusion

The methodology for monitoring dengue has been improved together with the chemicals employed for eliminate the vector. Further research is required to understand the relationship of water, climate,weather changes and residue placement and diseases. the selection of complementary measures may also increase the controlof dengue. Additionally, management practices must be specifically adapted for each region according to its economic characteristics, to achieve the intelligent management of zoonoses., restraining a deepening of poverty. As the dengue vector is associated with climate changes and fluctuations such as increased temperature, rainfall and humidity [4]. More effective public health interventions are needed (Figure 1). The choice of natural chemicals would have great implication in the manipulation of insecticides. Despite the adoption of citronela and other plants for green spaces in the cities. Further research is necessary on ecological systems, especially regarding education of population. In 2022 the number of probable cases increased130% for dengue, zika e chikungunya in Brazil., besides cases of Zika e Chikungunya increased more than 50% [1-9].

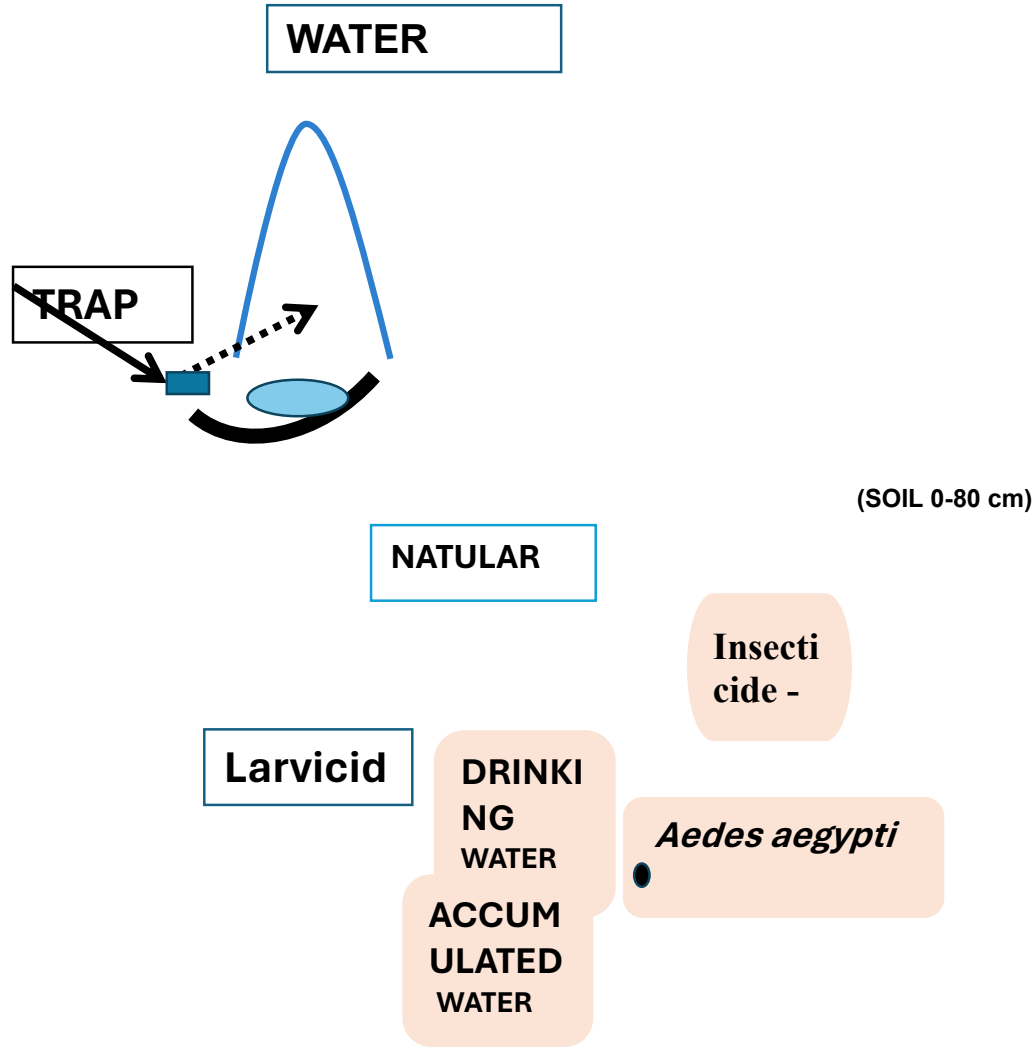

Figure 1: The Mosquito Control (Holistic Approach)

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