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Analysis of the current major Dengue outbreak in Argentina in an area with permanent control activities against *Aedes aegypti* since 2009

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Mundo Sano

INTRODUCTION

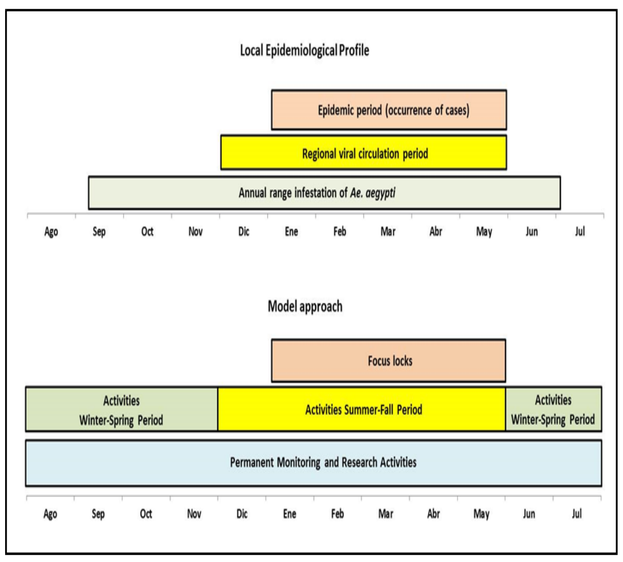
Mosquitos of the genus Aedes are the main vectors of dengue, chikungunya, zika and yellow fever. The presence and broad distribution of Aedes aegypti in north Argentina plays a fundamental role in the circulation and transmission of these viruses in the region. This is why the locality of Tartagal (Salta Province – Figure 1) has historically constituted a vulnerable urban scenario for the development of endemic dengue outbreaks. Ten years after the first record of dengue in Argentina, during 1988, Tartagal has suffered several seasonal outbreaks of varied incidence (Figure 2).

In 2009, Argentina suffered the first dengue epidemic of great importance, both in magnitude and distribution, with 26,000 countrywide cases and 14 provinces affected. Salta Province reported 2,678 cases of which 665 corresponded to Tartagal. Given this situation, Mundo Sano Foundation began a Surveillance and Control Program for Ae. aegypti, including the study of the abundance of breeding sites of the mosquito and identification of local epidemiological risk factors. The main goal of the program was to decrease the incidence of dengue in the locality through the implementation of permanent actions to reduce the levels of vector infestation and perform contingency outbreak interventions in the presence of dengue cases.

METHODOLOGY

The components of the operative program are organized in relation to the epidemiological profile of the locality (Figure 3) and activities are planned in accordance to the time of the year and the risk situation, trying to obtain the greatest impact on the mosquito populations.

Figure 3. Schematic of the operative components of the Program for Surveillance and Control of *Ae. aegypti*.

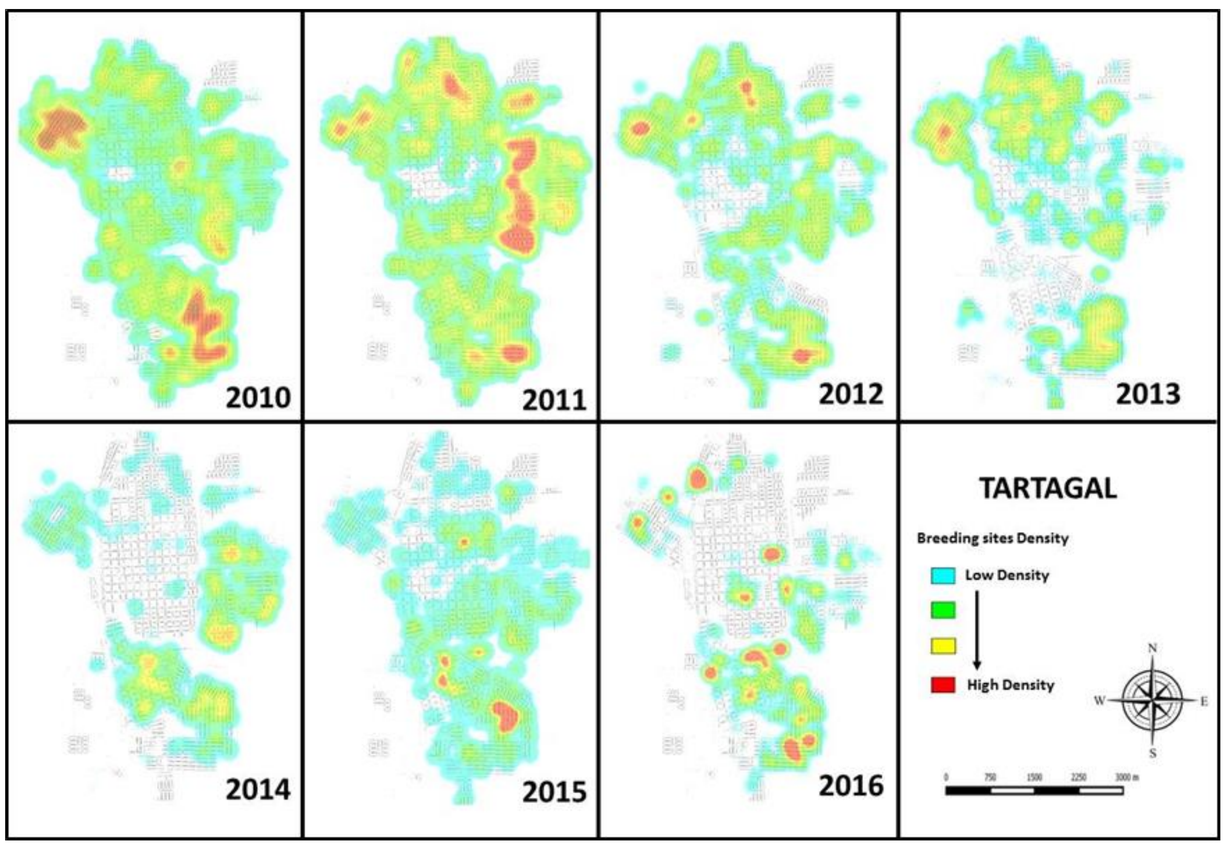


Winter-Spring Period (June to November)
Larval survey in 20% of the blocks in urban areas
Systematic registration of containers and breeding sites
Neighborhood rallies for the disposal of potential breeding sites ("descacharrado")
Operations directed to critical points (cemetery, repair workshops, tire repair shops and scrapyards/junkyards)

Summer-Autumn Period (December to May)
Rounds and house visits to 100% of the blocks
Monitoring of the Aedic index
Systematic registration of containers and breeding sites
Neighborhood rallies for removal of potential breeding sites ("Descacharrado")
Point control with larvicides in drains, sewers, septic tanks and other potential breeding sites in the peridomicile that cannot be eliminated or removed
Outbreak control in the presence of suspected cases
Collection of biological material (eggs) destined to assays for monitoring of levels insecticides resistance

Activities performed throughout the year
Monitoring with ovitraps and gonadotropic activities
Studies on the determinants of the abundance of breeding sites and other research studies
Community communication campaigns
Workshops in schools

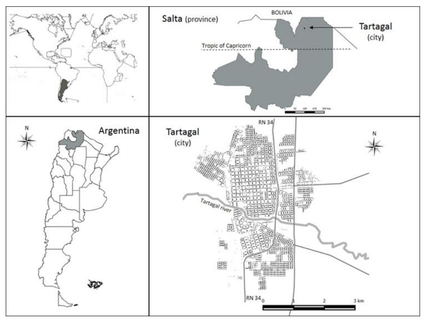
Figure 5. Annual density of *Ae. aegypti* breeding sites for Tartagal during the Summer-Autumn period.



CONCLUSION

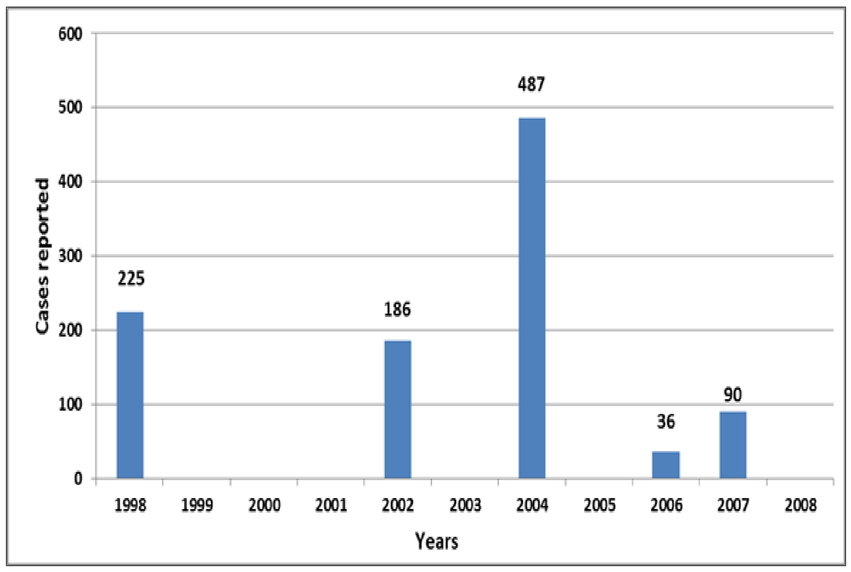
The implementation of a permanent monitoring system of breeding sites and of key infestation determinants provides the necessary information for the temporal and spatial analysis of the population dynamics of Ae. aegypti. The use of this information permits the development of a model for vector control sustainable in time and adjusted to the local situation, with the ultimate goal to have a greater impact on the mosquito populations with the least environmental impact possible.

Figure 1. Study area



Left top, worldwide location. Left bottom, location of Salta in Argentina. Right top, Salta bordering Bolivia to the North. Bottom right is the town of Tartagal, locality where the study was carried out.

Figure 2. Registered cases of dengue in Tartagal, 1998 - 2008



RESULTS

As seen if Figure 4, the Summer-Autumn months are more favorable for the mosquito since the weekly levels of oviposition Ae. aegypti are higher during this period. Moreover, the levels of abundance of breeding sites are high and widely distributed in the urban area. Nonetheless, Figure 5 shows the gradual decrease of the levels of abundance of breeding sites during the Summer-Autumn months since the program began.

The neighborhood rallies to remove potential breeding sites ("descacharrado") performed throughout the year and especially in the weeks prior to the rainy season leads to a start of the risk period with a diminished amount of available breeding sites. Consequently, there is a lower basal level of mosquitoes in comparison to those present in other localities of the region where control measures are not performed throughout the year (Figure 6).

These activities have permitted to gradually reduce the application of larvicides for point controls, as well as the use of spatial treatments with adulticides, being implemented only for outbreak control (Figure 7).

After the epidemic of 2009 and even in the one registered in 2016, the notified cases of dengue in the locality of Tartagal have shown a clear decrease (Figure 8), with the peculiarity that in this last outbreak the co-circulation of dengue and chikungunya was reported.

Figure 4. Weekly oviposition

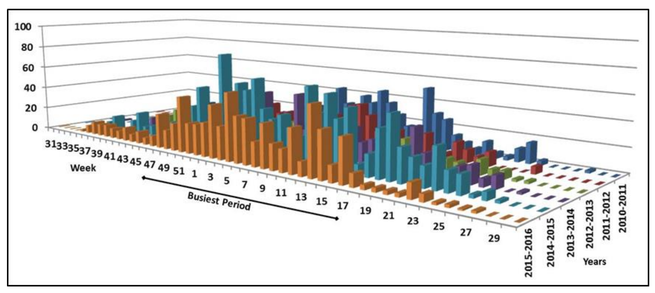
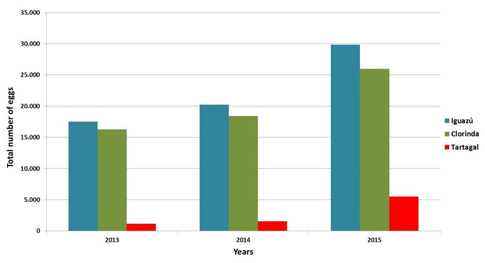
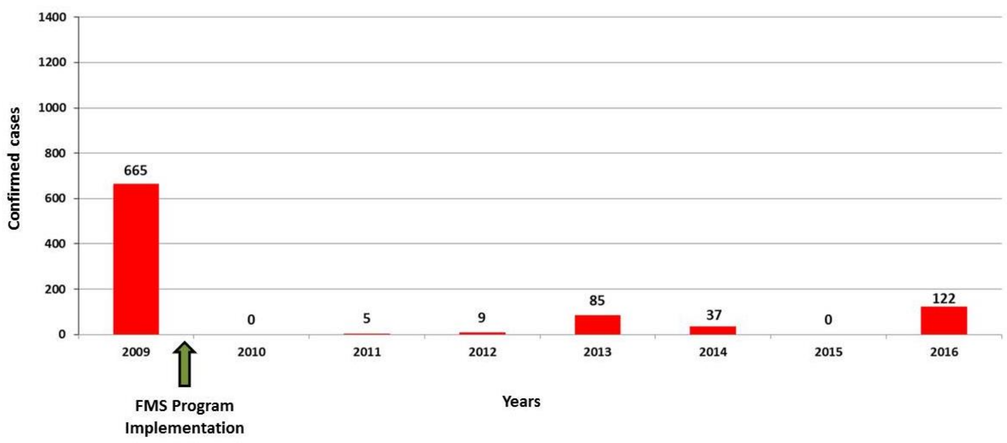


Figure 6. Total ovipostion during the months previous to the start of the epidemiological risk period (October-December)



Unlike Tartagal, Clorinda and Iguazu do not have a program with permanent control actions.

Figure 7. Dengue cases confirmed in Tartagal between 2009 and 2016



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