TOPIC:
12) Vector resistance to pesticides used in Public Health

APPROACH:
4. Vector control and surveillance including insecticide resistance

Insecticide resistance associated to environment in *Triatoma infestans*: what do we know and what remains unknown

Keywords: vector resistance; pesticides; Public Health; vector control; surveillance; insecticide; *Triatoma infestans.*

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Resistance to insecticides is considered as a barrier to chemical control of *Triatoma infestans*, the main vector of Chagas disease in the Southern Cone of South America. Although initiatives of disease incidence reduction in the area have integrated different strategies, they have been based mainly on vector elimination through pyrethroids insecticides like deltamethrin. The first reports of pyrethroids resistance were found in *T. infestans* populations from Salvador Mazza (northern Argentina) and Yacuiba (southern Bolivia). Recently, a mosaic pyrethroid resistant focus was described in the center of the Argentine Gran Chaco (General Güemes department, Chaco province), characterized by the presence in the same area of susceptible and very high resistant populations. Different resistance mechanisms were proposed to be involved together with the contribution of environmental variables that promote the toxicological heterogeneity described. In this context, new questions arise: Is there another resistant focus along *T. infestans* Argentinian endemic zone? Are the environmental predictors influencing the distribution of resistance at endemic area scale? To contribute to this knowledge, we studied toxicological information from insects collected and analyzed in 224 Argentinian localities during 2010- 2020 as part of the resistance monitoring performed by Chagas National Programme. The sites were classified according to insects survival rate exposed to deltamethrin discriminant dose: with 0- 0.19 were considered susceptible, 0.2-0.79 low resistant, and 0.8- 1 high resistant. Then, it was georeferenced in order to describe the spatial distribution of resistance and to set up spatial variables (demographic, land use, urbanization, connectivity, climatic) potentially related to resistance. The association between resistance and spatial variables was studied using generalized linear models (GLM), with error distribution selected according to the response variable definition: the number of surviving insects was modeled with Poisson error distribution with log link, while the presence/ absence of resistance was modeled with Binomial error structure with n= 1 (Bernoulli distribution) and logit link function. Concerning spatial distribution, 197 susceptible localities were spread along the endemic zone. Resistant localities with different survival rates were registered throughout the area, 9 of them with high resistance circumscribed to the two resistant foci described by the moment. 18 localities with low resistance were present in Chaco, Salta, Tucumán, Catamarca, Formosa and Santiago del Estero provinces, highlighting their relevance in control activities planning. Precipitation variables were associated with resistance in all GLM evaluated. Models of presence/absence were the most accurate, with precipitation, distance to the capital city and land use contributing to resistance distribution. This information could be valuable to

improve control strategies of *T. infestans* in future scenarios characterized by unpredictable changes in land use and precipitation.