

Use of the mobile app for surveillance and control (Vicon SAGA) as a tool for notification and registration of cases of canine leishmaniosis

Paulo Abilio Varella Lisboa^{1*}, Jessika Caroline Ferreira da Silva¹, Carlo Eduardo da Silva Verona¹, Denise Alves Lima¹, Isabele da Costa Angelo², Elisa Domingues Pádua³

1. FIOCRUZ, RJ/RJ/Brasil, 2- UFRRJ, Seropédica/RJ/Brasil, 3- Veterinária Auqmia, RJ/RJ/Brasil.

*paulo.abilio@fiocruz.br

Background

Canine leishmaniosis (CanL) is a chronic and fatal disease caused by the protozoan *Leishmania infantum*, which also infects humans and other animal species. Its transmission in South America takes place by infected sand flies *Lutzomyia longipalpis*, with dogs being the main domestic reservoir. Brazil currently does not have a real-time surveillance system for CVL notification and information on the number of infected animals. The objective of this study was to test the effectiveness of an application for mobile devices for notification purposes, data organization and georeferencing positive cases.

Materials and methods

The study was carried out using the mobile application of the Surveillance and Control platform (Vicon SAGA), based on training and qualification trips in the diagnosis of CanL, for zoonosis surveillance services in municipalities and educational and research institutions. Symptomatic and asymptomatic suspect animals and possible contacts were selected by the training site teams. The Zoonoses project was created (<https://viconsaga.com.br/zoonoses>) to insert and manage data from the application records for mobile devices, allowing the user to generate records directly from the field, just using the integrated resources of the mobile device, for notifications and data storage and subsequent data availability for evaluation.

Results

The application's initial test (study and data collection) was conducted between 2018 and 2019, For database and georeferencing purposes, records of positive animals were used to compose the distribution and spatial analysis. The application proved to be effective in recording data (Figure 1), working even in areas without an internet signal. The animals that were selected for the work showed some clinical signs associated with the disease. All dogs had a guardian and most had some private or public veterinary assistance.



Figure 1: Screen Captures of Vicon SAGA Application Interface.

To fulfil the objective of this work, maps were created from the data entered into the application and exported to the platform to demonstrate how the results are distributed spatially, verify the areas of highest concentration, and compare the data obtained with the available information. The application allowed the generation of notification points and simple or superimposed maps on the Normalized Difference Vegetation Index (NDVI), or of heat maps for viewing records, showing the intensity of a record through colors in two or more dimensions (Figure 2).

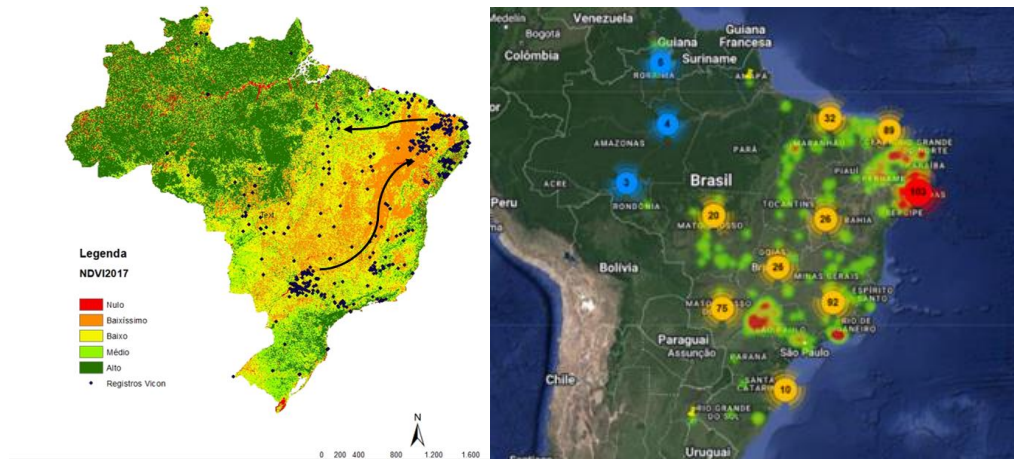


Figure 2: NDVI and heat maps generated from Vicon SAGA Application Data.

As a result, a pattern for positive animals occurrence was observed going from the border region of Mato Grosso do Sul, at the division with the central-western region of the state of São Paulo, extending through the central and northeastern regions of Minas Gerais, and reaching the Northeast region via the Center-South of Bahia. The pattern continues towards the northeast coast, extending through the state of Maranhão and further northward through Piauí, ultimately reaching the southern region of Pará.

The maps of the applications and/or platforms of notification were able to visually demonstrate the areas with the highest concentration of positive animals. With the georeferenced points, it was possible to compare the occurrence of positive animals with maps of the disease's occurrence in humans, creating opportunities for alert and prevention in neighboring areas where the disease is not yet prevalent. As a result, we can still see that there is a strong correlation between the presence of the disease in animals and people, which confirms the data in the literature that cases in animals precede the appearance of human disease.

Conclusions

The use of the notification and georeferencing application proved to be effective as an auxiliary tool for surveillance and control of CanL, it was easy to use, and had a low cost of use and maintenance. The use of applications for mobile devices can be of great value for fieldwork and facilitate the consolidation of results and generation of maps and data that allow analysis of the disease's evolution and contribute to its prevention.

Funding: Fiocruz's strategic management support system (SAGE), under number 2015.8315.084.21744.

Conflict of interest: None declared.

References

1. Dantas Torres F, Miró, G, Baneth, G, Bourdeau, P, Breitschwerdt, E, Capelli, G, Cardoso, L, Day, M. J., Dobler, G., Ferrer, L., Irwin, P.; Jongejan, F., Kempf, V., Kohn, B., Lappin, M., Little, S., Madder, M., Maggi, R., Maia, C., Marcondes, M., & Otranto, D. (2019). Canine Leishmaniasis Control in the Context of One Health. *Emerging infectious diseases*, 25(12), 1–4. <https://doi.org/10.3201/eid2512.190164>
2. Dantas Torres, F, Miró, G, Bowman, D, Gradoni, L, & Otranto, D. (2018). Culling Dogs for Zoonotic Visceral Leishmaniasis Control: The Wind of Change. *Trends in Parasitology*, 35 (2), 97-101. <https://doi.org/10.1016/j.pt.2018.11.005>