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Effectiveness of control strategies against visceral leishmaniasis in Brazil: there is no silver bullet

Efetividade das estratégias de controle da leishmaniose visceral no Brasil: não existe uma bala de prata

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ABSTRACT

Control of zoonotic visceral leishmaniasis has been a deceiving effort for Brazilian public health officers and researchers. Since the implementation of the Brazilian program for visceral leishmaniasis control (PVLC) in the beginning of the 1960s, the disease has undergone a notable process of urbanization and geographical dissemination and the epidemiological situation is far from showing any substantial progress. The main strategies to reduce transmission proposed by the current PVCL still are vector control with residual insecticides and culling of seropositive dogs. However, few well- designed epidemiological studies give support for their wide-scale use, most showing limited effectiveness and only in specific settings. Novel promising approaches have been advocated such as dog vaccines, insecticide-impregnated dog collars, treatment of infected dogs, and topical insecticides, but there are still many doubts about their effectiveness. The few available effectiveness estimates are not high, suggesting that no intervention would alone solve the problem. There is no simple solution but considering the heterogeneous spatial pattern of disease distribution and the lack of high levels of effectiveness for individual interventions, there is probably no means to reduce transmission without using a combination of interventions delivered according to the different transmission scenarios, preferably targeting areas at highest risk.

Keywords. visceral leishmaniasis, strategies for control, effectiveness of interventions.

RESUMO

O controle da leishmaniose visceral zoonótica tem sido um esforço desalentador para gestores da saúde pública e pesquisadores brasileiros. Desde a implantação do programa brasileiro de controle da leishmaniose visceral (PCLV) no início da década de 1960, a doença passou por um notável processo de urbanização e disseminação geográfica, e a situação epidemiológica está longe de mostrar algum progresso substancial. As principais estratégias para reduzir a transmissão propostas pelo atual PCLV ainda são o controle de vetores com inseticidas residuais e a eliminação de cães soropositivos. No entanto, poucos estudos epidemiológicos bem desenhados dão suporte para seu uso em larga escala, a maioria mostrando efetividade limitada e apenas em contextos específicos. Novas abordagens promissoras têm sido preconizadas, como vacinas para cães, coleiras impregnadas com inseticidas, tratamento de cães infectados e inseticidas tópicos, mas ainda há muitas dúvidas sobre sua efetividade. As poucas estimativas de efetividade disponíveis não são altas, sugerindo que nenhuma intervenção sozinha resolveria o problema. Não existe uma solução simples, mas considerando o padrão espacial heterogêneo de distribuição da doença e a ausência de altos níveis de efetividade para intervenções individuais, provavelmente não há meios de reduzir a transmissão sem usar uma combinação de intervenções dirigidas de acordo com os diferentes cenários de transmissão, preferencialmente visando áreas de maior risco.

Palavras-chave. leishmaniose visceral, estratégias para controle, efetividade de intervenções.

INTRODUCTION

Control of zoonotic visceral leishmaniasis has been a deceiving effort for Brazilian public health officers and researchers. In conjunction with dengue, the control of VL has been considered one of the major fiascos in the control of transmissible diseases in Brazil[1]. Since the implementation of the Brazilian program for visceral leishmaniasis control (PVLC) in the beginning of the 1960s, the disease has undergone a notable process of urbanization and geographical dissemination[2].

At the time of the initiation of the PVLC, in 1963, the main proposed control strategies were obligatory notification of human cases, opportune diagnostic and treatment of human cases, vector control with insecticides and culling of seropositive dogs. Indeed, these strategies seemed to be appropriate for confronting a disease that was deemed as mainly rural, occurring in specific environments such as hollows and foothills.

The Brazilian society underwent huge changes from this time onward, with an inexorable process of urbanization. Massive population movements from rural areas affected by severe droughts in the Northeastern region of the country were reported. Initially, migrants towards the periphery of State capitals and large cities of this region, and subsequently to the other regions of the country. This intense, fast and excluding process of urbanization, led to social segregation, with the peripheries of the large metropolitan areas characterized by the lack of urban services, environmental destruction and poor living conditions. This was the ideal setting for the introduction and maintenance of the zoonotic visceral leishmaniasis cycle, with the domestic dog as the main reservoir of the infection and the main vector, the sand fly *Lutzomyia longipalpis*, adapting well to the new peridomiciliary environment[3].

However, all the transformations in the Brazilian society and in the epidemiology of visceral leishmaniasis have not been convoyed by substantial modifications of the control strategies preconized by the original PVLC. The main supports of the current PVCL to reduce transmission still are vector control with residual insecticides and culling of seropositive dogs, although the first is underused[2]. However, the visceral leishmaniasis epidemiological situation is far from showing any substantial progress.

Few well-designed epidemiological studies have been conducted to evaluate the effectiveness of vector control and culling of infected dogs against visceral leishmaniasis[4]. Those that exist do not give support for wide-scale use of such interventions, showing limited effectiveness and in specific settings. Many other approaches have been advocated by distinct groups, some of them might be questioned based on potential conflicts of interest. Among such novel approaches are dog vaccines, insecticide-impregnated dog collars, treatment of infected dogs, and topical insecticides[5]. Although some of them might be promising, there are still many doubts about their level of effectiveness at the population level. As a matter of fact, the available effectiveness estimates are not that high, suggesting that no single intervention would alone solve the problem[4, 7].

One of the key characteristics of the epidemiology of zoonotic VL is its distinct spatial and temporal distribution, with different scenarios of transmission not only at the national level, but also at the regional and local levels[8, 9]. In view of this, some researchers may be tempted to adopt an approach to the epidemiology of VL assuming that there is not a single pattern of transmission but a singular transmission dynamic in each endemic area. This approach is appealing but is indeed a naïve and extreme viewpoint that misses some structural features that rules VL transmission in any place, such as the ubiquitous presence of the sand fly vector *Lutzomyia longipalpis* in most transmission areas. Opposed to this viewpoint is another innocent and yet rigid idea, that states that local variations are just random variations and there is just one single pattern of VL transmission, conditionally to basic facts such as *Lutzomyia longipalpis* as the principal vector and domestic dogs as reservoirs. Unfortunately, this approach has no solid support considering the current knowledge about VL transmission. In the field of cross-cultural adaptation of questionnaires, such approaches would be called "relativist" and "absolutist", respectively[10]. The problem with the "relativist" concept is the assumption of no

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regularity, in which each endemic area is so distinct from the others that no one could ever learn anything from a local experience to apply to any other place. On the other hand, the "absolutist" approach close its eyes to the difference and would assume that a unique general approach would be sufficient to deal with VL transmission in all endemic areas. Therefore, we need a different approach, an "universalist" approach assuming that there are peculiarities in the transmission patterns at the local level, but they are rarely unique in a sense that one would be able to devise general transmission patterns to guide interventions.

Bearing in mind these aspects, one would conclude that there is no simple solution but considering the heterogeneous spatial pattern of disease distribution and the lack of high levels of effectiveness for individual interventions, there is probably no means to reduce VL transmission without using a combination of interventions which should be delivered according to the different transmission scenarios, preferably targeting areas at highest risk[5].

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