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Editorial

Vector-Borne Parasitic Diseases at a Crossroads: From Biological Transmission to Programmatic Equity

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Vector-borne parasitic diseases occupy a singular position at the interface of medical parasitology and epidemiology. Vectors are not merely biological intermediaries; they are ecological actors, operational constraints, and, increasingly, determinants of equity in global health. Recent high-impact publications converge on a central message: the future of control and elimination efforts will depend less on incremental advances in single-disease strategies and more on how effectively vector biology, epidemiology, and implementation realities are integrated into coherent public health responses.

A recent *Lancet Infectious Diseases Commission* on vector-borne helminthiases articulates this challenge with unusual clarity, framing vectors as central drivers of both persistence and opportunity across sub-Saharan Africa (1). In parallel, a discussion in *Trends in Parasitology* highlights how the persistent neglect of specific vector–parasite systems, such as *Loa loa* transmitted by *Chrysops* flies, has created structural blind spots that undermine elimination goals for multiple filarial diseases (2). Taken together, these contributions suggest that vector-borne parasitic diseases are approaching a conceptual and operational inflection point.

Beyond transmission: vectors as structural bottlenecks

Traditionally, vectors have been treated primarily as components of transmission cycles and as targets to be suppressed once pathogens are identified and interventions deployed. While biologically valid, this framing has proven insufficient in complex epidemiological landscapes. The *Lancet* Commission moves beyond this view by emphasising that vector ecology, behaviour, and competence shape not only transmission intensity but also the feasibility, safety, and acceptability of interventions (1).

Author's Biosketch

Josué de Moraes is a Professor of Parasitology and a leading researcher in medical parasitology, epidemiology, and drug discovery for neglected tropical diseases, with particular emphasis on anthelmintics. He directs the Research Center on Neglected Diseases at Guarulhos University and Brasil University, Brazil, where his work focuses on helminthiases and the development of novel therapeutic strategies, including drug repurposing, natural products, and synthetic molecules. His research integrates experimental parasitology, translational science, and public health perspectives, with a focus on schistosomiasis, angiostrongyliasis, and other helminthiases of medical and zoonotic importance. He has published extensively in high-impact international journals and actively contributes to global discussions on equity, innovation, and elimination strategies for neglected diseases. In addition to his academic activities, he is engaged in science policy and scientific communication, promoting the interface between research, public health, and evidence-informed decision-making.

This reality is starkly illustrated in regions where vector-borne helminthiases overlap. In Central Africa, the presence of *L. loa* and the risk of severe adverse events following ivermectin treatment have effectively excluded entire populations from mass drug administration for onchocerciasis and lymphatic filariasis. As argued by de Moraes and Geary (2), this exclusion represents more than a technical limitation; it reflects a systemic failure that perpetuates inequity and stalls progress toward global elimination targets.

These examples underscore a critical point. Elimination frameworks that do not explicitly account for vector-specific risks and constraints risk becoming operationally fragile and ethically unsustainable.

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From uniform strategies to context-sensitive decision-making

One of the most important shifts emerging from recent literature is the move away from uniform intervention packages toward context-sensitive decision-making. The Lancet Commission calls for the development of operational decision frameworks that integrate vector species, ecological setting, seasonality, and co-endemic infections to guide control strategies (1). This approach recognises that the effectiveness of vector control tools, whether chemical, biological, environmental, or behavioural, cannot be assumed across settings.

This paradigm is particularly relevant in loiasis-endemic areas. Loa-safe strategies that combine alternative drug regimens, point-of-care diagnostics such as the LoaScope, and targeted vector control demonstrate how tailored approaches can restore programmatic momentum while minimising harm (2). Importantly, these strategies also illustrate that vector control should not be treated as an adjunct to chemotherapy but as an integral component of risk management and community trust.

Vector biology matters

A further insight emerging from recent work is that relatively subtle aspects of vector biology can have disproportionate epidemiological consequences. Studies on sand flies and *Leishmania* suggest that additional blood meals after parasite acquisition can amplify infection intensity within the vector and increase transmission potential (3). Comparable effects have been described for arboviruses in Aedes mosquitoes, indicating that vectors function as dynamic biological environments rather than passive conduits.

For epidemiology, this challenges models that rely primarily on vector abundance or geographic presence. Vector competence, feeding behaviour, age structure, microbiota, and environmental stressors can all modulate transmission risk independently of density. Failure to incorporate these dimensions risks underestimating both outbreak potential and the impact of environmental change.

Climate change, geography, and preparedness

Recent analyses focusing on Europe reinforce the notion that vector-borne diseases are no longer confined to traditionally endemic regions. Climate change, land-use modification, and global mobility are reshaping vector distributions, often faster than surveillance and response systems can adapt (4). Notably, these analyses emphasise that regions with long-standing experience in vector-borne diseases, often in low- and middle-income countries, offer valuable operational lessons for preparedness elsewhere. This challenges entrenched assumptions about the geography of expertise and highlights the importance of bidirectional learning in vector control and epidemiology.

Recent commentary in *The Lancet Infectious Diseases* further illustrates how vector-borne filarial diseases can transition from persistent neglect to effective national action when political commitment and programmatic integration converge. The experience of lymphatic filariasis elimination efforts in India demonstrates that sustained investment, integrated vector control, surveillance innovations such as xenomonitoring, and strong community engagement can translate long-standing scientific knowledge into measurable public health gains (5). Importantly, this example underscores that vectors are not merely technical challenges but also governance challenges, reinforcing the argument that elimination trajectories are shaped as much by policy prioritisation as by biological feasibility (6, 7).

Reframing priorities in vector-borne parasitic diseases

Collectively, these developments argue for a reframing of vector-borne parasitic diseases as system-level challenges rather than isolated biological problems. Effective responses will require integration across disciplines, diseases, and sectors, as well as explicit recognition that neglect is often selective and cumulative.

For medical parasitology, this implies treating vector biology not only as a mechanistic research domain but as a determinant of intervention design and policy relevance. For epidemiology, it calls for moving beyond descriptive mapping toward decision-oriented frameworks that link evidence to action in real-world settings.

As vectors continue to shift ecologically, geographically, and biologically, the critical question is whether scientific and public health strategies will evolve with comparable sophistication. Aligning biological insight with epidemiological responsibility is no longer optional. It is a prerequisite for equitable and sustainable progress in the control and elimination of vector-borne parasitic diseases.

Authors' Contribution

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Competing Interests

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