

Colloquy



THE IMMUNE HOME: Domestic Enclaves, Diffuse Protections

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A delegation of senior officials from several Tanzanian ministries and research agencies disembarks the plane taking them from Dar es Salaam to Ifakara. From the airport it is a short, if bumpy, ride to the Ifakara Health Institute (IHI)—a former Swiss tropical field laboratory that has become in recent decades a Tanzanian center for global health research and a world leader in the study of malaria and other mosquito-borne diseases.

On arrival, the group is ushered into the Vectorsphere, a combination of insectary, open-plan office, and “semi-field system”—an outdoor enclosure where mosquitoes are studied under quasi-natural conditions (Kelly and Lezaun 2017). As the delegates progress from lab bench to rearing cage, a series of demonstrations follow—a PhD student developing a machine-learning algorithm for mosquito dissection explains the relationship between wing size and flight tone; an undergraduate intern illustrates the attractiveness of human sweat by releasing mosquitoes into tubes wafting synthetic odours on plumes of CO₂. It is Arnold Mmbando’s investigations in the semi-field, however, that garner the most enthusiastic response.

Arnold is working on a new method to protect local residents from malaria: eave ribbons impregnated with the chemical transfluthrin. Made of ten-centimeter-wide bands of hessian fabric, the ribbons are light and can be easily affixed to the house's exterior, covering the gaps between walls and roof common in many rural dwellings. Thanks to transfluthrin's spatial-repellent properties, the eave ribbons produce emanations that divert female mosquitoes away when they approach inhabited spaces in search of blood. Portable, cheaply made, and aesthetically pleasing, the combination of ribbon and chemical could, Arnold believes, transform the landscape of malaria prevention.



Figure 1. Arnold Mmbando, describing the operation of eave ribbons attached to an experimental hut, January 2020. Photo by Ann H. Kelly and Javier Lezaun.

For the past two decades, the battle against malaria-carrying mosquitoes in sub-Saharan Africa has relied on two domestic interventions: the spraying of residual chemicals on interior surfaces (indoor residual spraying, or IRS) and the

distribution of long-lasting insecticide-treated bed nets (LLINs). Integrated with antimalarial drugs and rapid diagnostic tests, these measures have significantly reduced the global malaria burden. In recent years, however, case numbers have plateaued and in some hyperendemic regions have started to rise again. Increasing mosquito resistance to insecticides presents the most obvious challenge, but it has long been clear that the limitations of IRS and LLINs are inherent in their design. In rural areas like the Kilombero Valley around Ifakara, the house does not always correspond to a singular, bounded material structure, and nighttime domestic activities rarely remain contained within the walls of a single familial dwelling. Residential space tends to spill out across a number of thresholds, open spaces, and partial enclosures, often encompassing multiple buildings in various states of construction and collapse. Here, as elsewhere, the house is a drawn-out vital project, propelled by the aspirations of its inhabitants, punctuated by material constraints, and distributed across a range of structures (see [Motta 2021](#), this issue; [Neiburg 2021](#), this issue).

The Vectorsphere's semi-field system attempts to replicate this fractal domestic topography, an effort not lost on its visitors. As Arnold finishes his presentation, Paul Erasto, the chief research scientist at Tanzania's National Institute of Medical Research, points to the chair just in front of the experimental hut. "My father will be sitting here speaking with friends throughout the evening. My mother will be cooking in the firepit just ahead. How will bed nets protect them? Nets protect the inside—a place where no one is!"

Arnold's impregnated ribbons are designed to create what he calls "bubbles of protection." They work through passive dispersion, emitting vapors into the ambient air over a period of several months. Compared with other steps usually taken to prevent mosquito bites outdoors—burning coils and herbs, applying topical chemical formulations to skin and clothes—these emanators require minimal investment or compliance from the user, and they pose fewer health risks. The ribbons can also travel light: researchers at IHI have recently tested them with local farmers who, during the rainy season, tend their crops from makeshift structures erected near the rice fields. Arnold is also exploring smaller repellent-dipped strips that could be distributed under verandas, partial walls, and outdoor kitchen pergolas.

Spatial repellents represent a novel form of *house-ing*, oriented toward the flow of domestic routines that unfold across and beyond the house's walls; Arnold and his colleagues at IHI are effectively engaged in an effort to extend the *oikos* by chemical means, so that it can encompass those peri-domestic locations and

inter-domiciliary events where the risk of infection is highest. A discreet intervention, such reformulation of chemical protection carries nevertheless huge implications. Seen within the long history of tools used against malaria, spatial repellents focalize different forms of relationality and propinquity, directing attention to the interstices of everyday life. They also create a powerful sense of moral ambivalence. Unmoored from the physically enclosed dwelling, the global fight against malaria appears to cast off its traditional material referent, and with it a crucial means of imagining the public good.

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The relationship between malaria control and the conceptualization of domestic space goes back to the very moment the disease was apprehended as a mosquito-borne infection. Ronald Ross's famous dissections of mosquitoes' *Plasmodium*-filled gut tissue in Secunderabad proved the existence of a microbial pathogen, but it was Patrick Manson's "model home" that ultimately settled the fundamental question of malaria epidemiology.

Manson conducted his famous experiment along the edge of a half-drained swamp in the Roman Campagna, an area known for being poor and intensely malarious. Constructed in London, disassembled, and shipped on to Ostia via Rome, Manson's house consisted of four rooms adjoined by a single corridor. The windows were fitted with clear glass encasements and covered with cotton netting; the eaves, left open for ventilation, were secured with wire mesh. The doors leading out of the house were lined with netting and further enclosed by a screened porch. Four men took up residence in the hut and lived there for three months, moving freely around the swampy grounds during the day, returning to the experimental hut during the evening to be cocooned within its mosquito-proof walls. For the duration of their stay they remained malaria-free, while the surrounding population suffered repeated attacks of the disease.

Manson's experiment established malaria as an intra-domiciliary disease, an infection acquired predominantly indoors, from female mosquitoes that entered the house during the night in pursuit of their blood meal. This understanding of transmission would shape disease-control efforts for more than a century: in contrast to the seemingly never-ending task of eliminating mosquito breeding habitats outdoors, one could suppress the disease by limiting exposure to the vector within private dwellings.

Yet how best to limit exposure remained unclear. In Italy, the strategy of *bonification* conceived malaria elimination as a by-product of "the improvement of

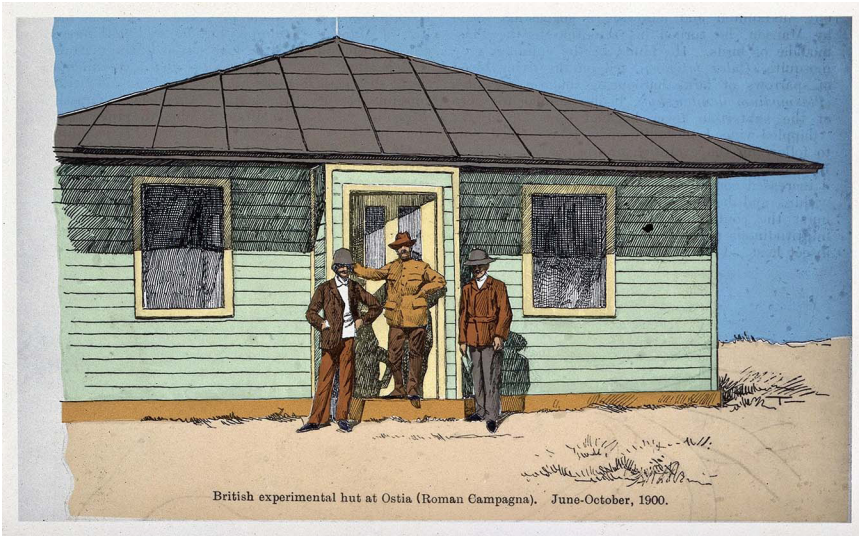


Figure 2. Patrick Manson's experimental hut and its occupants from June to October 1900. Colored photograph of a pen drawing by A. Terzi, ca. 1900. Wellcome Library, London, <https://wellcomecollection.org/works/pz5qmgv2/images?id=dpzttts8h>.

the countryside in all its aspects” (Longobardi 1936, 8). Protection against malaria would emerge naturally from a generalized upgrading of the population's living conditions, particularly a betterment of the housing stock that would render the interior increasingly impermeable to mosquitoes. The discovery of DDT in the 1940s offered an alternative paradigm of domestic safeguarding: the chemical's extraordinary residual toxicity allowed it to kill female mosquitoes resting on interior walls and ceilings months after application, dramatically affecting the rate of transmission. DDT's low-cost efficiency disentangled malaria prevention from house improvements or rural development, while the possibility of concentrating efforts on indoor surfaces made control programs modular and scalable. This form of chemical action underpinned the WHO's Global Malaria Eradication Program (GMEP, 1955–1969). “Houses, unlike potential breeding places, are easy to locate. Their area of wall surface can be closely estimated, and it is possible to forecast accurately requirements in materials, equipment, personnel and finance” (Alvarado and Bruce-Chwatt 1962, 90).

The GMEP implied a very specific form of *house-ing*, and had its share of successes where homes conformed to the domestic topography of industrialised modernity. It struggled, however, in regions where residence was neither architecturally bound nor geographically fixed. The most intractable obstacle was, according to a WHO report, those “habits of the population” that unsettled the assumption

of the house as a stable material entity corresponding to an equally stable social unit. “Outside sleeping during the hot season and frequent rebuilding, re-thatching and re-plastering of houses, related to special events, e.g. festivals, but carried out in an entirely irregular fashion” were some of the activities that undermined the WHO’s eradicationist ambitions (Bernard 1963).

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This Colloquy reminds us that the home comes about through intensive boundary work, a product of social coordinations enacted through domestic space but independent of any permanent demarcation between the interior and the out-of-doors (Douglas 1991). Our understanding of the home has a direct bearing on how we imagine the scope for solidarity within the immunitary configurations that constitute human existence. Peter Sloterdijk (2016) likens modern domestic architecture to “a spatial immune system,” whereby individuals can live adjacent to, yet insulated from, neighbors defined by a situation of co-isolation. “Residence is, immunologically speaking, a defensive measure designed to demarcate a sphere of well-being from invaders and other agents of unwellness” (Sloterdijk 2016, 535).

Yet while they might appear inoculated from the kind of intricate social coordinations that characterize the home, these “co-isolated associations” generate new connections, dependencies, and communal exposures by feature of sheer physical proximity and their reliance on shared infrastructures. As we learn time and again when the private dwelling becomes our last line of defence against a common threat, the immunitary paradigm at the core of the high-modern security regime is inequitable, fragile, and ultimately dangerous. When seclusion is the price of safety, the most immediate danger may be refracted, but new threats are quick to emerge. Lasting immunity cannot emerge from compartmentalization and exclusion, but from “something more complex that implicates and stimulates the common” (Esposito 2011, 18).

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In Ifakara, Arnold’s eave ribbons are just one of several new spatial-repellent products currently undergoing testing. The team is trialing a range of tranfluthrin-treated bags, sandals, football socks, prayer mats, and chairs, all of which could be used to create transitory, mosquito-free envelopes that would accompany the user in her daily outdoor routines and interactions.

While these products partake in the long genealogy of chemical tools against malaria, they represent a different paradigm of protection. They reorient disease

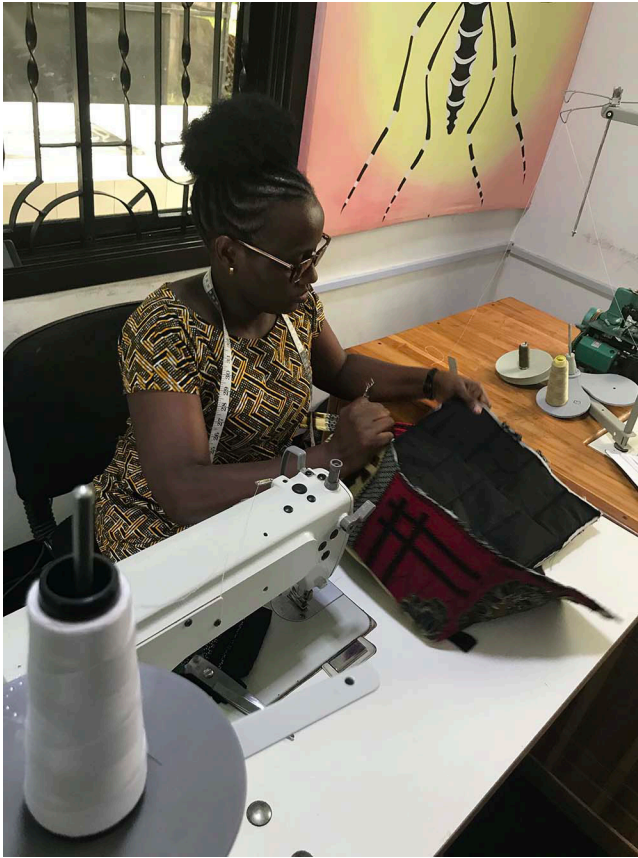


Figure 3. Paulina Mshingo, Ifakara Health Institute’s in-house seamstress, stitching together a repellent shoulder bag, January 2019. Photo by Ann H. Kelly and Javier Lezaun.

prevention away from the insecticidal approach and toward the design, through repellency, of protective atmospheres. The site of operation is not the bounded, enclosed space of the home, but the more fluid topography of the peri-domestic, those spatiotemporal in-betweens that play a critical role in the transmission of malaria. Key *house-ing* practices that typically occur outside the walls of the house—washing, cooking, sleeping (during the hot season), funerals, and parties—move from the fringes of public health attention to become the very point of intervention. Kinship ties and social groupings external to the nuclear family begin to feature more prominently in the malarialogical literature: the fluid collective that gathers to watch a football game, or to pay respects outside the house of the village leader, can now do so under the invisible but deliberate protection of chemical emanations.

Arnold's eave ribbons have attracted the attention of several foreign donors, and a group of international collaborators has arrived for a week-long visit to prepare a randomized controlled trial. They have spent the day driving around rural villages in the district, identifying areas with sufficiently high rates of malaria transmission to demonstrate the ribbons' protective effectiveness. Around the dinner table at the institute's main house, Arnold looks visibly shaken. Lina Finda, a social scientist at IHI, asks how he feels about the coming project. Arnold describes his day as "heartbreaking"—a tour of houses with backs open to the elements, mud walls crumbling around sticks, children lying sick. Lina nods. "We are just going to go around putting ribbons on these homes? It is shameful." Even if they are effective in diverting mosquitoes, she implies, the eave ribbons will fail to bring durable improvements to the material living conditions of those most exposed to the risk of malaria; by virtue of their very cheapness and ease of application, they might in fact help perpetuate chronic forms of destitution.

This exchange clarified for us some of the moral ambivalences that emerge when global health interventions are detached from the seemingly self-evident referent of the enclosed dwelling. It also cast the history of malaria control in a new light—the issue with the GMEP's approach, we now realized, was not its focus on domestic spaces, but the reduction of the *oikos* to a set of intersectional planes



Figure 4. Rural house near Mafinigi, south of Ifakara, January 2020.
Photo by Ann H. Kelly and Javier Lezaun.

within which a family spends the night. DDT had provided a chemical formulation for precisely this understanding of the home—its uncommon residual toxicity foregrounded surfaces at the expense of other factors affecting the distribution of health and disease.

The question we were left grappling with is whether spatial repellents could conjugate a different vision of the home, one attuned to forms of mutual dependency and obligation that cut across physically bounded domestic enclaves. Arnold's unease at his own invention illuminates the stakes: how to ensure that portability does not provide a justification for the individualization of security, and that the atmospheric quality of protection is not used as an excuse to neglect material improvements. Still, implicit in the diffuse power of these chemicals lies the possibility—if only that—of treating the in-betweens of social life as a space of *communitas*, a zone of collective experimentation, rather than simply a gap where danger lurks.

ABSTRACT

This essay tracks a paradigm shift in the use of chemicals to control malaria: away from insecticidal approaches, focused on killing mosquitoes within private domestic dwellings, and toward the creation of protective communal atmospheres. An ongoing study of the efficacy of spatial repellents to reduce malaria transmission in rural Tanzania provides an opportunity to rethink the oikographic assumptions of malaria control—and of many global health interventions—and to foreground the specific relationalities of peri-domestic spaces. Yet a sense of moral ambivalence permeates this inquiry, as malaria prevention becomes untethered from any long-lasting material improvement in the house. We reflect on the power of chemicals to reveal chronic forms of neglect and, just possibly, conjugate new, if diffuse, forms of communitas. [malaria; peri-domestic space; chemicals; immune home; critical global health; Tanzania]

NOTES

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