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EDITORIAL

Tracking the Traveler Without a Passport: Perspective on Surveillance of Imported Disease

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Since the turn of the century, we have experienced increases in a variety of disease threats including bioterrorist attacks, pandemic influenza, emergence of novel diseases, and re-emergence of known pathogens. Although every disease scenario had specific criteria surrounding its spread, a common factor in nearly all included travel. It is not a new concept that travel is in itself a vector for disease transmission and in some respects one of the most important factors, given our increasingly global society.

The mode of disease transmission, whether vector borne, such as dengue, or airborne, such as influenza, provides us with a clear picture of the necessary mitigation strategies for minimizing transmission; however, our prevention strategies have not advanced to keep in line with the role of travel in the rapid spread of diseases. Our borders have significant restrictions for the movement of people and goods, but not for the potential pathogens traveling with them.

There is substantial lack of addressing the human role, or more specifically the traveler's role in disease spread. We tend to view the traveler as a victim of diseases present in endemic travel destinations when infection is acquired. We need to evolve our approach to travel health by recognizing the traveler as an important aspect of the disease transmission cycle. This would allow researchers and practitioners to extend prevention strategies beyond endemic regions and the individuals therein, and consider international travel behavior a significant facet of imported disease risk. Leggat and Franklin address the importance of risk perception in travel behavior and how it influences adherence to pre-travel health recommendations.[1] Additionally, Rossi and Genton discuss the uncertainty of pre-travel risk assessments, and express concern that pre-travel history is not indicative of actual travel behavior.[2]

Travel health needs a fresh perspective and alternative concept for understanding risk and the intricate link that exists between perceptions, behavior, and the role they play in our capabilities for successful prevention and response to imported diseases. One strategy could be the use of the concept of "Cultural Embeddedness" (CE), which could aid our understanding of the relationship between travel behavior and imported disease risk. Figure 1 exemplifies this concept within the travel health behavior theory "CE and Mosquito Avoidance Practices (MAP)." CEMAP explains the influence of the social and physical environment, which influences perceptions, intended and actual international travel behavior for compliance to MAP. The concept takes into consideration the different levels of influence, which may help or inhibit adherence to pre-travel health recommendations, and inherently influence the risk of acquiring common vector-borne infections such as dengue.[3] Although CEMAP may appear as an idiosyncratic concept of prevention, it can provide a basis for future research and a strategy for practice-based travel medicine utilizing a public health approach.

Assessing the Risk: What Is the Risk and Can We Handle It?

There has been a noteworthy increase in the spread of emerging and re-emerging pathogens associated with

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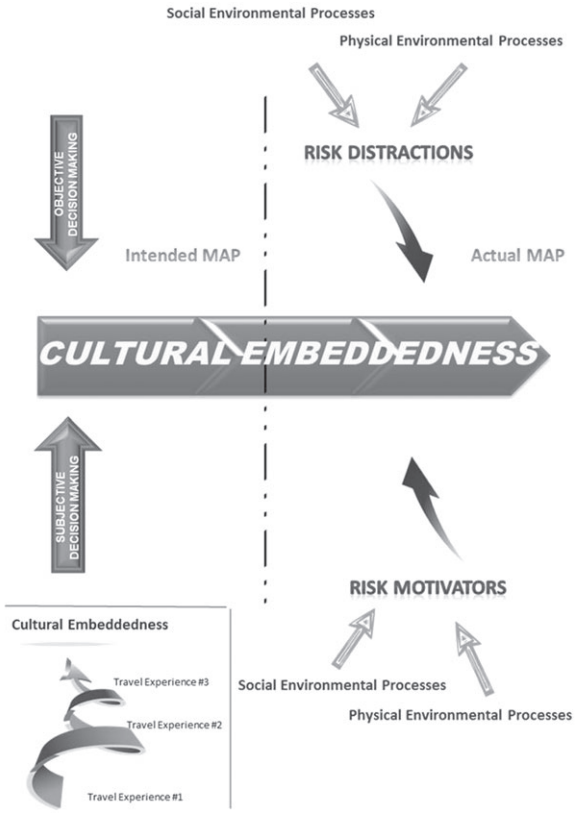

Figure 1 Theory of Cultural Embeddedness and Mosquito Avoidance Practices (CEMAP). The theory of CEMAP represents the process of cultural embeddedness, which occurs from the planning phase of travel through the travel experience. CEMAP is an unbounded spiral that continues over the course of each travel experience. This international travel behavior theoretical framework is also grounded in the public health approach and social–ecological framework for health behaviors.[3]

travel, including imported Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV) from the Arabian Peninsula,[4] and imported and consequently local-acquired dengue cases in Florida.[5] Most recently, the inadvertent spread of chikungunya throughout the Caribbean poses a threat for imported cases and introduction to other regions.[6] The main issue is the lack of preemptive strategies using collaborative efforts that can aid in early detection and outbreak prevention. There were great strides in response to SARS in 2003, which highlights the impact of international collaboration; yet, an effective response is not exactly primary prevention.[7] Nevertheless, similar efforts should become standard procedures for these persistent disease threats that rapidly emerge.

Admittedly, not every country has the capability to develop programs following broad-based recommendations for prevention and control of diseases such as dengue and chikungunya; however, collaboration between countries and organizations and the use of surveillance tools and networks, such as Health-map, Geo-Sentinel, Pro-med, and other more sophisticated aggregate surveillance systems, make it possible for not only outbreak detection but also outbreak prediction. The key is to improve strategies utilizing these tools and protect our borders from infiltration by diseases because once established, we lose our opportunity for prevention and must switch gears to response and control.

Dengue: A Case in Point

For dengue, clear guidelines exist for the prevention, detection, control, and response to outbreaks. For example, guidelines include personal protection, community engagement in environmental protection, vector surveillance, risk communication, laboratory detection, and clinical management.[8] Broad-based strategies also exist, such as the Integrated Management Strategy for dengue prevention and control (IMS-dengue), to provide guidance for program development at the country level.[9]

Next steps in dengue control must be innovative and specific to the dengue threat within a given locale. Lagi and colleagues, for example, conducted a retrospective analysis of confirmed cases to determine the characteristics of imported dengue in Italy. They concluded that increased awareness and inclusion of diagnostic methods that aid in early diagnosis could thwart secondary transmission in Italy during periods of *Aedes albopictus* activity.[10] In Taiwan, a pioneering approach to surveillance included the use of fever screenings. Although not 100% effective, fever screenings can prevent imported cases and partially block secondary transmission within the region.[11]

For dengue, we need a robust preemptive strategy for surveillance, which incorporates multiple facets of the transmission cycle. The strategy should include early warning capabilities by identifying imported disease "hotspots," using methodology similar to Gardner and colleagues' network-based regression modeling to estimate the relative risk of imported cases.[12] This could assist an active surveillance strategy in high-risk cities and a fever-screening program in high-risk airports. Moreover, the strategy should include complementary passive surveillance and vector surveillance and control programs.[3]

Prevention Is Complex

A robust prevention strategy may sound sexy; however, it is important to note that disease transmission is complex; therefore, disease prevention is also complex. Keeping in mind a simplistic view of imported disease consequences—travel-acquired infection, importation, secondary transmission, and subsequent outbreaks—we can then delve into prevention details at each stage. Robust surveillance may not be the answer everywhere, but it may be for certain areas. Furthermore, importation is not always preventable, so effective response strategies are essential.

Declaration of Interests

The author states that he has no conflicts of interest to declare.

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