Climate, Oceans, Infectious Diseases, and Human Health: Biocomplexity of Cholera Epidemics

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VECTORBORNE diseases are recognized to be climate driven and it is now clear that many infectious diseases are intricately related to weather patterns, climate, and seasonality. What is less well understood is the role of these factors in occurrence and distribution of specific pathogens. *Vibrio* spp. are autochthonous to the aquatic environment and include pathogens, e.g., *Vibrio cholerae*, *Vibrio parahaemolyticus*, and *Vibrio vulnificus*. Since vibrios are abundant in estuaries, coastal waters, and river systems, it is important to understand their seasonal and climate-related patterns in order to provide public health direction relative to human health risk. A system has been constructed to predict the likelihood of the presence of *Vibrio* spp. in Chesapeake Bay. Prediction is successful by driving available multivariate empirical habitat models estimating presence of a *V. cholerae*, as an indicator species for vibrios, within the range of salinities and temperatures, with hydrodynamically-generated predictions of ambient temperature and salinity. This is based on previous work correlating incidence of *V. cholerae* and cholera with environmental parameters including sea surface temperature, sea surface height, and salinity, among others. Incorporating satellite sensing technology, ground truth measurements, and microbiological analyses have provided the basis for predictive modeling of cholera epidemics in Bangladesh, India, and East Africa.