The Web of Causation: A conceptual model to assess environmental exposures during foodborne outbreak disease investigations

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The production and distribution of safe food needed to support the health of human civilization represent both a major accomplishment and constant challenge for modern societies. To help address this challenge, the USA enacted the Food Safety Modernization Act to maintain supplies of safe food products and improve health by reducing outbreaks of foodborne illness. While the development of food safety standards domestically and internationally at both pre- and post-harvest steps is anticipated to help reduce such outbreaks, the existence of multiple complex issues surrounding food production and distribution make future occurrences of such outbreaks unavoidable. Along with the need for creating and adopting food safety standards by public policy, so too exists the need for comprehensive standard approaches to discover root causes of health outcomes such as foodborne illness when outbreaks occur. Such approaches must consider the complex relationships that exist among environmental hazards that lead to contamination at all points along the food supply continuum. To address the need for a One Medicine/One Health approach to investigating the complex interactions among pathogens, sources and routes of contamination, farming practices, and the environment, a ‘Web of Causation’ was created. This conceptual model illustrates the multitude of complex pathways that lead not only to vulnerabilities in production of safe food, but also to an organized approach by which sources for environmental exposures can be identified and health outcomes such as outbreaks of foodborne illness can be prevented.