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# Does the Plant Pathogens are Threat for the Human and Vice-Versa: A Report

Poly Saha*
Department of Plant Pathology, College of Agriculture, Burdwan Campus, Bidhan Chandra Krishi Viswavidyalaya, Kalna Road, West Bengal-713101. India.

## Editorial

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***For Correspondence**

Poly Saha, Department of Plant Pathology, College of Agriculture, Burdwan Campus, Bidhan Chandra Krishi Viswavidyalaya, Kalna Road, West Bengal-713101. India.

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## ARTICLE

Plant pathogens i.e. mainly fungi, bacteria and viruses vary virtually from those pathogens that attack humans or animals. It means, working with plant pathogens are not at all harmful to the person who is dealing with it not even eating or touching. In general, pathogens that infect plants cannot infect people. We are not likely to catch a disease from working with diseased plants in our garden.

On the contrary, we have an experience that the produce from a sick plants often having different flavor or texture than the healthy produce. In that case, what we will do? Are both of the product is safe for us? The answer is - it is desirable have the healthy one, unless the disease is only a mere superficial spot like (sooty blotch and flyspeck on an apple) but the best way is always to avoid the disease produce.

There are very few instances where plant pathogen also known to attack the human. For e.g. the bacterium Pseudomonas aeruginosa, the causal agent of soft rot disease in plants like lettuce better known as "opportunistic pathogens" for both because it can only infect the weakened hosts. People with challenged immune systems, this bacterium may infect the urinary tract, lungs, blood, and burns and other wounds. It case of hospitalized patients with severe burns, cancer, AIDS, or cystic fibrosis i.e. with weak immune system are more prone to the bacterium but it is good to know that for most of us (and for most healthy plants), *P. aeruginosa* is not a concern.

Some saprophytic plant pathogen can cause human disease. One of such disease known as "rose-picker's disease" or “sporotrichosis” is due to the fungus *Sporothrix schenckii*, frequently found on dead rose thorns. When it gets into a person's skin mainly through a scratch and into the lymph system or inhalation of its spores it produce symptoms of the disease in humans can cause problems with in the lungs, eyes, central nervous system, bones and joints.

‘Mycotoxin’ produced by some of the plant pathogenic fungi on the infected host are toxic to the people and the animals although the pathogen itself does not infect the people. Some important mycotoxin producing fungi are Aspergillus flavus is a common contaminant of grains and peanuts, and it produces ‘Aflatoxins’. At very high levels (acute exposure), aflatoxins cause vomiting, pain, convulsions, and death. At lower levels of longer duration (chronic exposure), they can lead to cancer. Fusarium cause ear rot of corn produces mycotoxin ‘Fumonisin’ and ‘Zearalenon’ togetherly known as Vomitoxin. Effects of these mycotoxins on livestock when they are fed with the contaminated grain may lead to the reproductive problems, vomiting, general lethargy and even death, depending upon the particular mycotoxin present and the level of contamination. Mycotoxins are generally produced on grains not on the common garden produce but care should be taken always those for human and animal consumption.

To cope up with the rising concern on the microbial contamination of food plants and resulting foodborne diseases have impelled new association and interactions between the scientific communities of plant pathology and food safety. The theme of this article just to provide information from the perspective of both disciplines and presents selected research results and concepts that highlight existing and possible future synergisms for the interest of both disciplines.

Now, coming to the another issue to address the problems of human pathogens on plants (HPOPs), there are human enteric pathogens such as Shiga toxin-producing *Escherichia coli* and *Salmonella* spp. have commanded some plant pathologists to expand the application of their science in the past few decades. Altogether, public health researchers and food microbiologists have become more worried about plant-microbe interactions before and after harvest. Members of the plant pathology and food safety communities are stepping forward to build a new collaboration, that lead to improved research capacity and superior empathetic of the subjects for which research is needed.

For example, traditional plant pathology concepts such as the disease triangle and the disease cycle can help to define cross-over issues that pertain also to HPOP research, and can suggest logical strategies for minimizing the risk of microbial contamination. Continued interactions and communication among these two disciplinary communities is essential and can be achieved by the creation of an interdisciplinary research coordination network.

Now a days, there is a steep increase in the gastroenteritis outbreaks in human due to consumption of the foods of plant origin has exploded public health concern and scientific attention in thoughtful interactions of human enteric pathogens with plants. Surprisingly, enteric disease caused by non typhoidal *Salmonella* which is a chief public health encumbrance associated with the number of illness linked to fresh produce, spices, and nuts beating those linked to foods of animal origin. The hypothesis behind it may be the colonization of plant is an indispensable part of the life cycle of this human pathogen. It is evident that the response of the plant to the human pathogens would be different from those of phytopathogen which is more specific, plants seems to recognize Salmonella, likely by perceiving conserved microbial patterns, which leads to activate basal defenses successively. Numerous *Salmonella* genes play a role in its colonization of plant surfaces and tissues have been identified, and its several collaborations with other members of the phyto-microbial community have also been established. Notably, *Salmonella* employs various and overlying tactics to interrelate with plants and their microflora, and the ostensible remarkable adaptation of this human pathogen to its potentially secondary host (plant).

Foodborne disease epidemics scatter threat to public health at the same time also corrodes consumer confidence in the underlying food product and thus, its impact on the economic health of the industry would be long lasting.

While at first considered as anomalous, a recent report by the Centers for Disease Control and Prevention, which revealed that contaminated produce caused 46% of the individual cases of foodborne illness in the United States between 1998 and 2008, confirmed that the risk of acquiring infections from produce is high and persisting despite increased awareness and prevention measures taken by producers and processors. Although researched extensively for nearly two decades, produce contamination with human pathogens continues to bring many important questions about the behavior of these pathogens on plants and the biotic and abiotic factors that contribute to their persistence in this habitat, thereby causing human illness.

The identification of routes of plant contamination by enteric pathogens is crucial to the design of intervention strategies to prevent contamination from taking place. Wasala et al. [1] demonstrates that filth (house) flies, which consume bacteria at the larval state, can acquire *Escherichia coli* serovar O157:H7 from inoculated manure and vector the pathogen not only by carrying it on their surface but can also contaminate the spinach phyllosphere through their regurgitated material. Upon landing on the plant surface, enteric pathogens may reside as single solitary cells or in a community of established epiphytic microbes. The elegant study by Poza-Carrion et al. [2] reveals by quantitative analysis of epifluorescence micrographs that established epiphytic bacteria such as Pseudomonas fluorescens and Erwinia herbicola (Pantoea agglomerans) influence the ability of *Salmonella enterica* to persist on plants. These bacterial species promoted the survival to desiccation conditions of *S. enterica* cells immigrating in their close vicinity on lettuce and cilantro leaves, potentially by modulating the immediate physicochemical environment at microsites where the pathogen arrived in the phyllosphere. Hence, interactions between human pathogens and indigenous plant microbes, whether directly or indirectly, may affect the outcome of a contamination event. Cox et al. [3] hypothesized that such an interaction between *S. enterica* and Pectobacterium carotovorum, which causes lesions that increase multiplication of the human pathogen in tomato fruit, involves cell-cell signaling via autoinducer-2 (AI-2). Using signal-defective mutants of both organisms and a sophisticated signal perception-reporter system, they report that AI-2 does not appear to be exchanged between the two bacterial species, nor enhance the competitive fitness of the human pathogen, during colonization of tomato soft rotted tissue. However, other molecular factors in *S. enterica* are known to participate in its colonization of plants, including a new bacterial attachment factor uncovered by Kroupitski et al. [4]. The misL gene was one of several *S. enterica* genes identified by recombinase-based in vivo expression technology (RIVET) as induced during cold storage of lettuce and played a role in attachment to lettuce leaf tissue. Because MisL is involved also in binding to fibronectin in animal hosts, their observation supports the conclusion in the review by Brandl et al. [5] that this highly adaptable enteric pathogen employs overlapping strategies to colonize both its primary and secondary habitats.

The ingress of enteric pathogens into plant tissue has been a topic of considerable interest in produce safety. Roy et al. [6] demonstrate that access to the leaf interior via stomata differs between *S. enterica* and *E. coli* O157:H7, likely because of differences in stomatal immunity to the two pathogens. Their findings provide further mechanistic evidence that plant basal defense responses can shape early interactions between human pathogens and plants, a field of research in produce safety that is receiving increasing attention. In this respect, the observation by Wright et al. [7] that *E. coli* O157:H7 forms colonies in the apoplastic space of root tissue and occasionally inside root cells will undoubtedly trigger many new scientific questions about the ability of enteric pathogens to invade plant cells. It will be tempting to surmise, based on data presented by Gu et al. [8] that highly diverse endophytic bacterial communities promoted by healthy soil management practices may contribute to minimize the probability of such internalization events by foodborne pathogens. Finally, the article by Hirneisen and Kniel [9] reminds us that while much of the focus in produce safety research has been on plant contamination with bacterial enteric pathogens, noroviruses, which cause a large percentage of the produce-linked outbreaks, have the potential to persist in the phyllosphere. Their observations should provide fascinating new territories to explore the biology of human enteric viruses on plants.

## REFERENCES

1. Wasala L et al. Transfer of *Escherichia coli* O157:H7 to spinach by house flies, *Musca domestica* (Diptera: Muscidae). Phytopathology. 2013; 103: 373-380.
2. Poza-Carrion C et al. Resident bacteria on leaves enhance survival of immigrant cells of *Salmonella enterica*. Phytopathology. 2013; 103: 341-351.
3. Cox C et al. Consequences of disrupting *Salmonella* AI-2 signaling on interactions within soft rots. Phytopathology. 2013; 103: 352-361.
4. Kroupitski Y et al. Identification of *Salmonella enterica* genes with a role in persistence on lettuce leaves during cold storage by recombinase-based in vivo expression technology. Phytopathology, 2013; 103: 362-372.
5. Brandl MT et al. *Salmonella* interactions with plants and their associated micro biota. Phytopathology. 2013; 103: 316-325.
6. Roy D et al. *Escherichia coli* O157:H7 induces stronger plant immunity than *Salmonella enterica* Typhimurium SL1344. Phytopathology. 2013; 103: 326-332.
7. Wright KM et al. The endophytic lifestyle of *Escherichia coli* O157:H7: Quantification and internal localization in roots. Phytopathology. 2013; 103: 333-340.
8. Gu G et al. organically managed soils reduce internal colonization of tomato plants by *Salmonella enterica* serovar Typhimurium. Phytopathology. 2013; 103: 381-388.
9. Hirneisen KA and Kniel KE Norovirus surrogate survival on spinach during preharvest growth. Phytopathology. 2013; 103: 389-394.