

PATH ORGANIC

Annual Abstract:

Project title and Acronym:	Risks and Recommendations Regarding Human Pathogens in Organic Vegetable Production Chains (PathOrganic)
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Period Covered:	01.08.2008-31.12.2009
<p>Popular Description of project progress and summary of results (1-2 pages).</p> <p>A continuous rise in the number of outbreaks of human diseases associated with the consumption of vegetables has been observed during the last few decades. <i>E. coli</i> O157:H7 was identified as the source of a severe spinach-linked epidemic in the U.S., and outbreaks involving lettuce infested with the same pathogen were reported in the Netherlands and in Iceland. As consumers strive to eat healthy diets and benefit from the year-round availability of fresh produce, the consumption of uncooked and minimally processed vegetables is increasing. Controversy exists on whether food safety is more at risk in organic versus conventional production of plant produce. The increased use of raw manure for fertilization in organic production may constitute an elevated risk of transferring human pathogens from livestock onto vegetables, either directly through fertilizer application or through cross-contamination between animal effluents and from contaminated water sources. On the other hand, it has been argued that the buffering capacity against invading microbes may be significantly improved in organic soils thanks to the more diverse and more active microflora. PathOrganic aims at assessing and minimizing risks associated with the consumption of organically produced vegetables. As the prevalence and behavior of enteric pathogens in organic plant produce are not well documented, the central part of the project is dedicated to the large-scale surveying of organically grown fresh produce in five European countries. During the first project period, a survey was carried out in which organic manures as potential entry points of pathogens into the food chain were screened for the prevalence of <i>E. coli</i>, <i>Salmonella</i>, <i>Staphylococcus</i>, <i>Listeria</i> and <i>Campylobacter</i> bacteria. Approximately 40 organic vegetable farms were approached in every country for the sampling of manures and for assessing data referring to specific management practices by use of a questionnaire. Subsequently, both cultivation-dependent and DNA-based molecular methods were used in analyses of in total 163 manure and slurry samples, which were shared among the participating labs according to expertise. Not unexpectedly, <i>E. coli</i> bacteria were detected in almost all manure samples. However, a considerable number of samples contained also pathogenic <i>E. coli</i>, <i>Salmonella</i> sp., <i>S. aureus</i>, <i>Listeria</i> sp. or <i>Campylobacter</i> spp.</p>	

Besides performing microbiological and chemical analyses of manure samples, in the second project period another survey was carried out on vegetables from farms where manures had suggested a risk of contamination. Only the more sensitive molecular methods were used for testing 4620 plants of lettuce or corn salad, 1900 plants of spinach and 500 carrots for pathogen prevalence. Here, an unexpectedly high number of samples proved positive for pathogens, including mainly *S. aureus* and *Salmonella* sp., but also *E. coli*, *Listeria* sp. and *Campylobacter* spp.. Since both manure and vegetable screenings were done based on enrichment cultures, no quantitative information was provided on viable bacterial cells, and hence screening results do not directly convey actual food safety risks. Thus, specific experiments have been set up in the greenhouse and in the lab as an integral part of the project, which are aimed at studying pathogen performance in biological matrices and at exploring risk factors in detail. In addition, questionnaires were sent out to specific farms to investigate which management related and environmental factors are influencing pathogen infestation of manures and vegetables. Data from these questionnaires have been collected and in the following will be transferred to a database for in depth evaluation.

Greenhouse and lab experiments are currently under way in the individual labs, which are directed at studying pathogen colonization behavior and persistence in manures and vegetables under consideration of various environmental and management-related factors. Among those are the soil management history and the use of differently treated manures. Also the resident soil microbial community is studied to evaluate its antagonistic capacity against invading pathogens. Plant and pathogen genotype characteristics are examined regarding differential effects on pathogen behavior in soil and vegetables.

Experimental data together with the survey results and the questionnaire entries will be used to identify “risk crops” and “risk factors” in organic vegetable production with the help of a risk assessment model. The ultimate aim of the surveys conducted within PathOrganic is to determine “critical control points”, depicting steps at which control can be applied to prevent or eliminate a food safety hazard. Preparations for a stakeholder workshop have started that will be held in Frick, Switzerland, in April 2010. Besides providing information on the PathOrganic project results, strategies shall be elaborated in group discussions among scientists, farmers’ associations’ representatives and other stake holders that may help minimize risks of bacterial pathogen contamination particularly in organic vegetable production.

References and links to papers/reports which have been published in the period:	
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