

# Integration Between Risk Assessment and Simulation Programs to Optimize the Evaluation of Microbiological Quality and Safety in Food Industry

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## Dear Editor,

Microbial contamination of water and food material constitutes a great concern for professionals working in the field as the health of the final customers may be impacted or even worse as they may die from incurable infections [1, 2]. A comprehensive list of pathogenic microbes is listed by FDA in “Bad Bug Book” and the number of objectionable microorganisms is still growing. The problem is exacerbated if coupled with the ever-growing population with defected health status [3].

Microbiological quality in the food industry is of prime importance qualitatively and quantitatively when dealing with product safety that is delivered to the final consumers. There are current techniques that have been developed such as quantitative microbiological risk assessment (QMRA) to assess the potential hazard that may arouse from contaminated food or water with pathogenic microbes [4, 5]. QMRA is useful in providing a numerical estimation of the possible hazard that could emerge from consumption of contaminated material with a specific pathogen.

Thus, QMRA is a mean of evaluating the hazard from the contact with microorganisms. The procedure includes estimating known microbial pathogens or markers and running a Monte Carlo recreation to evaluate the hazard of transfer [6]. If a dose-response demonstration is accessible for the organism under investigation, it will be utilized to assess the likelihood of a certain population to get infected. QMRA has extended to be utilized to appraise microbial hazard in numerous fields, however, is especially imperative in evaluations of food, water supply and human stool/wastewater hazard [4, 7, 8].

The influence of a manufacturing or processing facility already has an impact on the final microbiological quality that is delivered to the final consumer and affects QMRA value [9]. Advances in the simulation software have allowed for prediction of the influence of the dynamic media such as air and water that could be excreted on the items under study in the same room or area, with the effect of cross-contamination included. Some examples of these program packages are sim Flow CFD and FLOVENT® [10, 11]. Moreover, these program packages provide a handy tool for design improvement for the manufacturing and processing facilities.

Thus, the level of contamination from microbial particles could be estimated from the manufacturing and processing facility and hence included in the risk assessment. This will help in the determination of critical steps, improving design (and layout), points of process weakness with significant potential of increasing microbial contamination and/or spoiling risk, improvement projects to enhance quality/safety issues and decision making based on rational scientific data.

Conceptual and practical continuous progress using new technologies and

techniques in improving microbiological quality and safety of food and water is required to avoid any excursions that may be catastrophic and devastating to human health and possibly life where the mankind suffered from many epidemics during his short life on earth.

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