

## Quantitative Microbiological Risk Assessment: Underrated Tool in Process Improvement in Food Microbiology

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Sir,

Microbial contamination of food has been responsible either as isolated cases or outbreaks for many human illnesses and even deaths over long years of man march on the earth. Over long years, it was possible to invent many techniques and technologies that control bioburden in the food material to avoid adverse impact on the life of the consumers. During recent years, useful tools were adopted to provide a mean for the assessment of the hazard to the human health encountered from exposure to pathogenic microbes. Taking into consideration, several factors such as dose-response model of infection, affected populations, the impact of processing conditions of food and cross-contamination [1].

Using mean that provide an objective method to estimate the microbiological risk was a subject of interest for decades. At the beginning of the twentieth century, early attempts were made to cover concerns

about the microbiological quality issues of water and food [2]. To cover this challenge, the concept of 'indicator microbe' was developed and adopted in food industry such as in milk and other industries [3]. Perhaps the coliform group of microorganisms was the first to be used to apply this concept [4, 5]. However, this tool was imperfect till now and suffer limitations as the absence of the indicator microbes is not guarantee for the absence of the pathogenic microorganisms [6]. Moreover, the establishment of health standards based on indicator microorganisms requires extensive epidemiological surveillance which is quite expensive to perform and suffers from a limitation in the detection limits. [2].

The search for a better and objective methodology was sought to the avoid limitation of indicator method. The utilization of microbial hazard appraisal in a quantitative manner will empower coordinate estimations of pathogens to be utilized to create pass/fail rules for nourishment, water, and

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**Running Title:** QMRA: Indispensable Technique In Food Industry

**Received:** June 08, 2018

**Accepted:** June 14, 2018

**Published:** June 20, 2018

**Editor:** Foluso Oluwagbemiga Osunsanmi, University of Zululand, South Africa

different vehicles that might be the wellspring of microbial introduction to human populace [2]. There might be various goals for the assessment of the microbial risk objectively. These targets identify with the method of reasoning for the execution of the assessment, and the techniques to be utilized. Extensively, the distinctive destinations reflect diverse scales at which a hazard evaluation might be performed. The progression of issue plan is basic to any hazard gauge [7].

A prominently useful tool in food microbiology comes into play which has an important role in providing an objective measurement of the health hazard risk encountered from consumption of contaminated food by hazardous microbes. This tool is called Quantitative Microbiological Risk Assessment (QMRA). Despite its few limitations, yet it provides a crucial role in decision making [8]. Evers and Chardon (2010) have provided a spreadsheet that rendered the calculation of the risk easy and rapid through an input of few data in what is called swift QMRA (sQMRA). Using this method, the current microbiological risk could be deduced at any food processing and manufacturing facility provided that required input data are available and continuously monitored and updated [9]. Accordingly, any modifications made in the processing steps could be assessed as either impacting the microbiological quality

positively or negatively quantitatively. Thus, QMRA brings the focus to the critical steps that should be controlled to avoid any catastrophic excursion in bioburden of the produced units or pieces.

A simple worked example could show the impact of changing microbial bioburden pathogenicity from minor to severe health hazard when other conditions are assumed to be the same as shown in Table 1 using Risk Ranger software [10-12]. Table 1 also showed obviously that gross chaos in post-processing of food may aggravate the hazard of the food-contaminating microbial population even those with minor risk. Thus, bioburden-limiting steps in the food industry should be strictly controlled to avoid risks of microbial outbreaks. Survivability of microbial cells for food treatment process is the bioburden limiting step that has pronounced effect on the number of ill population and hence the risk factor as shown in Figure 1 [8].

In a survey of early QMRAs, Schlundt (2000) remarked that couple of formal QMRAs had been completed as per the Codex Alimentarius rules [13]. From the QMRAs standpoint, it was uncertain whether a basic assessment of information had occurred, and the changeability and vulnerability of the information were regularly not depicted in adequate detail. Moreover, suspicions affecting the last outcome were frequently

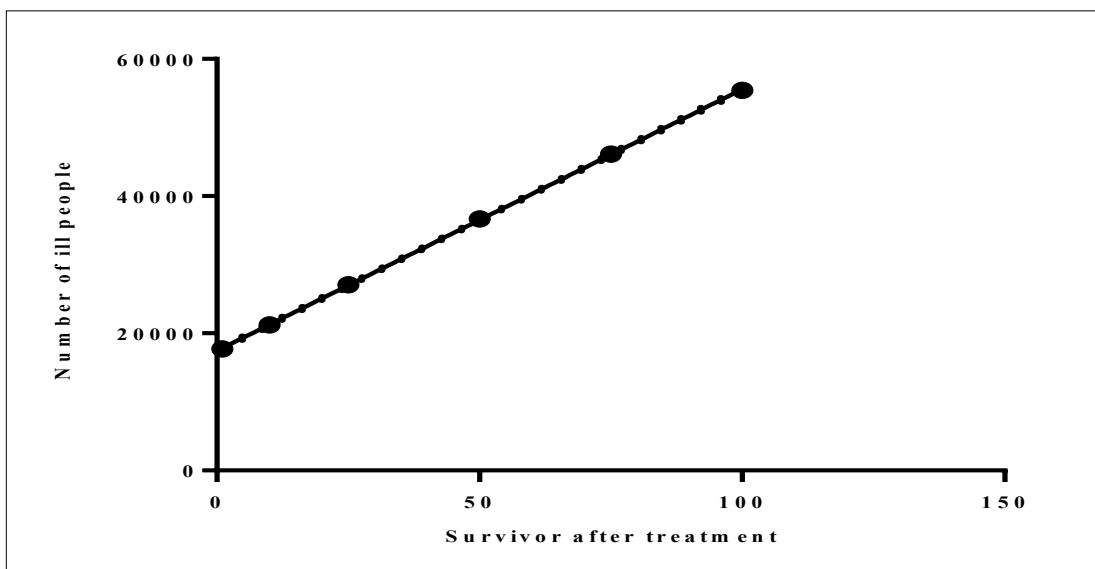


Figure 1: Number of the ill population (Y-axis) vs. percent of the microbial population that survives food treatment process when other parameters were maintained constant.

Table 1: Application of Risk Ranger Excel sheet in the risk assessment of microbial hazard from food consumption [4-6].

Severity of The Hazard	Rank of The Risk	Post-Processing effectiveness <sup>ψ</sup>	Rank of The Risk/Total Annual Illness Per Target Population
Minor	33	Log1= 0.000	35/2.54 X10 <sup>2</sup>
Mild	39	Log3=0.477	38/7.61X10 <sup>2</sup>
Moderate	45	Log10=1.000	40/2.54 X10 <sup>3</sup>
Severe	56	Log1000=3.000	52/2.54 X10 <sup>5</sup>

<sup>ψ</sup> Increase in the bioburden of pathogens with a minor hazard

not unmistakably introduced or basically assessed. Shockingly, indeed, even in later QMRAs similar downsides relating to the absence of a sound quality assurance (QA) framework are still regularly experienced [14].

Nevertheless, the application of QMRA is underestimated and/or not used with its full potential value, especially in the developing countries where lack of sufficient trends and input monitoring data are hindering barriers for correct implementation of this methodology. The mandatory implementation of this technique as a stand-alone or in combination with the other boosting tools such as Statistical Process Control (SPC) by regulatory authorities after an appropriate establishment of globally harmonized rules for the application may provide suitable starting platform. Awareness of the GxP, microbial hazard and the value of various tools used in the food microbiology the among the workers in the industry field are essential in the dissemination of correct practices to deliver safe products to the intermediate and the final customers.

### Acknowledgment

N/A

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