APPLICATION OF MICROBIAL RISK ASSESSMENT IN BRAZIL: OPPORTUNITIES FROM THE INDUSTRY TO THE GOVERNMENT

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Introduction

To investigate the public health risks of microbial in food, quantitative microbial risk assessment (QMRA) is a useful approach and a good alternative when surveillance data are sparse, and for management decisions. The goal of QMRA is assess the probability of the disease occurrence given the ingestion of a contaminated food and its consequences, and when the risk is estimated, control measures can be applied and its impact on disease assessed. Consequently, this method supports the promotion of public health by the authorities.

QMRA is now well recognized as a risk management decision-support tools, and a well-designed risk assessment provides the means to evaluate and compare the effects of different control measures on public health. Moreover, the application of QMRA is not restricted only to the government decision-makers. Since this tool can be used to validate the impact of the HACCP measure on the public-health, the industry can also make use of this tool to help the manager to decide whether to change the process accordingly with the safety objectives. In this sense, the impact of a given critical control point can be evaluated using risk assessment approach because it allows describing the changes in microbiological numbers along the food-processing chain from the farm to the consumer using mathematical models.

Recently, this method (qualitatively and quantitatively) was applied to ranking hazards that can be present in pork meat as well as to assess the effect of meat inspection practices on the contamination of the pig carcasses. These are practical examples of application of microbial risk assessment in our region and they also illustrate the potential of this approach in helping decision makers in both public and private sector.

It was reported in the literature that few quantitative microbial risk assessment have been performed in developing countries, (1) as is the case of Brazil. The objective of this study was to discuss the using of QMRA in Brazil and its potential regarding its use as a tool for decision-making.

Material and methods

A systematic review was made with the main objective to assess how many articles on QMRA performed in Brazil have been published in peer reviewed Journals. The search engines used were PubMed and ScienceDirect and included original articles (not reviews) published in English language from 2007 to date. Only QMRA performed in Brazil were selected. The search strategy used the combination of the following keywords: "quantitative microbial risk assessment" or "microbial risk assessment" or "quantitative risk assessment" and "food" and "Brazil". The data collected from the studies were basically the type of food and hazard involved.
In order to improve the discussion regarding the application of this method in the current Brazilian situation, a “reference search” was made using the same keywords (“quantitative microbial risk assessment” or "microbial risk assessment" or "quantitative risk assessment" and "food") and period in the EFSA (European Food Safety Authority) Journal. Hence, we discuss the perspective of the application of this tool by the Brazilian authorities.

**Results and discussion**

The searching strategy resulted in 178 publications, of which nine articles described QMRA performed in Brazil in food (n=7) and water (n=2). Publication in peer review journal started only in 2013. QMRA were done in food of animal origin in three published papers, in which the risk was estimated for food of pork origin in two of them. Details of the published QMRA performed in food are described in Table 1.

**Table 1.** Quantitative Microbial Risk Assessment in food performed in Brazil and published in peer review journals from 2007 to 2017.

<table>
<thead>
<tr>
<th>Type of food</th>
<th>Origin</th>
<th>Pathogen</th>
<th>Year</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salad crops irrigated with effluents</td>
<td>Vegetal</td>
<td><em>Escherichia coli</em></td>
<td>2013</td>
<td>Pavione et al. (2)</td>
</tr>
<tr>
<td>Fresh sausage</td>
<td>Animal</td>
<td><em>Salmonella</em> spp.</td>
<td>2013</td>
<td>Mürrmann et al. (3)</td>
</tr>
<tr>
<td>Oyster</td>
<td>Animal</td>
<td><em>Vibrio parahaemolyticus</em></td>
<td>2014</td>
<td>Sobrinho et al. (4)</td>
</tr>
<tr>
<td>Ready-to-eat leafy vegetables</td>
<td>Vegetal</td>
<td><em>Salmonella</em> spp. and <em>Listeria</em> spp.</td>
<td>2014</td>
<td>Sant'Ana et al.(5)</td>
</tr>
<tr>
<td>Leaf green</td>
<td>Vegetal</td>
<td><em>Salmonella</em> spp.</td>
<td>2017</td>
<td>Pavione et al. (2)</td>
</tr>
<tr>
<td>Cheese</td>
<td>Animal</td>
<td><em>Staphylococcus</em> enterotoxin</td>
<td>2017</td>
<td>Nunes and Caldas (6)</td>
</tr>
<tr>
<td>Fermented sausage</td>
<td>Animal</td>
<td><em>Salmonella</em></td>
<td>2017</td>
<td>Corbellini et al. (7)</td>
</tr>
</tbody>
</table>

Considering that quantitative microbial risk assessment applied to evaluate the risk of diseases caused by the exposure to pathogens in food started in the middle nineties, there is evidence that this tool is still overlooked in Brazilian reality. That is because only in 2013 the first two published articles describing QMRA usage in Brazil were found in the search along with the low number publications. Santos et al. (8) pointed that the lack of training opportunities and a formal organization to conduct risk assessment are some limitation for the use of this tool within National Veterinary Services in Brazil, for example.

In contrast, the search made in the EFSA journal resulted in 107 publications of which at least 33 of them described the use of risk assessment to help authorities in the process of decision-making. EFSA is an agency that works as risk assessor to promote, for example, food safety and animal health and welfare, and it was possible to observe that there are many risk assessment developed to cover all these aspects. Among these publications, there are several reports describing scientific opinions on the risks estimated by risk assessments, guidance to harmonize procedures, requirements for a risk assessment on antimicrobial resistance, etc.
This fact clearly denote that there is a formal organization to conduct risk assessment to aid authorities to take decision in Europe, in contrast to what happens Brazil. This situation i.e., the absence of a formal organization might be one of the reasons to the lack of opportunities for the using of risk assessment in large scale to help the process of decision-making on food safety for both private and public sectors in Brazil.

**Conclusion**

Risk assessment is a tool largely used to promote animal health and public health. In Brazil, there are still few publications describing risk assessment on food safety, which might be related with the lack of formal organization to promote its use in large scale by the authorities or the lack of formal training.

**References**


