NUSAP: a Tool to evaluate the Quality of Assumptions in Quantitative Microbial Risk Assessment

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INTRODUCTION

Carrying out a quantitative microbial risk assessment (QMRA) involves subjective choices and assumptions. These assumptions have a large impact on the decision-making process. NUSAP (Numeral Unit Spread Assessment Pedigree) is a method that aims to provide a better communication and management of uncertainty in science used for policy. The pedigree component from the NUSAP system was used to evaluate the assumptions in a Belgian QMRA for Human Salmonellosis through Household Consumption of Fresh Minced Pork Meat in Belgium for *Salmonella* in minced pork meat (METZOON, Bollaerts et al., 2009).

AIMS OF THE STUDY

- Assessment of the subjective component of assumptions in the QMRA model
- Identification weak links in the model
- Enhancement of transparency in QMRA

MATERIAL AND METHODS

- Thirteen key-assumptions were selected by reviewing the QMRA model. A workshop was organised to assess the subjective component of these assumptions by using four Pedigree criteria:
  1. the influence of situational limitations (time, money, human resources)
  2. plausibility
  3. choice space
  4. the agreement among peers.
- Nine experts attributed scores to the criteria for each of the assumptions on a scale from 0 to 4, using a pedigree matrix (**table 1**). The lower the scores, the higher the degree of subjectivity of an assumption.
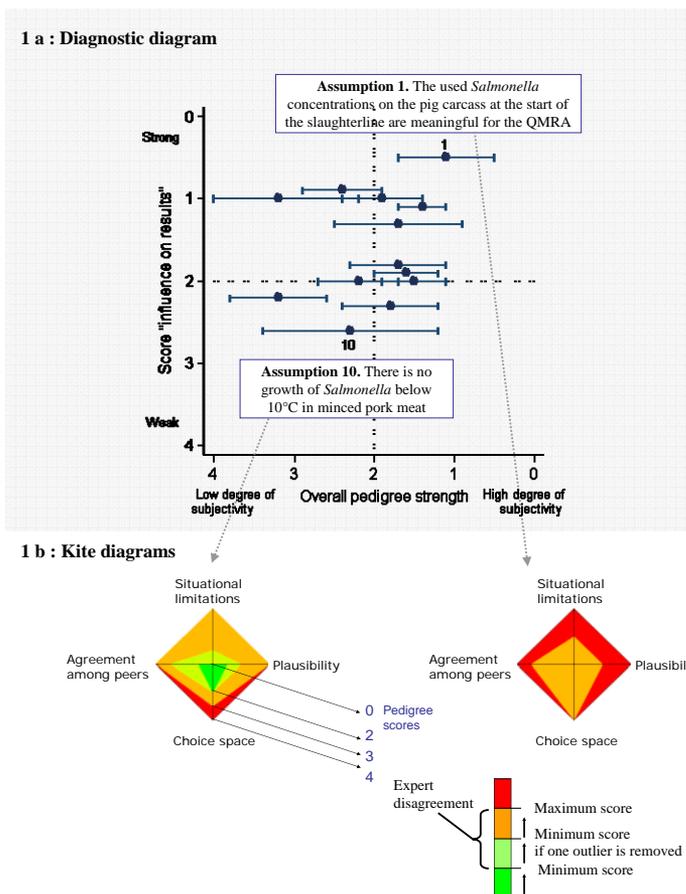- The matrix contains an additional criterion to estimate the influence on the outcome of the QMRA model.

Table 1 : Pedigree matrix to evaluate assumptions (adapted from Kloprogge et al., 2005)

Score / Criterion	0	1	2	3	4
Influence situational limitations	Totally different assumption had there not been limitations			⤍	Hardly any influence
Plausibility	Assumption fictive / speculative				Very plausible
Choice space	Ample choice from alternative assumptions				Hardly any alternatives
Agreement among peers	Hardly any expert would have made same assumption				Large agreement among peers
Influence on results	Assumption greatly determines the result			⤍	Assumption has little or no impact on the results

RESULTS

Figure 1a: **Diagnostic diagram** showing the overall pedigree strength (= average of scores of the 4 criteria for each assumption) of the assumptions. Assumptions with low overall pedigree strengths and a strong estimated influence on the results of the QMRA can be considered as weak links in the model (upper right quadrant of the diagram).

Figure 1b: **Kite diagrams** visualising each pedigree component of each assumption (2 shown). Red areas correspond to a large degree of subjectivity.

1 a : Diagnostic diagram

Assumption 1. The used *Salmonella* concentrations on the pig carcass at the start of the slaughterline are meaningful for the QMRA

Assumption 10. There is no growth of *Salmonella* below 10°C in minced pork meat

1 b : Kite diagrams

CONCLUSIONS

NUSAP:

1) resulted in an **enriching debate on the quality of assumptions** in the QMRA model

2) was helpful to **redesign critical and weak parts** in the model

3) leads to **enhanced and transparent risk communication** using **diagnostic diagram and kite diagrams**

REFERENCES

1. Bollaerts K. et al. 2009. METZOON: Development of a quantitative microbial risk assessment for human salmonellosis through household consumption of fresh minced pork meat in Belgium. *Risk Analysis.*
2. Kloprogge P. et al. 2005. A method for the analysis of assumptions in assessments, exploring the value-ladenness of two indicators in the fifth Dutch environmental outlook. Bilthoven. Netherlands Environmental Assessment Agency. Report no 550002010/2005.