Microbial Modelling and Risk Analysis PDG

Attendees: Nurul Hawa Ahmad, Alejandro Amezquita, Maren Anderson, Manish Aryal, David Baker, Angel Barnes Jr., John Bassett, May Frances Bautista, Mark Beaumont, Tamrat Belete, Dan Belina, Thomas Bell, Peter Ben Embarek, Robert Brodnick, Tom Bruursema, Sarah Cahill, Joanna Carroll, Dongjie Chen, Yuhuan Chen, Sally Crowley, Heidy Den Besten, Madhumeeta Dutta, Mariem Ellouze, Jeff Farber, Yaohua Feng, Alonzo Gabriel, Zhujun Gao, Francisco Garces-Vega, Mirijam Garske, Leon Gorris, Karen Gregory-Williams, Leena Griffith, Sanjay Gummalla, Brian Hawkins, Erin Headley, Montserrat Hernandez Iturriaga, Ian Hildebrandt, Sunee Himathongkham, Sandra Hoffmann, Lihan Huang, Xiao Ping Huang, Cheng-An Hwang, Matt Igo, Oluwatosin Ijabadeniyi, Keith Ito, Jiin Jung, Janell Kause, Laura Keller, Susanne Keller, Shigenobu Koseki, Bala Kottapalli, Brian Kraus, Young Seok Kweon, Mijin Kwon, Yvan Le Marc, Yunjin Lee, Glenda Lewis, Quanhong Li, Yanbin Li, Zhe Li, Chao Liao, Lisa Lucore, Stephanie Maggio, Deon Mahoney, Bradley Marks, Miho Matakatsu, Conor McGauran, Adora Christee Mercado, Zahra Mohammad, Hyejin Moon, Gerardo Morantes, Yemi Ogunrinola, Chris Okolo, Samet Ozturk, Haiying Pang, Mickey Parish, Laura Patterson, Vera Peterson, Raquel Pinto, Aurelie Pohl, Monica Ponder, Abani Pradhan, Prasant Prusty, Lakshmanan Ramamoorthi, S. G. D. Nagalakshmi Reddi, Catherine Rolfe, Joyjit Saha, Sofia Santillana-Farakos, Oscar Santos, Renee Schwartz, Jenny Scott, Dennis Seman, Panagiotis Skandamis, Edward Sliwinski, Philip Steinbrunner, Quincy Suehr, Katherine Swanson, Yoko Takahashi, Mark Tamplin, Abdullatif Tay, Fanny Tenenhaus-Aziza, Zeynal Topalcengiz, Tomohiko Tsurumaru, Aaron Uesugi, Jane Van Doren, Xinyue Wang, Christopher Wells, Richard Whiting, Pamela Wilger, Jian Wu, Xingning Xiao, Hongshun Yang, Mira Yoon, Yohan Yoon, Yangjunna Zhang, Zijin Zhou, and Marcel Zwietering. **Number of Attendees:** 117.

Meeting Called to Order: 9:00 a.m., Sunday, July 9, 2017.

Minutes Recording Secretary: Bala Kottapalli (with the help of Yuhuan Chen and Marcel Zwietering).

Chair Marcel Zwietering welcomed attendees, followed by self-introductions for all PDG members and visitors. Marcel reviewed the meeting agenda. No additional agenda items proposed.

Greetings/Comments from Executive Board:

Mickey Parish indicated that IAFP organization is healthy, financially strong and having a record attendance. He also mentioned MMRA PDG is very strong and active. He mentioned that 400 students registered for the meeting and requested the PDG groups to find ways in recognizing students.

Minutes: Minutes from the 2016 meeting were presented for comments or edits. There were no edits. Motion to adopt the minutes was by Katie Swanson, seconded by Jane Van Doren. Minutes adopted.

Matters Arising from 2016 PDG Meeting:

Marcel explained the selection process for new Vice Chair. This included multiple nominations from PDG members and elections through a voting process. Marcel indicated that this type of selection process will be adopted for future selection of Vice Chair(s), so nominations are welcome. Nominations are welcome from different regions (U.S., Europe, Asia/Eurasia, Asia Pacific) and affiliations (industry, government, academia, etc.). Nominations are due by **October 3, 2017!** People may self-nominate or nominate others.

Updates from SRA, MRA Specialty Group and ICPMF Committee:

Dr. Abani Pradhan provided the vision statement for SRA. He indicated that SRA is a multidisciplinary, interdisciplinary, scholarly, international society that provides an open forum for all those who are interested in risk analysis. SRA has several specialty groups one which is Microbial Risk Analysis Specialty Group (MRASG). The MRSAG focuses on public health risks associated with a variety of biological hazards. Different activities of MRSAG include: (1) sponsor/organize symposia, technical sessions, posters at SRA annual meeting, (2) organize webinars, (3) encourage students – Specialty Group student merit award competition, and (4) facilitate communications and networking (e.g., LinkedIn subgroup). At the upcoming 2017 SRA annual meeting (Arlington, VA), 6 topics relating to microbial risk assessment will be sponsored. For more information relating to SRA, please contact the Chairperson Abani Prahan (akp@umd.edu).

Fanny Tenenhaus-Aziza gave an overview of ICPMF activities. The mission of ICPMF is to catalyze the development of predictive modelling in foods, primarily through advancing the success and sustainability of the biennial ICPMF-conferences. Currently the organization is in the process of revising their by-laws. The objectives of 2017–2019 include: (1) to export the concept of the Software Fair to conferences gathering microbiologists, industrial representatives and (2) preparing ICPMF10 (2017) and ICPMF2011 (2019). In the 2017 IAFP meeting, a symposium and software fair are being organized by ICPMF and Fanny thanked MMRA PDG for supporting the events. Future actions will include: (1) Software fair at Food Micro 2018, (2) session on predictive microbiology at Food Micro 2018, (3) a webinar on PM and RA tools, and (4) potential collaboration with SRA.

Guest Speaker: Sofia M. Santillana Farakos, Ph.D., (Center for Food Safety and Nutrition, US FDA)
Highlights of the presentation:

Low water activity foods are foods with water activity less than 0.7 and stored for long periods of time at ambient temperature. *Salmonella* survival in low moisture foods typically follows a Weibull or a log-linear distribution. *Salmonella* survival is influenced by water activity and temperature. During storage, increased survival is apparent at lower temperatures and lower water activities. At the higher water activities the lethality rate is faster compared to the lethality in lower water activity products. Major influential factors in thermal inactivation include: (1) environmental conditions (2) food matrix (3) serotype (4) growth media and (5) inoculum drying conditions (affects cell physiology). Stress adaptation studies showed the *rpos* gene expression slightly changes during storage. Studies relating to risk assessment of *Salmonella* in almonds were summarized. It was indicated that a 4-log reduction in almonds reduces illnesses to < 1 per year. It was pointed out that considerations must be given to re-evaluating risk assessments if there is a risk of post-process contamination. Future work should focus on: (1) controlled conditions (2) physiology of the organism (3) predictive modeling of dynamic conditions (4) QMRA contamination data and (5) *Listeria* risk assessments. Studies relating to risk assessments are presented in the form of posters and symposia at this year IAFP 2017.

Following the presentation, there was discussion on the following points:

For your assessments, did you (Sofia) take into consideration how the person prepared the inoculum? Is there a reference on how to prepare inocula for low water activity products to not disrupt the water activity of the product:

- For the first question the answer is Yes. For the second question, to the best of Sofia's knowledge there is no specific method to do it because every method has its own limitations

Use of single strain vs cocktail for inactivation studies
- Better to use multiple single strains separately vs. cocktail to understand effect of thermal process on individual strains

Have you seen any great influences in your modeling if you prepared the inoculum dry vs. wet?
- Sofia responded Yes. When cells are dried, they become more resistant.

Organisms used for inoculation: broth or plates? Influence on heat resistance?
- In Sofia's personal experience, she found that organisms in broth exhibited better stability (more heat resistance) compared to organisms used from plate.

Sofia pointed out validation studies are performed in one matrix should be verified in other matrices to understand if the same inactivation kinetics apply.

Bob Buchanan pointed out that moisture migration and re-distribution may be possible (based on his experience with Pet foods risk assessment) when low moisture foods are distributed through dynamic conditions (due to temperature fluctuations) resulting in non-equilibrated conditions. So, future studies should consider these variables. Bob also suggested that characterization of strains (in preparation for inoculum) must be performed.

Is there any work being done to work backwards from the atypical incidents (that may lead to outbreaks and consumer illness) to get an understanding of hierarchy of those incidents so that we can prevent public health issues
- Some work has been done in pistachios and it is challenging because it is difficult to know the actual cause. Requests are being made to investigators to enumerate the organisms when sampling occurs.

Which methods were used to enumerate *Salmonella*?
- Culture method using selective and non-selective media. Selective media showed 1-log difference because of cell damage.

IAFP 2017 Recap of Submitted Proposals
- Do Not Stumble over a Process Deviation: Regain Control with Predictive Microbial Modeling
- How to Exploit Omics Data on Pathogen Behavior in Microbiological Risk Assessment: An Update on the Current Research
- Complexity in Managing Risk from Pathogens in the Fresh Produce Chain: How Can Risk Assessment Help?
- A Risk-based Approach to Setting Microbiological Performance Standards for Poultry
- Development of Microbiological Criteria as Indicators of Process Control or Insanitary Conditions: A Summary of the Report Prepared for the United States Department of Defense by the NACMF
- Managing Risk in a Zero Tolerance World
- Predictive Microbiology and Risk Assessment Tools
- Software Fair on Predictive Microbiology and Risk Assessment Tools
- Foodborne Viruses: Detection, Risk Assessment, and Control Options in Food Processing
- Modeling Pathogens in Low Water Activity Foods: What, How, and How to Use It
- Ranking Risks in Low-resource Settings

- Translating the Big Data to the Food Industry
- Risk Modeling (12 presentations)
- Chemical and Microbial Risk Assessment: Similarities and Differences
- What is the Meaning of Zero Tolerance in the Age of Food Genomics?
- Preventive Controls Other Than CCP: Choosing, Verifying, and Validating
- Towards Risk-based Microbial Standards for Irrigation Water
- Modeling and Risk Assessment & Retail and Food Service Safety (8 presentations)

Symposia/Workshops/Roundtables/Debate and Webinars – Ideas for 2018 – Proposal due October 3, 2017
- Fundamental concepts relating to Non-threshold microbial dose-response models (Bob Buchanan)
- Mathematical modeling and risk assessment in viruses (Jane Van Doren)
- Risk-risk and Risk-benefit analysis (Jane Van Doren)
- *Listeria monocytogenes* risk assessment (Yuhuan Chen)
- Horizon scanning and subsequent quick risk assessments (Leon Gorris)
- Organizing Software fair (Fanny Tenenhaus-Aziza/ Mariem Ellouze)
- Applying modeling to defend nation's food supply against terrorism (Jessica Cox and Brian Hawkins)
- Estimating the threat of EMA through modeling (Brian Hawkins)
- Mathematical prediction of causative pathogens in food (Brian Hawkins)
- Applying modeling to prioritize strategic investments (Brian Hawkins)
- Complicated risk assessment or classic hazard analysis – do we really need both/can we really do both? (Yuhuan Chen and Bala Kottapalli)
- Biological variability (in thermal processing): Impacts for process control and validation (Marcel Zwietering and Heidy den Besten)

Webinars and Other Communications
- Marcel gave an overview of past webinars and recordings, asked the group what would be an appropriate frequency for webinars. The recommendation was two per year.

Recommendations to the Executive Board:
1. Recommend contacting firms like IBM who are working with the food industry on BIG data across the industry and finding a sway for them to summarize their findings through webinars, symposia or informal sessions.
2. The MMRA PDG again had big support to recommend that recordings of MMRA PDG webinars be made freely available for both ALL IAFP Members and Non-Members. It is especially the most generic subjects that would be good to broadly diffuse.
3. Recommend finding a way to fund webinars through the PDG for presentations that cannot be sponsored by a commercial third party, due to the nature of the project (such as a study by a government agency or WHO/FAO). This would help make webinars freely available.

Next Meeting Date: July 8, 2018, Salt Lake City, UT.

Meeting Adjourned: 11:02 a.m. July 9, 2017.

Chairperson: Marcel Zwietering.