Microbial Modelling and Risk Analysis PDG

Attendees: Marcel Zwietering (Outgoing Chair), Bala Kottapalli (Chair). Jennifer Acuff, George Afari, Seun Agbaje, Nurul Ahmad, Peiman Aminabadi, Angela Anandappa, Dan Anderson, Maren Anderson, Ashley Arnold, Richard Arsenault, Thomas Bailey, S. Balamurugan, Brita Ball, Cameron Bardsley, David Basler, Michael Batz, Mark Beaumont, Sylvia Bergman, Arpan Bhagat, Yige Bima, Zeb Blanton, Neil Bogart, Ernest Bonah, Sara Bover-Cid, Robert Brackett, Fred Breidt, Laurel Burke, Ronald Burke, Cheryl Burn, Joyce Cao, Loan Cao, Laurenda Carter, Wei-Hsiang Chang, Ben Chapman, Jennifer Chase, Hsiu-Ling Chen, Judy Chen, Yuhuan Chen, Larry Cohen, Stephanie Colorado, Frederick Cook, Maria Crespo, Sally Crowley, Carl Custer, Tracey David, Kelly Dawson, Heidy Den Besten, Joan Donelan-Weber, Christophe Dufour, Martin Duplessis, Mariem Ellouze, Bertrand Emond, Tom England, Peyman Fatemi, Shelley Feist, Betty Yaohua Feng, Matthew Fenske, Tracy Fink, Lois Fleck, Wade Fluckey, Michele Fontanot Borasino, Elise Forward, Neal Fredrickson, Gina Frontino, Robert Fuller, Balasubramanian Ganesan, Zhujun Gao, Bina Gautam, Joseph Glenn, Angelica Godinez Oviedo, Virendra Gohil, Chase Golden, Gustavo Gonzalez Gonzalez, Peggy Good, Leon Gorris, Robert Gravani, Leena Griffith, Stephen Grove, Anyi Gutierrez, Jesus Guzman, Hillary Hagan, Arie Havelaar, Erin Headley, Jim Heemstra, Ian Hildebrandt, Dylan Hinrichs, Leslie Hintz, Joseph Holt, Jason Horn, Dave Horowitz, Taryn Horr, Emily Hovis, Kirsten Howe, Lihan Huang, Oluwatosin Ijabadeniyi, Renata Ivanek, Megan Jensen, Lone Jespersen, Stephanie Jimenez Ramos, Qing Jin, Jennifer Jolly, Kent Juliot, Vijay Juneja, Jiin Jung, Hidehito Kai, Janell Kause, Megan Kenjora, Ahyoon Kim, Kathy Knutson, Robert Koeritzer, Shigenobu Koseki, Barbara Kowalcyk, Audrey Kreske, Bobby Krishna, Kunihiro Kubota, Julie Kuruc, Young Seok Kweon, Ching-Chang Lee, Jeong-Eun Lee, Susan Leslie, Katrina Levine, Vickie Lewandowski, Larry Lichter, Marie Limoges, Yuqian Lou, Lisa Lucore, Stephanie Maggio, Gita Malik-Dahiya, John Marcy, Bradley Marks, Conor McGauran, Deborah McIntyre, Maia Metreveli, Joseph Meyer, Zahra Mohammad, Laura Nelson, Melanie Neumann, Nicolas Nguyen Van Long, Philip O'Connor, James O'Donnell, Teresa Olson, Omar Oyarzabal, Laura Patterson, Brian Perry, Ruth Petran, Randall Phebus, Steven Phillips, Stacey Popham, Gale Prince, Kally Probasco, Hang Qi, Mohsen Ranjbaran, Jeffrey Read, Kimberly Rice, Tanya Roberts, Catherine Rolfe, Joanne Ruebl, Tim Rugh, Joyjit Saha, Kristen Saniga, Britanny Saunier, Sara Scharber, Sara Schoen, Dina Scott, Nicola Sharman, Nilay Sheth, Subash Shrestha, Panagiotis Skandamis, Edward Sliwinski, Chris Smith, Philip Steinbrunner, Eric Stevens, Don Stoeckel, Robert Strong, Varalakshmi Sudagar, Rico Suhalim, Joni Sweet, Abdullatif Tay, Fanny Tenenhaus-Aziza, Anna Theil-Gangl, Sheela Thogaru, Ellen Thomas, Jennie Thomas, Sarah Tillis, Corey Troutman, Tomohiko Tsurumaru, Ching-Yu Tu, Edward Verosko, Kirty Wadhawan, Chris Waldrop, Carol Wallace, Isabel Walls, Steve Warshawer, Josephine Wee, Kevin Wegman, Hechen Wei, William Weichelt, Steven White, Richard Whiting, Pamela Wilger, Barbara Wilhelm, Patrick Wilson, Anett Winkler, Zhihan Xian, Jing Xie, Wenqing Xu, Hongshun Yang, Xianqin Yang, May Yeow, Yohan Yoon, Peipei Zhang, Kang Zhou, Kristen Ziegler, and Wen Zou.

Number of Attendees: 214.

Meeting Called to Order: 9:00 a.m., Sunday, July 8, 2018.

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

- Chair Marcel Zwietering welcomed attendees; he presented the Antitrust Guidelines and partially reviewed the meeting agenda.
- Ruth Petran provided an update to the PDG meeting for the main outcomes of the last Board meeting. The major points were as follows:
  1. There was a 4% increase (3,800) in attendees and 3% in exhibitors (270) this year compared to last Annual Meeting in Tampa.
  2. Only 90 symposia out of 200 proposals were accepted by the Program Committee this year, due to space and time slot constraints. Competition for slots was great. PDGs are encouraged to engage with each other in developing new symposia proposals for 2019. Many quality proposals that were not accepted this year could be redeveloped into webinar submissions.
  3. Membership counts 4,300 Members, with almost 20% of them representing countries outside North America. These include 135 sustaining members, including 24 Gold and 21 Silver.
  4. *Food Protection Trends (FPT)* continues to have steady submissions of articles for *FPT*, with more than 90% of readers being either satisfied or very satisfied with the content of *FPT*, according to recent survey.
  5. *Journal of Food Protection (JFP)*: Manuscript submissions were reduced in the past couple of years but the total number of article pages printed remained steady. Based on a 2015 study, efforts are being made to make *JFP* more discoverable in searches, thus leading to higher citations, improving the use of *JFP* articles and increasing the Impact Factor.
  6. PDGs have been encouraged to consider activities to recognize student achievements. PDGs are encouraged to coordinate with the Student PDG regarding assignment of Student Liaisons for each PDG. PDG members were encouraged to support student activities ($5,000 collected so far) by purchasing the 2018 student shirt at the Student booth in the exhibition hall.
  7. *IAFP Report* is sent monthly to all members. Members are encouraged to open and review the Report for recent information related to food protection activities worldwide.
  8. The 14th European Symposium on Food Safety was held in April this year in Stockholm, Sweden, with record setting attendance of more than 370 registrants.
  9. Social media can be a valuable tool to enhance PDG activities throughout the year. Executive Board continues the efforts by regularly posting on Facebook, LinkedIn and Twitter.
  10. The Foundation continues to have great success in growing its balance with a goal of $2 million by 2020. This supports among others travelling for 20 students and 3 safety professionals from a Country with a Developing Economy.
  11. IAFP continues to have a good financial health.
- The greetings from the Board were followed by self-introductions for all PDG members and visitors.

Old Business:

Adoption of 2017 PDG Minutes: Minutes from the 2016 meeting were tabled for comments or edits. There were no edits. Motion to adopt the minutes by Leon Gorris, seconded by Mariem Ellouze; minutes adopted.

Matters Arising from 2017 PDG meeting:
- Marcel explained the selection process for new Vice Chair. This included multiple nominations from PDG members and elections through a voting process. For this term, all (four) nominations were for Panos Skandamis, so no voting was necessary and Panos was proposed and accepted by the IAFP Board as new Vice Chair.

New Business: The outgoing Chair (Marcel) thanked the former Chairs and the whole PDG:

"I have served this Committee with a lot of pleasure. Organizing symposia, roundtables, webinars, etc. Bringing science, industry and government together for making better food safety decisions. I thank very much the past Chairs Mickey Parish as the first, but also Leon Gorris, Richard Whiting and the last two Chairs, Alejandro Amézquita and Yuhuan Chen. My goal this year was to organize many webinars. Even for that Yuhuan supported me; she organized this year a sequence of three webinars. So, not only as a Chair she put a burden on me to succeed her, but now even as Past Chair! I wish Bala and Panos all the best for the continuation, but the PDG again is in good hands. Thank you also, all members!"

Thank You to past Chair and election of new Vice Chair: Yuhuan thanked Marcel for his leadership and mentioned that during Marcel's term the MMRA PDG had record attendance and participation of members from around the world. Yuhuan also remembered that it was Alejandro who convinced Marcel to accept the nomination 4 years ago. It was not easy since Marcel had a lot of other commitments. Yuhuan thanked Alejandro for the nomination and thanked Marcel for taking on the Vice Chair position. As Chair, Marcel planned PDG meetings, facilitated collaborations with other PDGs, coordinated the development of symposia, webinars, and advocated for our members' proposals. One of the best examples of his accomplishments is the webinar offerings, sponsored and co-sponsored by the MMRA PDG. On Marcel's initiative, and

with the very enthusiastic support of the PDG, the number of webinars has more than doubled in the last two years. In her concluding note, Yuhuan cited a quote from the recent webinar series (03-05-18 Webinar Q&As): Dr. Zwietering says it best: "Many models are correct...but they are not perfect" and described it as thoughtful and insightful statement with regards to modeling. As a PDG, we have more work to do. Yuhuan said that it had been a great pleasure working with Marcel, and thanked Marcel for all that he has done for the PDG and for advancing its mission.

Bala followed Yuhuan and thanked Marcel for his contributions to the PDG. To quote Bala "*It has been an honor/privilege working with Marcel this past couple years. Coming to the MMRA PDG, I had very minimum knowledge about the depth of my role. Marcel has been a great mentor and helped increase my understanding of the role of PDG and the impact it can have on the scientific community. Personally, I have learnt a great deal working with Marcel and I would like to thank him for his commitment, knowledge and assistance where needed. It will be difficult to fill Marcel's shoes but I will try to do my best to advance the PDG with all the members support.*"

Updates from SRA, MRA Specialty Group and ICPMF Committee:
Bala provided the vision statement for SRA since there were no representatives from SRA (Special thanks to Dr. Abani Pradhan for providing the slides). 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). The upcoming 2018 SRA Annual Meeting will be in December 2–6 and held at New Orleans, Louisiana). For more information relating to SRA, please contact the Chairperson Regis Pouillot (rpouillot.work@gmail.com) and Amir Mokthari (Amir.Mokhtari@fda.hhs.gov).

Mariem Ellouze 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 bi-annual ICPMF-conferences. ICPMF organized a symposium and a software fair last year in Tampa with a great success. The Committee has created newly a webinar group that can liaise very well with our PDG. ICPMF also collaborated with SRA Webinar working group on the topic "The use of risk assessment and predictive microbiology in the context of food safety alerts and outbreaks." The next conference ICPMF will be in Braganza, Portugal 17–30 September 2019 (Deadline for abstracts submission is 10th March 2019). For the 2023 conference applications are open. More information about ICPMF can be obtained by contacting contact@icpmf.org.

Guest speaker: Bradley P. Marks, PhD, P.E. (Professor, Biosystems Engineering, Michigan State University), Title: *Modeling pathogen inactivation with multiple dynamic variables and external process factors*.

- Initially well-controlled experiments can be used as *iso-iso-iso*, such as small scale-constant conditions experiments. This will result in primary (e.g., log linear, Weibull) and secondary models (Bigelow-type). But in bench scale thermal inactivation conditions are dynamic in time (T, a_w, etc.). In pilot scale experiments, more spatial effects are encountered.
- In dynamic conditions it is difficult to relate back non-linear behavior to their causes. Scaled-sensitivity coefficients can be helpful to test if parameters can be estimated. Confidence interval of the model is often reasonably small but the prediction interval is often very large and unfortunately underreported.
- Inactivation modeling with multiple dynamic variables is possible. Model development approaches can be inherently limited since coupling product and process variables complicates parameter estimation.
- Take home messages: (1) Inactivation modeling with multiple dynamic variables is possible but there are few important considerations (2) Model development approaches can be inherently limited and (3) Coupled product and process variables complicate parameter estimation.

Some of the questions and answers to Bradley:
- Using iso iso iso and then validating under real world condition: Is that approach correct?
  1. Yes that works fine. If that is possible of course, but sometimes there are inter-correlated effects that need to be incorporated. So it is not always obvious.
- How did you handle process characteristics: with a transport model, or with a dummy variable?
  1. Yes, adding a dummy variable, it did make marginal improvement.
- Confidence and prediction intervals: in challenge tests what should I use?
  1. Exactly, there is no set definition. While the 95% confidence intervals describe the distribution of data around the mean, the prediction intervals tries to capture the variability in the individual observations. But what percentile to use is a difficult choice.
- Mainly the prediction interval seems determined by variability in No: in this case log reduction PI will also be informative (Answer: agreed).
- Are there any learnings from modeling of low moisture foods like nuts and tree nuts that can be applicable to other low moisture foods like granola and breadcrumb products?
  2. In addition to temperature and time, rate of decrease in moisture content is an important variable that needs to be monitored as part of the validation.
- Could you also use parameters like heat transfer and mass transfer, since they are more generic: (Answer: agreed).

IAFP 2018 accepted proposals for roundtables, special event and symposia (Sponsored by MMRA PDG)
- Updates on the Impact of Sampling Plans on Microbiology Results (*Roundtable*, Primary Contact: Preetha Biswas).
- *Salmonella* in Poultry: Where Do We Go from Here? (*Roundtable*, Primary Contact: Juliana Ruzante).
- Biological Variability in Thermal Processing: Impact for Process Control and Validation – What You Need to Know about Microbiological Variability for Food Quality and Safety Control (*Symposium*, Primary Contact: Marcel Zwietering).
- Building a Strategic Alliance for Sustainable Food Safety Risk Analysis Capacity Building in the Americas (*Symposium*, Primary Contact: Marcos X. Sanchez-Plata).
- The Meaning of Clean – Fit for Purpose Water for Field, Factory and Food Preparation (*Symposium*, Primary Contact: Leon Gorris).
- International Experiences with Systems for Hazard Monitoring and Rapid Risk Assessment (*Symposium*, Primary Contact: Leon Gorris).
- Complex Risk Assessment and Classic Hazard Analysis on a Spectrum – Do We Really Need Both/Can We Really Do Both? (*Special Event*, Primary Contact: Yuhuan Chen).
- Risk Assessment of Listeriosis: Latest Developments for Food Safety Risk Management (*Symposium*, primary Contact: Yuhuan Chen).
- Antimicrobial Resistance: Current Knowledge and Steps Toward Understanding the Relative Role of Food and Other Resistance Sources (*Roundtable*, Primary Contact: Solenne Costard).

Roundtables, Symposia, Workshops, Debate and Webinars – Ideas for 2019:
Proposal submission due on October the 2nd, 2018
- Re-cap symposia and workshops in 2017 proposed by members/sponsored by MMRA PDG.
  1. 18 submitted proposals, people do mention our sponsorships without contacting. This should not be done. If you want to get support be timely with your request the latest 48 h before closing.
- Thoughts from 2018 Proposal leaders/Webinar Organizers.
  1. RT on HA and QRA: connect more with small and medium size companies: what needs they have: incorporate more of the practical aspects and SME.
  2. Predictive micro was co-sponsored by meat and poultry PDG, we did bring in practical aspects.

- Discussion on ideas for 2018: considering cutting-edge information not previously presented; international perspectives on various issues (Formats: roundtables, technical symposia, pre-meeting interactive workshops).
  1. Interactive sessions: for example the software fair was very helpful, attendees could bring their problem and get support (really have a case study worked out in a webinar like *Combase*).
  2. Ecology of detection of *Campylobacter*, including modelling, physiology, and validation aspects.
  3. Desiccation effect with improper humidity control when is it a real factor: It is addressed in the low a_w PDG and with a roundtable this year (Could be done in conjunction with low a_w PDG).
  4. Modelling the effect of chronic diseases, a proposal around chronic health effects associated with pathogens and chemical hazards (tox), and how advanced tools such as WGS and organs-on-chips can advance our understanding and assessment of these chronic effects and perhaps dose-response relationship.
  5. Relevance of asymptomatic infections to be included in QMRA, (consider host-immunity).
  6. The need for sampling more and better and along the food chain as a joint effort: we all need it, so a joint effort is needed.
  7. Software fair on real case studies and 2) modelling and regulatory compliance.
  8. Workshop on FDA-iRISK 4.0. Workshops could be organized for example on Friday before the meeting, but also many expressed concerns that for many interested people (both U.S. and international) the meeting would become too long. It could also be done in a technical session type meeting if the Program Committee would allow.

Proposal leads can contact other PDGs, and send in before October 2nd (and to the PDG before end of September if sponsoring is desired).

Webinars and other communications
- Potential webinar topics 2019–2020 / Volunteers.
- Development of booklets, drafting of white papers, other ideas.
- Continue with examples of PM: Vickie Lewandowski and Larry Cohen are willing to give support.
- Proposal for a joint ILSI-Europe / IAFP virus webinar, co-organized with the virus PDG (with Alvin Lee).

IAFP 2018 and other meetings of interest
IAFP 2018 selected symposia and technical sessions of note.

Other upcoming meetings/events of interest
- 26th International ICFMH Conference – FoodMicro 2018: Berlin September 3–6.
- 11th International Conference of Predictive Modelling in Food (ICPMF11) September 17–20, 2019 Bragança (Portugal).
- 14th European IAFP symposium in Nantes, France, 24–26 April 2019.

Encouraging students: we could try to find methods to do so. For example use the PDG to evaluate the abstracts and then let them pitch their paper/poster at the PDG meeting and give certificate. The Chair and Vice Chair of the PDG ask the members to express their interest to serve as judges (or nominate other members) for evaluating student abstracts that will receive certificate of presentation in the PDG committee. We have to find out with IAFP how to coordinate this (see also updates from Executive Board above for further ideas).

Recommendations to the Executive Board:
1. Recommend Panos N. Skandamis as Vice Chair of the Microbial Modelling and Risk Analysis PDG.
2. Recommend the Board to approve the Microbial Modelling and Risk Analysis PDG to provide certificate for those student abstracts (to be presented as posters/technical presentations in the forthcoming IAFP meeting) that will be qualified by the judgment panel of the PDG for being presented at the PDG.

Next Meeting Date: July 21–25, 2019 Louisville, KY.

Meeting Adjourned: 10:49 a.m.

Chairperson: Bala Kottapalli.