

Quantitative microbial risk assessment of pathogens in food systems

ANS 6637

June 5 - 16, 2017

1. Course Description– Modeling principles of microbial risk assessment in food chains. Model implementation in stochastic simulation software (**R**). Focus on the bottom-up food chain approach and basic principles of top-down approach.
2. 3 credits.
3. Pre-requisites and Co-requisites – ALS 5932, STA 6166 or similar statistics course; knowledge of the **R** programming environment.
4. Course location: L.E. 'Red' Larson Dairy Science Building, 2250 Shealy Drive, Gainesville, Florida 32611; room 201
5. Instructor – Arie H. Havelaar
 - Office location: 2055 Mowry Road room 105
 - Telephone: (352) 273- 5921(office)
 - E-mail address: ariehavelaar@ufl.edu
 - Class Web site: login to e-learning at <http://elearning.ufl.edu>
 - Office hours: By appointment

Co-instructor – Min Li

 - Office location: 2250 Shealy Drive Room 104I
 - Telephone: (352) 392-1981 Ext. 230 (office)
 - E-mail address: min.li@ufl.edu
 - Office hours: By appointment

Co-instructor – Nitya Singh

 - Office location: 2055 Mowry Road
 - Telephone: (314) 583-6405 (mobile)
 - E-mail address: nitya11@epi.ufl.edu
 - Office hours: By appointment
6. General scope - Foods can be contaminated by infectious disease agents (e.g. micro-organisms, viruses, antimicrobial resistance genes). These may be introduced in food chains at different locations and the population sizes and properties of these agents may change throughout transmission chains. These agents can infect humans when contaminated foods are consumed. A bottom-up approach, in which knowledge about the prevalence and numbers of an infectious agent in a food source is combined with knowledge about the transmission routes from that source to humans and dose-response relations, can be used to calculate the risk for humans to become infected. Alternatively, observational epidemiological information may be used to assess risk factors in a top-down approach, typically making use of statistical regression models. Also, models exist using elements from both approaches, e.g. for source attribution. These approaches have different starting points, use different types of data and serve different purposes. In this course, we

focus on the bottom-up approach yet highlight the differences between both. The fundamentals of risk assessment will be taught through a combination of lectures, case studies and computer practicals.

7. Course Objectives

At the end of this course, students will be acquainted with the principles of microbial risk assessment modeling, observational epidemiology, and source attribution, related to infectious foodborne diseases. In addition, after completing this course students will be able to:

- explain the different elements of the risk analysis paradigm
- recognize the four steps of microbial risk assessment: hazard identification, hazard characterization, exposure assessment and risk characterization.
- define and obtain the data necessary for constructing risk assessment models;
- discriminate the concepts of variability and uncertainty;
- represent data by appropriate probability distributions
- construct microbial risk assessment models in the statistical software **R**
- use the models for determining the efficiency of intervention strategies;
- explain the results of a risk assessment study to a risk manager
- contrast the bottom-up and top-down approaches used in risk assessment of infectious agents
- explain the principles of burden of disease assessment and attribution

8. Meeting Times – June 5 - 16, 2017 (9 AM – 1 PM)

Students are expected to attend all classes, any absence should be discussed with and pre-approved by the teachers.

Assignments and quizzes will be provided every day to apply the theory explained in the morning sessions.

9. Material and Supply Fees – No fee.

10. Textbooks and Software Required

Students are expected to bring their own laptop computer with a recent version of the R software (<http://www.r-project.org>) and RStudio (<http://www.rstudio.com/products/RStudio/>) installed.

Recommended Reading

For statistics and R primer:

- Knell RJ. Introductory R.

<http://www.introductoryr.co.uk/Introductory%20R%20example%20chapters.pdf>

- Maindonald J. Using R for Data Analysis and Graphics - Introduction, Examples and Commentary.

<http://cran.r-project.org/doc/contrib/usingR.pdf>

For main course:

- Nauta MJ. 2008. The Modular Process Risk Model (MPRM): A Structured Approach to Food Chain Exposure Assessment, p 99-136. In Schaffner D, Doyle M (ed), Microbial Risk Analysis of Foods. ASM Press, Washington, DC.

- Teunis PFM, Havelaar AH. The Beta-Poisson dose-response model is not a single-hit model. Risk Anal. 2000;20:513-520.

- Mughini Gras L, Smid JH, Wagenaar JA, de Boer AG, Havelaar AH, Friesema IH, et al. Risk factors for campylobacteriosis of chicken, ruminant, and environmental origin: a combined case-control and source attribution analysis. PloS One. 2012;7:e42599 -

- Bouwknegt M, Verhaelen K, Rzezutka A, Kozyra I, Maunula L, von Bonsdorff CH, et al. Quantitative farm-to-fork risk assessment model for norovirus and hepatitis A virus in European leafy green vegetable and berry fruit supply chains. *Int J Food Microbiol.* 2015;198:50-58.

Further materials will be provided during the course.

11. Attendance and Expectations - Requirements for class attendance, assignments, and other work in this course are consistent with university policies that can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>. All students are expected to attend class. Cell phones should be silenced in class. Reading of newspapers, working on assignments for other classes, or other activities that are not part of the class are not allowed during class time.
12. Grading – Grades will be based on assignments (40 points), quiz questions (40 points), attendance (10 points), and peer evaluation (10 points – based on participation and contribution to group work). See course schedule for details. Grading Scale - The grading scale is shown below and it is in agreement with UF grading policies. 1 point corresponds to 1%.

A	93.0-100%
A-	90.0 – 92.9%
B+	87.0 – 89.9%
B	83.0 – 86.9%
B-	80.0 – 82.9%
C+	77.0 – 79.9%
C	73.0 – 76.9%
C-	70.0 – 72.9%
D+	67.0 – 69.9%
D	63.0 – 66.9%
D-	60.0 – 62.9%
E	< 60.0%

For more information on UF grades and grading policies, please visit:

<http://gradcatalog.ufl.edu/content.php?catoid=2&navoid=762#grades>

13. Class policies – Students will be expected to work in groups of two during the practicals and answer quizzes and assignments individually.
14. Online course evaluation process – Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.
15. Honesty Policy – As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: “*We, the*

members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.” You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

16. Accommodation for Students with Disabilities – The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/ .
17. Software use - All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.
18. Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Course outline

Date	Topic	Assignments and due dates
June 5 and 6	Primer in statistics and R	#1. Statistical distributions; June 20
June 7	General concepts of risk analysis	
	Hazard identification	
	Food consumption data	
June 8 and 9	Exposure assessment	#2. Exposure modeling; June 23
June 12	Dose-response modeling	#3. Dose response modeling; June 26
June 13	Risk characterization	
June 14	Tools for QMRA	
June 15	Attribution	
June 16	Burden of disease	# 4. Burden of disease, June 29