

The Research Triangle Chapter of the Society of Risk Analysis (RTC-SRA)

will hold its monthly seminar on Wednesday, May 9, 2001
at 12 noon
at the USEPA Environmental Resource Center, Classroom 2

Quantitative microbial risk assessment for human salmonellosis associated with the consumption of raw, shell eggs

Dr. Heejeong Latimer
North Carolina State University

Salmonella enterica serovar. Enteritidis (SE) is a frequent cause of foodborne disease and has been identified as an emerging foodborne pathogen. Most foodborne SE infections are associated with the consumption of raw eggs and foods containing raw or undercooked eggs. In an effort to estimate the risk of human salmonellosis associated with the consumption of raw, shell eggs, a quantitative risk assessment model was produced. For exposure assessment, an integrated mathematical model was developed to account for two different factors influencing the rate of SE growth in shell eggs, i.e., (i) the time to complete loss of yolk membrane integrity; and (ii) an SE growth model. *Monte Carlo* simulation was used to account for variability in temperature and time parameter values and for uncertainty in the estimated SE exposure levels. The dose-response assessment was based on human feeding study data using a disease endpoint. Three dose-response models were applied to the raw data stratified into three virulence categories. The degree of confidence for each component model and variations in the proportion of strains within each virulence/pathogenicity category were incorporated into a composite dose-response model. Taken together, this work describes the influence of variation in strain virulence and host susceptibility on the shape of the population dose-response relationship. Finally, a risk simulation model that combined the probability of SE contamination with the exposure and dose-response models was produced. Under non-abusive egg handling conditions and a low level of SE contamination, the mean individual risk was estimated to be 5.7×10^{-2} per consumption of a single, raw egg and the mean annual individual risk was estimated at approximately 5.0×10^{-5} , assuming consumption of 0.43 raw eggs per person per year. Under abusive storage conditions, the estimated mean annual individual risk ranged from 8.2×10^{-5} to 8.8×10^{-4} at SE exposure levels of 3 to 9 \log_{10} CFU/egg. Sensitivity analysis revealed that the prevalence of SE contamination and the level of SE to which the consumer is exposed play particularly important roles in overall disease risk. This analysis suggests that control of on-farm SE contamination and SE growth in shell eggs during processing, distribution and storage would be appropriate risk reduction strategies for future consideration.

Directions to USEPA's Environmental Resource Center:

The ERC is at 86 Alexander Drive, just at the corner of Alexander and NC 54, in Research Triangle Park. If coming from the West, take the NC 55 exit and proceed on NC 55 southbound about one block, until the intersection with NC 54. Turn left on route 54, proceed to Alexander Dr., where you should turn left at the light, and make the first left turn into the ERC driveway. Park in the visitors' parking lot, and sign in at the receptionist desk. Classroom 2 is not far from the entrance.

If coming from the East on I-40, take the Alexander Dr. exit (stay in the left lane as you approach the Durham Freeway exit, then quickly move to the right lane for the Alexander Dr. exit). You will then be on the southernmost quarter mile of the Durham freeway. At the stop light, turn right. You will be heading south on Alexander Dr. Cross NC 54 at the stop light, and take the first left into the ERC parking lot.