SPREAD OF E. COLI CONTAMINATION IN GROUND BEEF PRODUCTION

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ABSTRACT. Human illness due to contamination of food by pathogenic strains of *Escherichia coli* is a serious public health concern and can cause significant economic losses in the food industry. Recent outbreaks of such illness sourced from ground beef production motivates this work. Most ground beef consumed in North America is produced in large facilities where many carcasses are butchered and various pieces of them are ground together in sequential batches. Assuming that the source of contamination is a single carcass and that downstream from the production facility ground beef from a particular batch has been identified as contaminated by *E. coli*, the probability that previous and subsequent batches are also contaminated is modelled. The model takes into account the fact that each batch of ground beef is generated from several different raw sources, both trimming bins from within the facility and often frozen material from other facilities, each with various fat content and differing likelihoods of being contaminated themselves. The primary determinant is the spread of each carcass across the trimming bins, and this is highly dependent on the operational procedures of the meat production facility. Given an estimate of this spread as well as information on the identity and mass of all input to the ground beef batches, we compute the probability that batches produced before and after the hot batch are also contaminated. Very little data are available for testing the model, however, we do compare our results with data from a genetic study of ground beef production, which provides some verification. This model may help the beef industry to identify the likelihood of contamination in other batches and potentially save money by not needing to cook or recall unaffected batches of ground beef.

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