The use of probabilistic graphical models (PGMs) to develop a cost-effective vaccination strategy against Campylobacter in poultry

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Human campylobacteriosis represents an important economic and public health problem. Campylobacter originating from feces of infected chickens will contaminate chicken meat posing a risk to the consumer. Vaccination against Campylobacter in broilers is one probable measure to reduce consumers’ exposure to Campylobacter. In this presentation we focus on the development of a computerized decision support system to aid management decisions on Campylobacter vaccination of commercial broilers. Broilers should be vaccinated against Campylobacter in the first 2 weeks of age. Therefore, the decision about vaccination needs to be made usually before Campylobacter is introduced in the flock. In fact, there is uncertainty regarding the introduction of Campylobacter into the flock that needs to be taken into account in the decision making process. Probabilistic Graphical Models (PGMs) integrate knowledge from diverse sources and can be used as decision support systems under conditions of uncertainty. The relationships between different entities in the model can be designed and conditional probability distributions are used to define the strength of these relationships. Important microbiological, epidemiological and economic factors (cost-reward functions) have been included in the models. The final outcome of the models is presented in probabilities of expected level of Campylobacter and financial terms influenced by the decision on vaccination. For example, if the best decision seems to be to vaccinate, the outcome will be expressed as the most probable number of Campylobacter in broilers and a cost-profit balance. There are other factors that could be considered increasing the complexity of the models, but we need to balance model efficiency with simplicity and usefulness for poultry managers to run the model as a tool for decision making on vaccination.