E.coli Vaccination in U.S. Feedlot Cattle: Market Impacts

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Shiga toxin producing E. coli (STEC O157) is a serious human health hazard in the United States. STEC O157 is naturally occurring in cattle and, through presence in fecal material, threatens food safety if meat contamination occurs during processing. Because of the human health threat of E. coli, considerable beef industry and public health official efforts have targeted pathogen reduction in beef processing plants including development of extensive hazard analysis critical control points (HACCP) and intensive testing of beef for E. coli presence. Pre-harvest interventions to reduce pathogens in live cattle have arisen as one strategy to lessen chances of post-harvest bacterial contamination of beef.

Since 2009, the set of commercially available pre-harvest interventions to reduce E. coli shedding in cattle has included immunization through vaccination. Despite recognition of the potential reduction in foodborne illness that could result from use of cattle E. coli vaccination, adoption is limited. This has occurred for two main reasons. First, in the presence of E. coli cattle feeding efficiency is not hindered so production costs for feedlots are not directly associated with E. coli O157:H7 prevalence. Furthermore, a well-established market that compensates producers for vaccinating for STEC 0157 has not developed. As such, fed cattle largely receive the same price whether or not the vaccine was used by a given feedlot. Combined, this situation depicts an externality existing because feedlots will not implement the socially optimal level of intervention without directly visible economic incentives. Doing so adds costs without directly visible offsetting increases in revenue.

A recent study was conducted to evaluate the economic impacts of incorporating animal vaccination into E. coli pre-harvest control practices.[1] This study estimates direct producer costs associated with use of a vaccine in cattle feeding. Potential benefits include reduced packer or retailer costs associated with lower risk of pathogens, reduced food safety concerns, and potentially increased domestic consumer or export demand associated with safer beef. To estimate market level impacts of the vaccination an equilibrium displacement model (EDM) that incorporates supply and demand shifts associated with the cattle immunization is used to determine economic impacts of the food safety technology across a series of alternative scenarios. This fact sheet highlights key findings and implications of this project.

Key Findings

This project generated several important results pertaining to the economic impacts of U.S. feedlot use of *E.coli* vaccinations. Notable findings include:

1. *Given the current market setting, producer adoption of E. coli vaccination protocols is likely to remain limited.*

- If *E.coli* vaccinations were implemented in U.S. feedlots, producers would face $1 billion to $1.8 billion in economic welfare loss over ten years if as a result demand for fed cattle did not increase with premiums for vaccinated cattle not materializing. This adverse economic impact corresponds with limited adoption observed to-date in the industry.

2. *Retail or export beef demand increases could incentivize adoption by feedlot producers.*

- Across alternative scenarios evaluated, retail beef demand increases of 1.7% to 3.0% or export beef demand increases of 18.1% to 32.6% would be necessary to generate

[1] The full journal article from this study is available online at: http://link.springer.com/article/10.1186%2Fs40100-014-0021-2.

sufficiently higher fed cattle prices to offset feedlot adoption costs making producers economically neutral to adoption.

3. *Production cost decreases for either beef retailers or wholesalers (packers) could incentivize additional adoption by feedlot producers.*
    - Cost declines of 2.2% to 3.9% for retailers or alternatively production cost declines of 1.2% to 2.2% for packers would be necessary to generate sufficiently higher fed cattle prices to cover feedlot adoption costs making producers economically neutral to adoption.

Conclusions and Implications

A key point of this research is limited use of *E.coli* vaccinations in U.S. feedlots is consistent with the lack of current economic signals for producers to expand adoption. Unless there is a substantial change in market signals presented to feedlot operators, limited use of *E.coli* vaccinations can be expected in the future. Adoption will likely require packers or retailers to recognize reduced food safety costs or increased revenue from supplying beef products having reduced food safety risks derived from vaccinated cattle and pass some of that cost savings or revenue increase on to producers in the form of price premiums for vaccinated cattle.

Given the notable social interest and investment in food safety broadly and *E.coli* specifically, additional research is needed to compare private economic thresholds for adoption estimated in this study to potential cost savings to downstream firms if feedlots increased use of *E.coli* vaccinations on their cattle. Similarly, the identified demand increase thresholds can be assessed in future demand work. Combined, addressing these unknowns would help us to better understand what market environment may develop over time. Identifying the prospects for this alternative market environment and associated economic signaling to feedlots is essential before *E.coli* vaccinations will be broadly adopted by the U.S. feedlot industry.