The Economics of Antibiotic Use in U.S. Livestock Agriculture

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Introduction

• All material in presentation from a USDA Economic Research Service report in progress
  • *Economics of Antibiotic Use in U.S. Livestock Production*

• Farmers use antibiotics to...
  – Treat disease
  – Control disease
  – Prevent disease
  – Increase productivity (*production purposes*)

• Two current U.S. FDA policy efforts
  1. Pharmaceutical manufacturers of medically important antimicrobials for use in feed and water voluntarily remove production purposes as possible label indication
  2. Use of all medically important antimicrobials in feed and water for other indications will require veterinary oversight
Questions addressed today

1. What are the anticipated economic effects of restricting use of antibiotics for production purposes at the animal, farm and market levels?
2. What is the extent of use of antibiotics for production purposes and disease prevention in the U.S. hog and broiler industries?
3. What does prior research say about the effects of production purpose antibiotic use or discontinuation?
4. How big would the market-level effects of production purpose antibiotic restrictions be?
Economic effects of antibiotic restrictions at three levels of aggregation

- Animal productivity effects
- Farm productivity effects
- Market-level effects
Potential Animal-Level Economic Effects of Antibiotic Restrictions in U.S. Livestock Production

- Slower growth to market weight
- Decreased feed efficiency
- Higher mortality rate of young animals
- More morbidity
- Lower reproduction
- More variability in product
Potential **Farm-Level** Economic Effects of Antibiotic Restrictions in U.S. Livestock Production

• **Direct:**
  – Animal-level productivity decreases may lead to increased input costs (e.g. feed, young animals purchased)
  – Lowered cost of antibiotic use
  – Increase veterinary costs (more treatment of disease)
  – More biosecurity measures (as replacement for production purpose antibiotics)
  – Higher labor costs if alternative practices require more management

• **Indirect:**
  – More variability of product may mean more penalties at market for animals outside of range used in mechanized processing
  – Potential reductions in economies of scale
  – Adjustments in housing to create more space per animal
Potential Market-Level Economic Effects of Production Purpose Antibiotic Restrictions

• Supply side:
  – Less output for each level of input
  – Increases price of animals at market
  – Revenues (price x quantity) may increase or decrease
  – May make U.S. less competitive in global markets

• Demand side:
  – Consumers may demand more meat (dependent on knowledge and perception)
  – Foreign buyers that may have previously rejected U.S. products on this basis may permit them
Data: Agricultural Resource Management Survey (ARMS)

- Only nationally-representative data that collects information on both antibiotic use and financial features of farms

- 2009 Hog Survey
  - Questioned operators on whether antibiotics were provided via feed or water for growth promotion, disease prevention, and/or disease treatment
  - Asked regarding nursery and finishing hogs
  - Due in part to contracting, producers may not know what is in feed, and so many answer “do not know”

- 2011 Broiler Survey
  - Single question on whether broilers raised without antibiotics in feed or water, unless the birds are sick
  - Not possible to distinguish use for growth promotion/prevention v. disease control/treatment
  - Again, producers under contract (most) may not know what is in feed, so “don’t know” response is common
  - Producers may or may not characterize ionophores as antibiotics
Figure 1: In 2009, between 40 and 62 percent of finishing hogs were administered antibiotics for growth promotion; between 51 and 71 percent were administered antibiotics for disease prevention.
Figure 2. In 2011, the percentage of contract broiler producers who raised birds without antibiotics in feed or water except in circumstances of illness was estimated to be between 48 and 80 percent.
Prior research suggests that the effects of production purpose antibiotics are declining

• Animal-level experimental research before 1980s:
  – High single-digit or double-digit percent changes due to production purpose antibiotic use

• Animal-level experimental research in the 2000s:
  – Low single-digit or less than 1% changes

• Animal-level observational research
  – Low single-digit or not statistically significant

• Farm-level observational research
  – Low single-digit or not statistically significant effect changes on productivity of farms, when adjustments on multiple inputs are considered
Fig. 3. Economic theory predicts that restriction on production purpose antibiotic use will decrease supply and increase price

- Restrictions on antibiotic use
- Supply → Supply’
- $Q_0 \rightarrow Q_2$
- $P_0 \rightarrow P_2$
- Quantity declines
- Price increases
Estimated market-level effects of restrictions on production purpose antibiotic use are limited

- <1% decrease in quantity produced
- <1% increase in wholesale price
- Overall, producers gain (<1%) gross revenue (price x quantity)
- Producers not using production purpose antibiotics before restrictions gain gross revenue
- Producers using production purpose antibiotics before restriction lose gross revenue
Questions?

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