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

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(A Summary of an ERS report by Stacy Sneeringer, James MacDonald, Nigel Key, William McBride, and Ken Mathews)
A Forthcoming ERS Report

Economics of Antibiotic Use in U.S. Livestock Production

Stacy Sneeringer, James MacDonald, Nigel Key, William McBride, and Ken Mathews
Introduction

• Farmers use antibiotics (AB) to...
  – Treat and control animal diseases
  – Prevent the spread of diseases
  – Increase productivity (production purposes)
    • Increases feed efficiency
    • Increases daily weight gain
    • Implies less feed, housing, labor required per unit of production
Widespread Concerns with Bacterial Resistance to Antibiotic Drugs

• AB use creates selective evolutionary pressures enabling populations of resistant bacteria to grow
• Resistance to specific drugs can spread among bacteria, jump from one type of bacteria to another, and move across regions.
• Growing resistance follows in part from widespread use of antibiotics in humans and animals
U.S. Policy Initiatives

• Food and Drug Administration (FDA), which regulates human and animal drugs, has two initiatives to take full effect in 2017:
  – Pharmaceutical manufacturers of medically important antimicrobials voluntarily remove production purposes as possible label uses
  – Remaining medically important antimicrobials will require a veterinarian prescription
• Goal is to end production uses
But Policy is Not the Only Driving Force in the U.S.

• Lots of retailer and consumer interest in meat products “raised without antibiotics”
  – Most major retail chains now offer such brands
• Policy re-enters: USDA approves labels and verifies production process claims
  – Challenges—what’s an antibiotic? What does “raised without” mean?
• Strategic behavior is important here
Where Does ERS Fit In? Farm-Level Surveys of AB Use.

• Using Agricultural Resource Management Survey (ARMS):
  – nationally-representative source collects data on AB use, other resources, production practices, and financial outcomes on farms.

• Other USDA surveys collect more detailed data on drug use and practices, but ARMS ties to other farm attributes.
ERS ARMS-based Research Focuses on Hogs and Broilers.

• **2004 and 2009 Hog Versions**
  – Whether AB drugs were provided via feed or water for growth promotion, disease prevention, and/or disease treatment
  – Asked regarding nursery and finishing hogs
  – Due to contracting, producers may not know what is in feed, and so many answer “do not know”

• **2006 and 2011 Broiler Versions**
  – Single question: were broilers raised without AB in feed or water (unless the birds are sick), meaning prevention + production
  – 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
Findings: Antibiotics Use in Hogs

Table 6: Proportion of Hog Producers and Hogs Using Antibiotics, by Type of Hog, and Purpose of Use, 2009

<table>
<thead>
<tr>
<th>Type of hog</th>
<th>Growth promotion</th>
<th>Disease prevention</th>
<th>Either growth promotion or disease prevention</th>
<th>Disease treatment</th>
<th>Any use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head sold or removed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>40%</td>
<td>51%</td>
<td>59%</td>
<td>61%</td>
<td>74%</td>
</tr>
<tr>
<td>Don't know</td>
<td>22%</td>
<td>20%</td>
<td>20%</td>
<td>18%</td>
<td>17%</td>
</tr>
<tr>
<td>Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>30%</td>
<td>44%</td>
<td>50%</td>
<td>44%</td>
<td>61%</td>
</tr>
<tr>
<td>Don't know</td>
<td>16%</td>
<td>14%</td>
<td>14%</td>
<td>13%</td>
<td>12%</td>
</tr>
</tbody>
</table>

Source: Authors' calculations from ARMS Hogs 2009 data.
Findings: Antibiotic Use in Broiler Production

- Use antibiotics only for disease treatment
- Don't know
- Use antibiotics for purposes other than disease treatment

- Farms
- Birds
- Production (by live weight)
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’
- Q₀ → Q₂
- P₀ → P₂
- 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 value of production (<1%)
- Producers not using production purpose antibiotics before restrictions gain value of production
- Producers using production purpose antibiotics before restriction lose value of production
Summary: Main Report Findings

• AB use for prevention and production purposes is widespread, but not universal
  – Clearly declining in broilers

• In production function framework, provision of AB for production purposes raises output by 1-3% (with large standard error)
  – Impact of AB provision on production outcomes is declining over time

• Impact of restriction on market outcomes: <1% change in prices & production.
Questions?

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