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Economics of Antibiotic Use in U.S. Livestock Production

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What Is the Issue?

The animal agriculture sector is a major user of antibiotic drugs for disease treatment, disease control, disease prevention, and “production purposes” (such as growth promotion). Routine use of antibiotics—in humans or animals—can encourage antimicrobial resistance, which can lead to significant human and animal health risks. In 2013, the U.S. Food and Drug Administration (FDA) issued final guidance on voluntarily phasing out the use of medically important antibiotics (those important for therapeutic use in humans) for livestock production purposes.

This report addresses the following economic issues associated with the use of antibiotics in U.S. livestock agriculture:

1. How widely are antibiotics used in livestock production? What is the extent and purpose of use among different species and at different stages of production?
2. Are there discernible trends in the use of antibiotics for production and disease prevention by livestock producers?
3. How could the current structure of the livestock industry influence the effects of restrictions on antibiotics for production purposes?
4. How does the use of antibiotics for production purposes affect production and costs at the animal and farm levels?
5. How do the farm-level impacts of limiting production uses of antibiotics affect production and prices in markets?

What Did the Study Find?

Extent of antibiotics for production-purpose and disease prevention use in livestock production - Administration of antibiotics for production or disease prevention uses in the livestock sector is not universal and varies by species:

- **Hogs.** Between 2004 and 2009, the share of *finishing* hogs sold or removed from operations administering antibiotics to promote growth fell from 52 to 40 percent. The share from operations stating they did not know—or did not report—whether antibiotics were administered for growth promotion rose from 7 to 22 percent. The share of *nursery* hogs

sold or removed from operations administering antibiotics for growth fell from 29 to 23 percent over 2004-2009. The share from operations stating that they did not know or report whether antibiotics were administered rose from 5 to 20 percent.

- **Broilers.** Between 2006 and 2011, the share of broilers raised *without* antibiotics except for disease treatment rose from 44 to 48 percent. The percentage of birds removed from operations reporting they did not know whether their birds were raised without antibiotics except for disease treatment rose from 29 to 32 percent.
- **Beef cattle.** While few beef/cow-calf operations use antibiotics for production purposes, they were fed to an estimated 49 percent of cattle at large-scale feedlots in 2011. In both 1994 and 2011, more than three-quarters of feedlots with at least 1,000 head provided antibiotics in feed or water, where the purpose is often growth promotion.
- **Dairy.** In 2006, an estimated one-fifth of dairy operations fed antibiotics to replacement heifers (milk cows that have not yet calved) for disease prevention. In 2007, 90.1 percent of dairy operations provided antibiotics for disease prevention.

Industry structure - Analysis of the structure of the pork, broiler, beef, and dairy subsectors suggests how limits on antibiotic use would affect the industries.

- Vertical integration—in which large firms control all or several parts of meat production, from feed mills to the retail level— influences which operations bear the costs of adjusting to restrictions on the use of antibiotics for production purposes. In many livestock industries, a majority of production is controlled by a few integrators who mostly determine feed formulations and use of antibiotics for production purposes; farmers may have little discretion in such uses of antibiotics.
- Livestock operations often specialize in specific phases of an animal's lifecycle. In certain stages, use of antibiotics for production purposes is more common and impactful. Hence, restrictions on the use of antibiotics would have varying impacts on different types of farms and may have short-term effects on supply chains.

Effects of changes in use of antibiotics for production purposes on livestock producers and markets - Use of antibiotics for purposes other than disease treatment is associated with a 1- to 3-percent increase in productivity of a farm (not statistically distinguishable from no effect). Given this, we develop an estimate of the effects of restrictions on production uses of antibiotics on production, prices, and total revenue.

- For a given level of output, a 1- to 3- percent increase in the cost of production would lead to an increase of approximately 1 percent in wholesale prices and a drop in output of less than 1 percent.
- Producers using antibiotics for production purposes before restrictions are predicted to reduce production by 1 to 2 percent due to higher costs. They are predicted to see a decline of less than 1 percent in their value of production.
- Producers not using antibiotics for production purposes before restrictions are predicted to respond to higher prices by increasing production. Since their production costs for a given level of output do not increase due to restrictions, their total revenues increase.

How Was the Study Conducted?

This report draws on data from the Agricultural Resource Management Survey (ARMS), jointly administered by the U.S. Department of Agriculture's National Agricultural Statistics Service (NASS) and Economic Research Service. The ARMS provides a representative sample of U.S. farming operations. The analysis also uses statistics from the National Animal Health Monitoring System conducted by the USDA's Animal and Plant Health Inspection Service and NASS.

The study modeled how restrictions in use of antibiotics for purposes other than disease treatment may affect market-level outcomes, including output and price.