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Antibiotics Restrictions: Taking Stock of Denmark’s Experience

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In June of 2003, McDonald’s Corporation announced that it would prohibit its direct suppliers from using antibiotics that are important in human medicine as growth promotants in food animals after 2004. The company also created a purchasing preference for companies that work to minimize antibiotic use. This announcement, coupled with recent Food and Drug Administration guidance on the same issue, will put pressure on the U.S. livestock industry to consider alternatives to feed-grade antibiotics. Denmark recently banned the use of feed-grade antibiotics in pork production and has been joined in this action by countries in the European Union. We traveled to Denmark last summer to talk to Danish veterinarians, farmers, economists, and industry analysts about how the ban was implemented and how the Danish pork industry responded to the changes. What we learned about the economic impact of the ban, as well as the effects on total antibiotic consumption, provides evidence of the likely economic impacts of a similar ban for the U.S. pork industry.

**DENMARK’S VOLUNTARY BAN**

Denmark’s pork industry is at least as sophisticated as that of the United States, with an export-oriented and market-driven production system. It is therefore a suitable market for evaluating a ban on antibiotic growth promotants (AGPs).

The Danish government instituted a voluntary ban on the use of AGPs in pork production at the finishing stage in 1998 (accompanied by a penalty tax for use). On January 1, 2000, it banned AGPs at both the weaning and finishing stages.

As shown in Figure 1 (based on data from DANMAP 2001, published by the Danish Veterinary Institute in July 2002), Denmark’s total consumption of antibiotics in pork production was 152 metric tons (mt) of active ingredient in 1996, 106 mt of AGPs, and 48 mt of therapeutic use as medication. By 1998 when antibiotics were banned from use at the finishing stage, the total use was 106 mt. The use of growth promotants fell by about 50 percent (from 107 mt to 49 mt) and therapeutic use remained about constant. By 1999, overall antibiotic use fell to a low of 74 mt.

The effective ban of AGPs at the finishing stage in 1998 was accomplished through a tax and some pressure to discontinue the use of subtherapeutic antibiotics. Faced with a tax of $2.00 per pig, most producers stopped using the products at the finishing stage.

Farmers reported very few health problems in their herds, a result that indicates that most of the benefits of AGP use at the finishing stage were driven by a growth-promoting effect plus a small reduction in mortality. The Danes viewed the ban at the finishing stage as a resounding success. Total antibiotic use was cut by more than 50 percent, and very few health problems were encountered.

The ban at the weaning stage in 2000 was much more difficult for farmers; they reported some significant health problems, especially in the early stages of pig production. Producers responded by restricting feed for the first two weeks. As problems of piglet mortality and disease mounted, veterinarians became more dependent on the use of therapeutic antibiotics. As a result, although the use of AGPs fell to nearly zero in 2000, the use of antibiotics as therapeutic medications increased. Therapeutic medications were increasingly substituted for the now-banned AGPs. Thus, the consumption of total antibiotics increased from 74 mt in 1999 to 81 mt in 2000 and to 94 mt in 2001. Despite this increase, the overall level of antibiotic use in 2001 was still limited to about 60 percent of the level used in 1996 before the ban at the finishing stage. On a per pig basis, the level in 2001 was estimated...
to be 3.0 grams per pig, down from earlier levels (DANMAP 2001, Danish Veterinary Institute, July 2002).

Most of the pig health problems experienced after the ban were described as problems with post-weaning diarrhea and also some diarrhea at the finishing stage. The Danish producers and veterinarians we spoke with reported that the pigs were weaker and more vulnerable to disease when they were moved to the finishing barns. The Danish experience suggests that reduced use of antibiotics at the weaning stage has had significant animal health effects throughout the production system.

**Cost Impacts and U.S. Estimates**

Based on what we learned in Denmark and on an earlier publication that measured the costs associated with a previous Swedish ban, we calculated the components of the cost of the ban. These costs include pre-weaning costs of $1.25 per animal, a 1.5 percent decrease in post-weaning feed efficiency, an increase of fattening-finish mortality of 0.04 percentage points, a decrease in sow productivity by 4.82 percent, an increase in veterinary and therapeutic costs (net of the AGP cost) of $0.25 per pig, and a $0.75 cost per pig for new vaccines.

In addition, we included sort-loss costs of $0.64 per animal because of increased variability of weights expected with the move away from AGPs and the penalty packers place on the lighter-weight pigs. We also incorporated capital costs of $63 million for the additional space needed for the extra five days post-weaning, and we included $166 million for the additional sow space.

Our best estimate is that costs would increase by approximately $4.50 per animal in the first year. We estimate the total cost of a ban to the U.S. pork industry spread across a ten-year period to be in excess of $700 million. The expected cost to consumers is an approximate 2 percent increase in retail prices.

The estimated first-year impact of $4.50 per head due to the effects of a ban on AGPs represents a production cost increase of approximately 4.5 percent. This cost increases slightly as more buildings are required in subsequent years and there are fewer animals but the same fixed costs. Comparable estimates of other studies suggest that the costs are likely to range from $3.00 to $4.50 per pig.

**Likely Effects for the U.S. Pork Industry**

With increased costs and declines in production, it is likely that some producers would be forced out of business. However, a lower level of production increases wholesale and retail prices, and higher prices help offset some of the cost increases. The profit impact is greatest in year one. By year two, the consumer is paying for most of the cost increase, and producer profits would fall. The end result is a slightly smaller U.S. pork industry, as slightly higher retail prices would lead to lower consumption. The productivity decline associated with the ban would be recovered by normal technological advances, but the dollars lost to individual producers during the adjustment phase would not be recovered.

One important lesson from the Danish experience is that there is wide variation in the effects incurred among producers. Our results show the economic impacts of a ban on an “average” or “representative” farm. These results mask wide differences across farms, and we did not include these distributional effects in the model.

The Danish experience clearly illustrates the differences between the effects of a ban at the weaning stage and one implemented at the finishing stage. The Danes achieved a large reduction in antibiotic use, and producers encountered few costs when they banned at the finishing stage. However, when they imposed a ban at the weaning stage, they encountered increased post-weaning health problems leading to increased medication and other costs. In general, the Danes achieved 80 percent of the benefits for 20 percent of the costs when they imposed a partial ban, and they encountered 20 percent of the benefits and 80 percent of the costs when they extended the ban.

Faced with similar problems, U.S. veterinarians would likely resort to greater use of therapeutic antibiotics, and the total use of antibiotics could rise, much as has happened in Denmark in the period immediately after the ban at the weaning stage.

The economic impact of a U.S. ban largely would depend on the willingness of U.S. veterinarians to increase therapeutic use, and the analysis assumes some increase in veterinary costs and vaccines. Recent experience in the United Kingdom indicates that the costs and management of eliminating use of subtherapeutic antibiotics are significant. Under agreements with retailers, U.K. producers eliminated AGPs in poultry production in 2000. Now, faced with significant problems of disease and diarrhea in their flocks, they are reintroducing antibiotics to prevent disease. Currently, total antibiotic use has dropped, but AGP use may increase as producers try to manage animal health concerns.

**For more information**