

DEADLY GERMS, LOST CURES

Denmark Raises Antibiotic-Free Pigs. Why Can't the U.S.?

American pigs are raised on a liberal diet of antibiotics, fueling the rise of resistant germs. Danish pork producers are proving there's a better way.

By Andrew Jacobs

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BILLUND, Denmark — How many rounds of antibiotics does it take to raise a Danish pig?

If it is one of the 35,000 piglets raised each year on Soren Sondergaard's sprawling farm, odds are the animal will get just a single course before it goes to slaughter.

At times, a quarter or more of his swine arrive at the abattoir without ever having received any antimicrobial drugs at all.

"When I was a boy, we used to pour kilos of antibiotics into their feeding troughs," said Mr. Sondergaard, 40, whose family has been farming the gently rolling terrain of the Jutland peninsula for generations. "That's a thing of the past."

As use of antibiotics in livestock has soared globally, contributing to the rise of drug-resistant germs, Denmark, which ranks among the world's top pork exporters, has proved that a country can build a thriving industry while sharply cutting back on antibiotic use in pigs.

American pork farmers, too, have been curtailing their use of these medicines, albeit more slowly. Although F.D.A rules bar the use of medically important antibiotics for growth promotion, some farmers still use them to help fatten pigs and increase profits.

American pork producers use antibiotics at a rate seven times higher than that of Danish farmers, according to a 2018 report by the Natural Resources Defense Council. The overuse in both humans and livestock is giving dangerous germs more opportunities to evolve and outsmart drugs designed to kill them.

Drug-resistant infections now claim 700,000 lives a year around the world, including 35,000 in the United States. Without bold action, the United Nations has estimated drug-resistant pathogens could claim 10 million lives globally by 2050.

Pork industry officials in the United States argue that antibiotics are essential for keeping animals healthy and food costs low. But Denmark has demonstrated it is possible to create a massive meat-based food supply while preserving the most precious antibiotics for people.

"By changing the way farmers raise their animals, Denmark has shown that you can substantially reduce antimicrobial use in pig production and that it can be done without any long-term impact on productivity," said Lucie Collineau, a French veterinarian who has studied antimicrobial use in European swine.

The changes in Denmark were achieved through tougher regulations and by removing a financial incentive that had encouraged veterinarians to liberally prescribe antibiotics when farmers requested them.

But much of the about-face occurred voluntarily, as farmers learned to raise animals in ways that kept them healthier. That has included providing pigs with more living space, improving ventilation and hygiene in confinement sheds, and reducing the stress that can make animals more susceptible to infection.



Anders Rhod Larsen, a microbiologist at the Statens Serum Institute in Copenhagen, with cultures of antibiotic-resistant *Staphylococcus aureus*. Ciril Jazbec for The New York Times

American pork industry officials remain unimpressed. Those who have toured Danish pig farms said in interviews that adopting their practices would markedly increase pork prices.

Some claimed that Denmark's sparing use of antibiotics has meant that sick pigs go untreated or that farmers must use more antibiotics to cure them — claims disputed by Danish farmers and government officials.

Denmark's efforts to reduce antibiotic use in pigs hasn't had any measurable impact on public health, nor has it led to a reduction in disease prevalence among animals, said Dr. Heather Fowler, a veterinarian and the director of producer and public health at the National Pork Board, a trade group financed by pork producers and overseen by the United States government.

Dr. Fowler said the board was instead focused on voluntary antimicrobial stewardship, "which means using the right drug for the right bug for the right amount of time."

"Our pig farmers are committed to what's right for pigs, people and the planet," she said.

Many experts in public health don't buy it. "The American pork industry's arguments are spurious and downright embarrassing," said Dr. Lance Price, director of the Antibiotic Resistance Action Center at George Washington University.

He said the industry's critiques of Denmark, Holland and other countries that have slashed antibiotic use are often based on a selective, cynical analysis of the data.

"For the sake of humanity, they need to take some responsibility for their role in this crisis before it's too late," he said of American pork producers.

Federal guidelines already discourage the use of medically important antibiotics in livestock, but consumers, it turns out, have proven to be especially powerful change agents. In response to shifting public sentiment, fast-food chains like McDonald's, Taco Bell and Wendy's no longer buy chicken from growers who use medically important antibiotics.

McDonald's last year announced it would begin scaling back purchases of beef raised with antibiotics. More than half the chickens in the United States are now raised without the drugs, according to the National Chicken Council.

Since 2015, the use of medically important antibiotics in chickens has fallen 47 percent, compared to 35 percent in pigs, according to the Food and Drug Administration.

American pork producers say it is challenging to wean pigs off the drugs because they live far longer than the average chicken broiler — six months vs. six weeks — which increases an animal's chances of getting sick.

The Danish experience, however, suggests it is possible to have both healthy pigs and far lower use of antibiotics. Industry officials in Denmark say they hope to raise 1.5 million pigs completely free of antibiotics within the next five years, up from 200,000 in 2018.

“Most of us have kids,” said Mr. Sondergaard, the pig farmer. “We want to make sure we leave them a world where antibiotics still work.”

Selling knowledge, not drugs

Denmark, roughly the size of Maryland, has an outsize pig population. The nation raises 32 million of them per year, but is home to just 6 million people. Pork is central to Danish cuisine — the national dish, *Stegt flæsk*, is crispy pork belly dressed in a parsley sauce.

So there was plenty of pushback in 1995 when the government, worried about the rise of drug-resistant infections, barred veterinarians from selling antimicrobial drugs directly to farmers, removing any incentive for unnecessary prescriptions.

Veterinarians could still prescribe antibiotics, but only pharmacies could sell them. Denmark's veterinarians were not happy, but there was a silver lining: The regulations required farmers to pay veterinarians for regular visits, a move that eased their opposition, said Ken Steen Pedersen, who oversees porcine health for the Danish Veterinary Association.

“Vets came to realize they could make their money from selling knowledge and advice to farmers rather than selling medicine,” he said.

The regulations were the first in a raft of measures that changed the livestock industry's relationship with antibiotics. In the years that followed, Danish authorities slowly phased out the use of antibiotics for growth promotion, introduced higher taxes on medically important antibiotics and largely banned the use in pigs of some of the most essential drugs for humans.

Then there were the dreaded yellow cards. Since 2010, the government has set national targets for reducing antibiotic use in animals, starting with 10 percent the first four years and 15 percent the five subsequent years. Farms that exceed the targets earn a yellow card, a badge of dishonor that in 2018 was meted out to just 30 of Denmark's 3,100 pig farms.

Over the past few years, only a handful of farmers have received a yellow card more than once, and none has been issued the far more serious red card for repeated noncompliance, said Elisabeth Okholm Nielsen, who oversees the program for the Ministry of Environment and Food.

“To the best of my knowledge, no farmer has gone out of business because of the yellow card system,” she said.

Cutting back on antibiotics has become something of a competitive sport among Danish farmers, who can check their usage against that of neighboring farmers with monthly government data.

Mr. Sondergaard, the farmer in Jutland, has never been carded. One recent morning, standing in the midst of the overpowering stench of hog waste, he smiled as he showed off a chart that traced his antibiotic usage over the past three years. In most years his farm has been well below the threshold, which has been lowered nine times since 2010.

Another farmer, Michael Nielsen, 55, said that the key to success was changing the way he has raised thousands of swine on his farm not far from Copenhagen. He has fed them homegrown wheat and barley, provided natural lighting in the sheds where sows give birth, and built “safety zones” in each stall that gave newborns a place to sleep beyond the potentially lethal crush of their gargantuan mothers.

His animals also got to keep their tails, unlike American and most Danish piglets, whose tails are cut off without anesthesia to avoid the tail-biting injuries that can occur in closely packed barns.

“I want to show that we can do industrial production with better animal welfare,” he said as he stroked the ears of a days-old piglet. “We try to make their lives as stress-free as possible.”

Some of his tactics are inexpensive, like hanging rubber tubes inside pens so that piglets have something to gnaw other than the tails of their siblings. A daily sprinkling of fresh straw has provided a cushion atop cold concrete floors and given restless adolescents something nutritious to munch.

But not all his innovations are so inexpensive. To reduce the stress on piglets that sometimes leads to infectious diarrhea, Mr. Nielsen and most Danish farmers have allowed them to wean for a month or so before separating them from their mothers, a week longer than the average American pig.

And in an effort to give nursing sows the space to stand up and stretch, Mr. Nielsen recently expanded the size of their confinement cages by 50 percent, a significant sacrifice for farmers whose profit margins are often razor thin.

Such changes have been critical in lowering drug-resistance rates in Denmark, and the progress has been painstakingly documented in an annual compendium, called Danmap, that has become the gold standard for researchers across the world seeking to understand the connection between antibiotic use and resistant germs.

One of the report's earliest findings showed that a 1995 ban on the antibiotic avoparcin in livestock led to the virtual disappearance of avoparcin-resistant bacteria in Danish chickens.

"That was a real aha moment for us," said Johanne Ellis-Iversen, a veterinary epidemiologist at the Danish National Food Institute. "For us, it's all about data, data, data."

The United States does not collect farm-by-farm data on antibiotic use and produces only a national estimate of the amount of drugs used in livestock. Scientists complain that they have generally been barred from doing research on farms.

Not so in Denmark. "Danish farmers are proud of their work and don't feel they have anything to hide," said Anders Rhod Larsen, a microbiologist at the government-funded Statens Serum Institute who frequently conducts field experiments on pig farms. "There is also a shared sense of responsibility, that we have to solve this problem together."

Many of the measures adopted by Denmark are now being embraced by pig farmers across Europe. Last year, the Danish government announced it was creating an international center for the study of antimicrobial resistance, based in Copenhagen, that will employ hundreds of researchers.

Still, in the developing world, where rising incomes are fueling increased demands for animal protein, antibiotic use in livestock continues to surge. One recent study predicted that antibiotic consumption by farm animals could climb 67 percent worldwide in the next decade, far outpacing the rise in humans.

Christian Fink Hansen, the director of pig research at Seges, a farmer-funded research cooperative in Denmark, said the impact of reducing antibiotics in livestock will be limited if other countries continue their liberal use of the drugs.

In an increasingly globalized world, no amount of diligence by Denmark's pig farmers will protect the nation from drug-resistant pathogens that easily cross borders.

"It's not like we can ban people from flying to Thailand on holiday," he said. "We are doing everything we can to combat this global problem, but at the end of the day, we can't do it alone."