NRDC
FACT
Food Animal Concerns Trust

NOVEMBER 2018
IB: 18-11-B

ISSUE BRIEF

ANTIBIOTIC CONSUMPTION IN U.S. PORK, BEEF, AND TURKEY INDUSTRIES VASTLY OUTSTRIPS COMPARABLE INDUSTRIES IN EUROPE, AND THE U.S. CHICKEN INDUSTRY

Antibiotic resistance is a global health crisis. Each year in the United States, at least two million people fall ill with antibiotic-resistant infections. More than 23,000 of them die as a result.[1] Conservatively, these infections cost the United States more than $55 billion each year in health expenses and lost productivity.[2]

Antibiotic resistance describes the proliferation and spread of bacteria that can withstand antibiotics. So when antibiotic-resistant bacteria make us sick, our medicines don't work as well, and sometimes not at all. The more we use antibiotics, the more we speed the spread of antibiotic resistant bacteria, and the more infections we have that are difficult or impossible to treat. This limits the effectiveness of antibiotics for curing common infections or enabling critical interventions like caesarean sections, chemotherapy, kidney dialysis, transplants, joint replacements, or other surgeries.[3]

Warnings from health experts, including those at the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO), have become more and more urgent: if we take life-saving antibiotics for granted and continue to overuse or misuse them, they will increasingly fail when we need them most.[4,5]

All use of antibiotics contributes to the spread of antibiotic resistance, including use in human medicine and in raising animals. As a result, reductions in human use alone are insufficient—especially since a significant majority of antibiotics around the world are sold for raising livestock.[6,7,8] In the United States, 70 percent of all antibiotics belonging to classes that are considered important to human medicine ("medically important") are also sold for use in raising livestock.[9]

Scientific studies show that antibiotic-resistant bacteria can proliferate on farms and then spread to communities through contaminated water, soil, and air; they can also travel through contaminated meat and via workers as they move between farms and their communities[10,11] That's why the WHO now recommends that farmers and the food industry "stop using antibiotics in healthy animals."[12]

Some countries and some U.S. sectors (human medicine and the chicken industry) are doing much better than others at limiting unnecessary uses of antibiotics. Understanding these differences is key to identifying where and how much improvement can be made in the United States. This means understanding not just total use of antibiotics, but the intensity of use as well.[a] Our analysis reveals that:

- The intensity of livestock consumption in the United States has increased since 2009. In the same time period, the intensity of antibiotics consumed in U.S. human medicine declined and then plateaued.
- U.S. livestock production consumes medically important antibiotics with an intensity 95 percent greater than does livestock production across 30 European countries.

a By intensity of antibiotics used, we are referring to the amount of antibiotics consumed per kilogram of livestock. With gasoline consumption, both total gasoline used and miles per gallon must be considered. In the same way, with antibiotics, both total consumption and the intensity of consumption, i.e., the milligrams of antibiotics consumed per kilogram of livestock, are important considerations.

For more information, please contact:
David Wallinga, dwallinga@nrdc.org
Steve Roach, sroach@foodanimalconcerns.org

www.nrdc.org
www.facebook.com/nrdc.org
www.twitter.com/NRDC

FoodAnimalConcernsTrust.org
www.facebook.com/FoodAnimalConcernsTrust
www.twitter.com/Talk_With_FACT

The conventional turkey, pig, and cattle industries in the United States consume medically important antibiotics much more intensively than both the U.S. conventional chicken industry, and their counterpart European industries, as well.

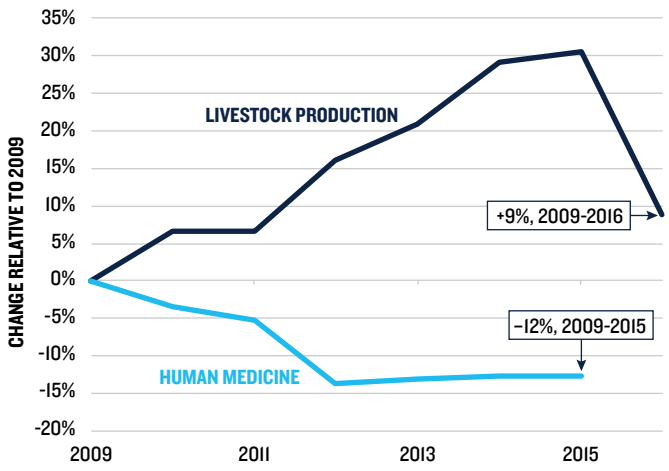
Our findings indicate that the U.S. livestock sectors, especially turkey, pork, and beef, have significant opportunity to reduce antibiotic use while still producing meat and poultry at scale. Given the risks posed by the antibiotic resistance crisis, this change can't come soon enough.

COMPARING CONSUMPTION OF ANTIBIOTICS IN U.S. LIVESTOCK PRODUCTION

Antibiotic consumption can vary enormously by place and sector. Comparing consumption across places and sectors can highlight successful models for reducing antibiotic use and give concerned consumers the information they need to choose products with less intensive antibiotic use, thus helping drive improvements in antibiotic use practices.

We compared the consumption intensity of medically important antibiotics in U.S. livestock production and human medicine. We also compared medically important antibiotic consumption intensity in U.S. livestock production overall with that in Canada and 30 European countries.[13] Finally, we compared the intensity of antibiotic consumption across different livestock sectors, within the United States and across several of these countries. Denmark, for example, produces about one-third more pigs than North Carolina, the second-largest pig-producer among the states.[14] France slaughtered about as many cattle in 2016 as California, Washington and Colorado combined.[15] In addition, the United Kingdom produces as many broiler chickens annually as Georgia, the top U.S. producer.[16]

FIGURE I: RELATIVE CHANGE IN INTENSITY OF ANTIBIOTIC CONSUMPTION FOR HUMANS AND ANIMALS OVER TIME



We calculated the intensity of antibiotic consumption using a measure developed by the European Medicines Agency that looks at milligrams of antibiotics used per kilogram of livestock.[b] Since 2011, it has been the most widely accepted method for measuring the intensity of antibiotic consumption in livestock.[17] In 2017 an independent commission of experts in human and veterinary medicine and public health recommended using this method to track progress in the United States as well.[18] The charts and discussions below outline our findings. (See Appendix for more information on our analysis)

a. The intensity of antibiotics consumed in U.S. livestock production has increased since 2009. In the same period, the intensity of antibiotics consumed in U.S. human medicine declined and then plateaued.

Figure 1 displays the contrasting trends in the intensity of antibiotics consumed over time in human medicine and in U.S. livestock production. While antibiotic intensity in livestock production is measured in milligrams of antibiotics per kilogram of livestock (to account for the different sizes and life cycles of different species), the intensity of use in human medicine is measured in milligrams of antibiotics per U.S. resident.[19]

The intensity of antibiotics consumed in human medicine declined from 2009 to 2012 and then stabilized at levels approximately 12 percent lower than in 2009. Over the same period, the intensity of medically important antibiotics consumed in livestock production rose about 30 percent before dropping in 2016. The 2016 figure remains almost 9 percent higher than in 2009, however.

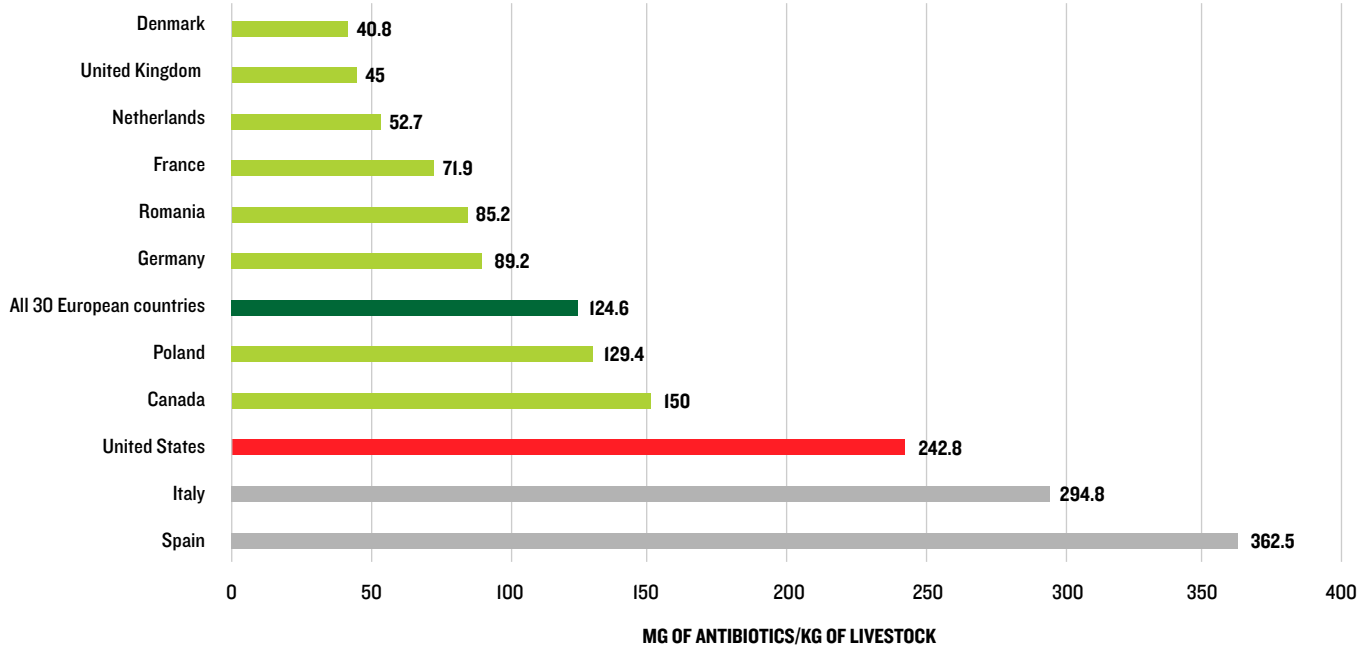
b. U.S. livestock production consumes antibiotics almost twice as intensively as does livestock production across 30 European countries, taken as a whole.

Figure 2 compares the intensity of livestock consumption in the United States with the consumption intensity for Canada and for the top nine individual livestock-producing countries in Europe. We also compare U.S. antibiotic consumption with the intensity of consumption across all 30 European countries for which livestock data are collected.

The U.S. livestock sector's intensity of antibiotic consumption is significantly higher than the intensity in Denmark, the Netherlands, the United Kingdom, France, and Germany, all of which produce livestock at a large scale. At 242.8 mg of antibiotic/kg of livestock, the figure for U.S. livestock production is 95 percent greater than the combined figure (124.6 mg of antibiotic/kg of livestock) for the 30 European countries. Livestock production in a few of those countries, notably Spain and Italy, consumes antibiotics more intensively than the United States.

b The measure divides the total sales of antibiotics, in milligrams of active ingredient, by the estimated weight of all the animals, in kilograms, at the time they likely are given antibiotics. The European Medicines Agency describes this estimate of livestock weight, adjusted to the time of treatment, as a "Population Correction Unit" or PCU and refers to the overall metric as milligrams of antibiotic per PCU. See: European Medicines Agency. *Trends in the Sales of Veterinary Antimicrobial Agents in Nine European Countries (2005–2009)*, Appendix 2. September 2011. http://www.ema.europa.eu/docs/en_GB/document library/Report/2011/09/WC500112309.pdf.

FIGURE 2: INTENSITY OF ANTIBIOTIC CONSUMPTION IN 2016 AMONG U.S., CANADIAN, AND TOP EU LIVESTOCK PRODUCERS



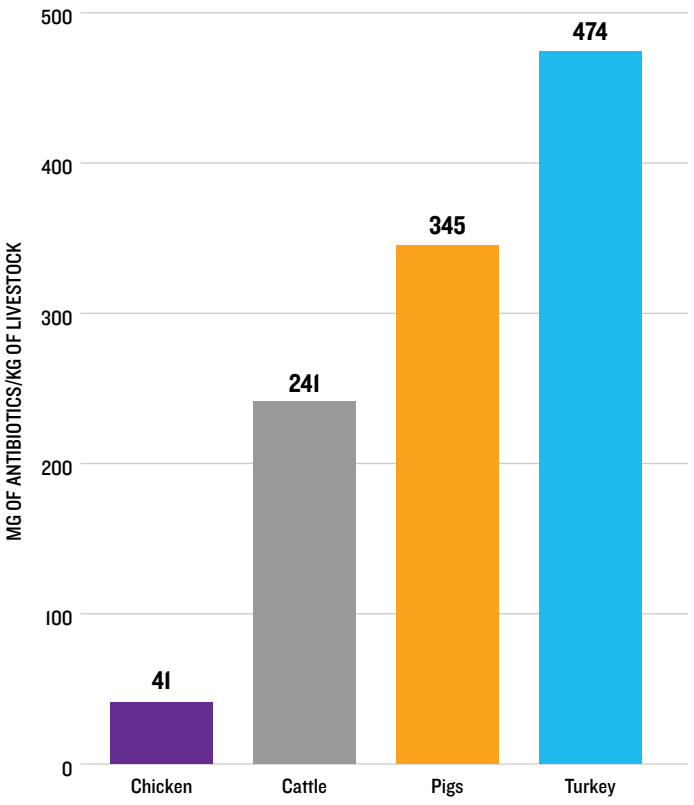
c. Overall, the conventional U.S. chicken industry consumes medically important antibiotics much less intensively than do the conventional turkey, pig, and cattle industries.

Of all the medically important antibiotics sold in the United States for animal use, the FDA estimates 43 percent are for cattle, 37 percent for pigs, and just 15 percent are for chicken and turkey production combined; the remainder are for sheep, goats, rabbits, and other animals.[20]

Figure 3 depicts how intensively the four major, conventional U.S. food animal sectors consume medically important antibiotics, in milligrams of antibiotic per kg of livestock. The turkey industry consumes antibiotics most intensively, followed by pork, cattle, and then broiler chicken. Not enough is known about why turkey production consumes antibiotics so intensively. *But while turkey production may consume antibiotics more intensively than beef and pork, the latter two industries are still quite intensive in their own right, and the total kilograms of antibiotics they each consume is several times higher than that amo unt consumed by the much smaller turkey industry*.[c]

U.S. consumers consistently express a preference for meat raised with fewer antibiotics.[21] In fact, many major conventional chicken producers have publicly committed to reducing their antibiotics use.[22] Figure 3 suggests that such commitments have significantly reduced the consumption of antibiotics in the sector as a whole.

FIGURE 3: INTENSITY OF ANTIBIOTIC CONSUMPTION, BY U.S. FOOD ANIMAL SECTOR



c According to FDA, "2016 Summary Report on Antimicrobials," beef production consumed 3,610,943 kilograms of medically important antibiotics, followed by 3,133,262 kilograms in pig production, 756,620 kilograms in turkey production, and 508,500 kilograms in chicken.

To date, consumers have been unable to compare antibiotic consumption across different meat and poultry sectors. Though USDA-certified Organic products and products labeled "Raised Without Antibiotics" must be sourced from animals never given antibiotics, conventional meat typically carries no label that reflects the intensity of antibiotic consumption.

Even though our analysis indicates that the chicken industry consumes antibiotics far less intensively than do the U.S. beef, pork, or turkey industries, that doesn't mean all chicken producers have embraced responsible antibiotic use. Consumers should verify that the chicken they are buying comes from a company with a strong commitment, whether reflected by a public statement or a "Raised Without Antibiotics," "Organic," or similar label.[23]

d. The U.S. beef, pork and poultry industries consume antibiotics more intensively than important counterparts in four European countries.

Figure 4 shows that poultry, pig and cattle production in the United States in 2016 consumed antibiotics more intensively—and *far* more intensively, in the case of pigs and cattle—than counterparts in France, the United Kingdom, the Netherlands, and Denmark that same year. The column for U.S. poultry production combines antibiotic consumption in both broiler chicken and turkey production, which vary enormously in consumption intensity. Poultry production figures reported by the other four countries are not similarly parsed and may include other poultry, such as duck.

More recent reports from the United Kingdom indicate that antibiotic consumption intensity in pig production in 2017 continued to decline, to 131 mg of antibiotics/kg of livestock.[24] This represents a decline in antibiotic consumption intensity of 53 percent since 2015, when the intensity was 278 mg/kg. The pig industry has set a target of reducing antibiotic intensity by another 12 percent from 2015 levels by 2020, to 99 mg of antibiotics/kg of livestock.[25]

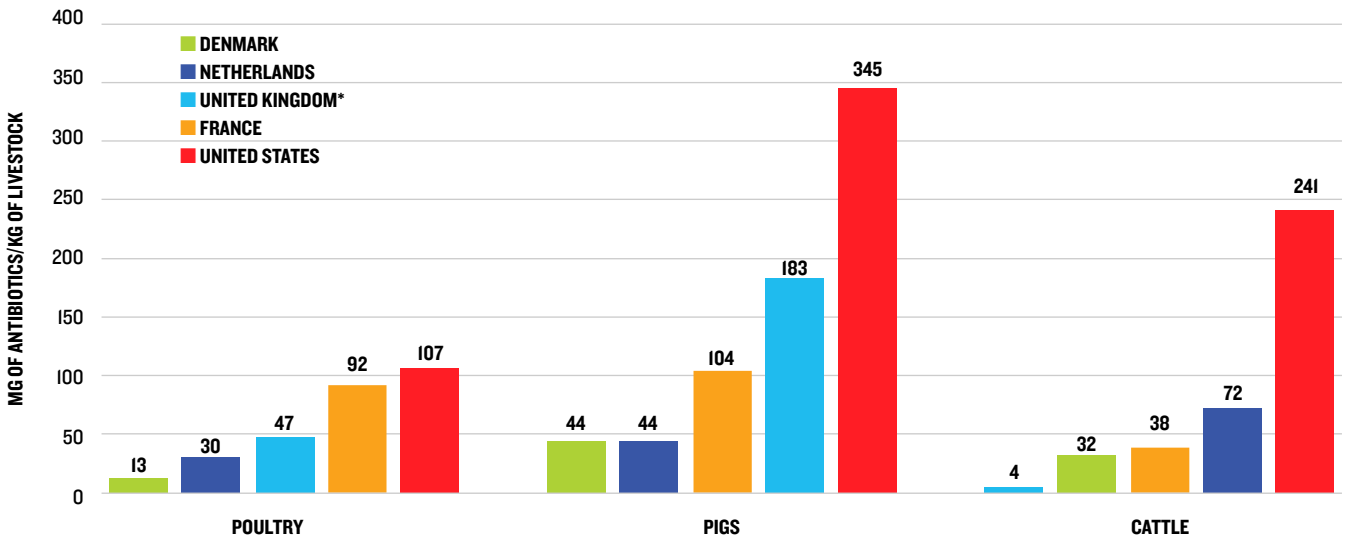
Large pig industries in Denmark and the Netherlands have also dramatically cut antibiotic consumption. In the Netherlands, the pig sector achieved a 58 percent drop in antibiotic use from 2009 to 2017.[26] Over the same period, antibiotic use in pigs in Denmark decreased 29 percent.[27] This followed a 41 percent decline in antibiotic consumption in all livestock production in Denmark, from 1994 to 2008.[28] Both countries achieved these improvements through commonsense measures of better cleaning and biosecurity, vaccinations, more space per animal, later animal weaning, and a variety of other interventions in various combinations.

CONCLUSION

Across all conventional livestock sectors, the United States consumes medically important antibiotics 95 percent more intensively than 30 countries in Europe put together.

But to reduce antibiotic overuse, the U.S. livestock industry does not have to reinvent the wheel. The U.S. chicken industry and livestock sectors in other countries that once overused antibiotics on poultry and meat farms have made rapid and dramatic improvements. U.S. beef, pork, and turkey producers can do the same. In the meantime, consumers have increasing options for buying meat raised with responsible antibiotic use, especially chicken, and they can continue to push the industry in the right direction by purchasing meat raised with fewer antibiotics.

FIGURE 4: INTENSITY OF ANTIBIOTIC CONSUMPTION IN POULTRY, PIG, AND CATTLE PRODUCTION IN THE U.S., FRANCE, UNITED KINGDOM, NETHERLANDS, AND DENMARK IN 2016



*Consumption intensity for UK pig production in Figure 4 is for 2016, although more recent figures are available for 2017, as noted in the text.

ENDNOTES

1 Centers for Disease Control and Prevention (hereinafter CDC). *Antibiotic Resistance Threats in the United States, 2013*. April 2013. http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf.

2 Ibid.

3 Public Health England. *English Surveillance Programme for Antimicrobial Utilisation and Resistance (ESPAUR)*. October 2018. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/749747/ESPAUR_2018_report.pdf.

4 *Antibiotic Resistance Threats in the United States, 2013*.

5 World Health Organization. Fact Sheet: "Antibiotic Resistance." Updated November 2017. http://www.who.int/news-room/fact-sheets/detail/antibiotic-resistance.

6 Van Boeckel, TP. "A Global Plan to Cut Antimicrobial Use in Animals." Blog post, Center for Disease Dynamics, Economics & Policy. November 7, 2017. https://cddep.org/blog/posts/global-plan-cut-antimicrobial-use-animals/.

7 Van Boeckel, TP, et al. "Reducing Antimicrobial Use in Food Animals." *Science* 357, no. 6358 (September 27, 2017):1350-1352. http://science.sciencemag.org/content/357/6358/1350.

8 O'Neill J. *Antimicrobials in Agriculture and the Environment: Reducing Unnecessary Use and Waste*. Review on Antimicrobial Resistance. December 2015. http://bit.ly/2d36sEH.

9 Expert Commission on Addressing the Contribution of Livestock to the Antibiotic Resistance Crisis. *Combating Antibiotic Resistance: A Policy Roadmap to Reduce Use of Medically Important Antibiotics in Livestock*. 2017. http://battlesuperbugs.com/sites/battlesuperbugs.com/files/Expert%20Commission%20Report%2001.02.18.pdf.

10 CDC. "Antibiotic Resistance from the Farm to the Table." Last updated December 22, 2017. https://www.cdc.gov/foodsafety/challenges/from-farm-to-table.html.

11 In addition to the CDC, published studies supporting this statement are summarized in two NRDC publications: "Antibiotic Resistance: From the Farm to You," March 2015, www.nrdc.org/sites/default/files/antibiotic-resistance-farms-FS.pdf; and "Better Bacon: Why It's High Time the U.S. Pork Industry Stopped Pigging Out on Antibiotics," May 2018, https://www.nrdc.org/sites/default/files/better-bacon-pork-industry-antibiotics-ib.pdf.

12 World Health Organization. "WHO Guidelines on Use of Medically Important Antimicrobials in Food-Producing Animals." November 2017. http://www.who.int/news-room/detail/07-11-2017-stop-using-antibiotics-in-healthy-animals-to-prevent-the-spread-of-antibiotic-resistance.

13 Use of the term antibiotics in the remainder of the fact sheet shall be understood to mean 'medically important antibiotics', unless otherwise indicated.

14 USDA, National Agricultural Statistics Service. *Quarterly Hogs and Pigs Report*. December 22, 2017. http://usda.mannlib.cornell.edu/usda/nass/HogsPigs//2010s/2017/HogsPigs-12-22-2017.pdf. Pig inventories for 28 countries in the European Union, including Denmark, at the end of 2017 are accessible from Eurostat. "Number of Pigs." http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tag00018&plugin=1.

15 France commercially slaughtered 4.69 million head of cattle that year vs. 1.22 million in California, 1.08 million in Washington, and 2.46 million in Colorado. Sources: USDA, National Agricultural Statistics Service. "Livestock Slaughter". Released January 19, 2017. http://usda.mannlib.cornell.edu/usda/nass/LiveSlau//2010s/2017/LiveSlau-01-19-2017.pdf, on April 29, 2018; and Eurostat. *Slaughtering in slaughterhouses – annual data*. Accessed at https://ec.europa.eu/eurostat/web/products-datasets/-/apro_mt_pann.

16 For the number of broiler chickens slaughtered in the UK in 2017, see Eurostat database. "Slaughtering in slaughterhouses - annual data". https://ec.europa.eu/eurostat/web/products-datasets/-/apro_mt_pann. For Georgia broiler chickens slaughtered that same year, see USDA, National Agricultural Statistics Service. "Poultry Slaughter 2017 Summary". http://usda.mannlib.cornell.edu/usda/current/PoulSlauSu/PoulSlauSu-02-26-2018.pdf.

17 See the European Medicines Agency's annual reports on sales of veterinary antibiotics, https://www.ema.europa.eu/en/veterinary-regulatory/overview/antimicrobial-resistance/european-surveillance-veterinary-antimicrobial-consumption-esvac; also see the latest *UK Veterinary Antibiotic Resistance and Sales Surveillance Report* from the Veterinary Medicines Directorate, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707974/_1274590-v2-VARSS_2016_for_GOV.pdf, and the latest Canadian Antimicrobial Resistance Surveillance System report, at https://www.canada.ca/en/public-health/services/publications/drugs-health-products/canadian-antimicrobial-resistance-surveillance-system-2017-report-executive-summary.html. In addition, the Center for Disease Dynamics, Economics & Policy uses mg/PCU to monitor and report on antimicrobial consumption in animals globally, at https://resistancemap.cddep.org/AnimalUse.php.

18 Expert Commission on Addressing the Contribution of Livestock to the Antibiotic Resistance Crisis. *Combating Antibiotic Resistance: A Policy Roadmap to Reduce Use of Medically Important Antibiotics in Livestock*. 2017. Washington, D.C. http://battlesuperbugs.com/PolicyRoadmap.

19 U.S. Census Bureau, American Fact Finder. "Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2017." https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=PEP_2017_PEPAGESEX&prodType=table.

20 U.S. Food and Drug Administration (hereinafter FDA), Center for Veterinary Medicine. "2016 Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals." December 2017. https://www.fda.gov/AnimalVeterinary/NewsEvents/CVMUpdates/ucm588086.htm.

21 Consumer Reports Survey Group. "Natural and Antibiotics Labels Survey." May 1, 2018. https://consumersunion.org/wp-content/uploads/2018/10/2018-Natural-and-Antibiotics-Labels-Survey-Public-Report.pdf.

22 Friends of the Earth, Consumers Union, Natural Resources Defense Council, Center for Food Safety, Food Animal Concerns Trust, and U.S. Public Interest Research Group Education Fund. "Chain Reaction III: How Top Restaurants Rate on Reducing Antibiotics in their Meat Supply." September 2017. https://www.nrdc.org/sites/default/files/restaurants-antibiotic-use-es-2017.pdf.

23 Recent public commitments, for example, include those made by Perdue Farms, at https://www.perduefarms.com/news/statements/antibiotics-position-statement/, and by Tyson Foods, at https://www.tysonfoods.com/news/viewpoints/antibiotic-use.

24 National Pig Association. *Pig Industry Antibiotic Stewardship Programme*. July 2018. http://www.npa-uk.org.uk/hres/NPA%20Pig%20Industry%20Stewardship%20Programme%20July%202018.

25 Ibid.

26 Netherlands Veterinary Medicines Institute (SDa). *Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2017: Trends and Benchmarking of Livestock Farms and Veterinarians*. September 2018. https://www.autoriteitdiergeneesmiddelen.nl/en/available-now.

27 Danish Integrated Antimicrobial Resistance Monitoring and Research Programme (herafter DANMAP 2017). *DANMAP 2017: Use of Antimicrobial Agents and Occurrence of Antimicrobial Resistance in Bacteria From Food Animals, Food and Humans in Denmark*. October 2018. https://www.danmap.org/~/media/Projekt%20sites/Danmap/DANMAP%20reports/DANMAP2017/Danmap2017.ashx.

28 Data from DANMAP 2017 indicate that overall consumption of antimicrobials (kg active compound) in all animals declined 51 percent, from around 206,000 kilograms in 1994 to 100,900 kilograms in 2017. Page 31 of the DANMAP 2008 report indicates a total antimicrobial consumption of 121,600 kilograms that year. From 206,000 to 121,600 kilograms represents an overall reduction of around 41 percent in antimicrobials consumed in animals from 1994 to 2008. Antimicrobial consumption in pigs represented 80 percent of the total in 2008 and 74 percent in 2017.