GARPNet News

The Animal Issue

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Global Antibiotic Resistance Partnership

New CDDEP research on antibiotic use and resistance in animals

Antibiotic use in animals, long a focus of GARP working groups, has attracted less attention in international discussions on antibiotic resistance. While it is known that humans and animals exchange resistant bacteria (and resistance genes) through a number of routes, including direct contact, the consumption of animal food products, and potentially the environment, much remains unknown about what implications this has for the resistance burden in humans. It is clear, however, that reducing the amount of antibiotics used in animals when there is no health benefit will reduce the antibiotic resistance burden in animals, with a likely spillover effect in humans.

A recent CDDEP initiative to build the knowledge base in this area, led by CDDEP Director Ramanan Laxminarayan, resulted in three major publications. The first created some of the first comprehensive estimates of antibiotic use in food animals worldwide and projected future trends in their use. The second explored the potential economic costs of withdrawing antimicrobial growth promoters from the livestock sector, and the third focused on the economics of antibiotic use for growth promotion in the United States for swine and poultry. (Links to all three papers are provided at the end of the newsletter.)

1. Estimating global antibiotic use in food animals

A team led by Thomas Van Boeckel at Princeton University (Van Boeckel et al. 2015) estimated antibiotic use in 2010 and projected use in 2030. In 2010, an estimated 63,151 tons of antibiotics were consumed by livestock worldwide – 45 mg per kg, 148 mg per kg, and 172 mg per kg of animal produced in cattle, chicken, and pigs, respectively. Hot spots for consumption include the Red River delta in Vietnam, the northern suburbs of Bangkok, the south coast of India as well as Mumbai and New Delhi, and the southeast coast of China (see figure 1).

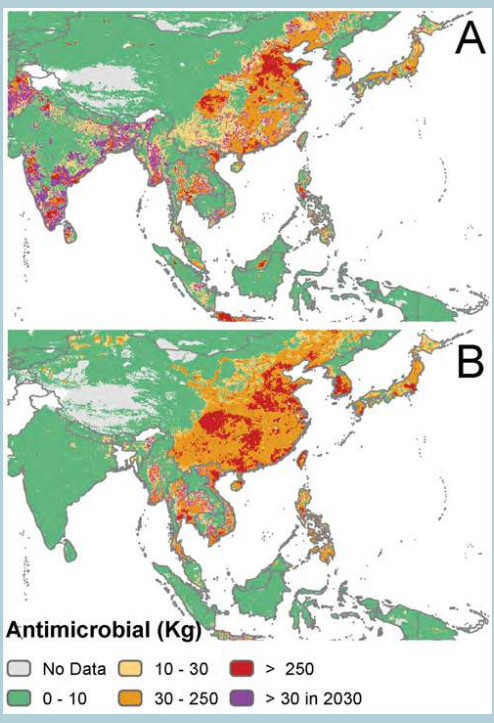

Fig 1. Antimicrobial consumption in chickens (A) and pigs (B) in 2010. Purple indicates new areas where antimicrobial consumption will exceed 30 kg per 10 km² by 2030.

By 2030, on current trends, consumption will increase by over 60% to 105,596 tons, driven mainly by increases in middle-income countries, particularly Brazil, Russia, India, China and South Africa, where consumption is projected to rise 99 percent. In Myanmar, Indonesia, Nigeria, Peru and Vietnam, the rise is expected to be even steeper (see Figure 2).

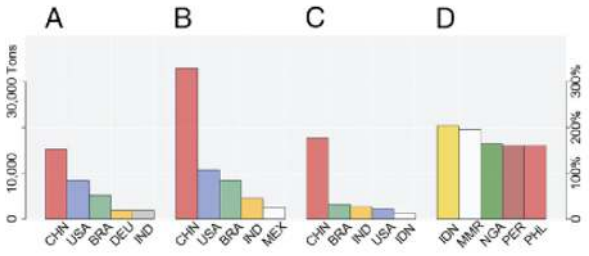

Fig. 2 *(A)* Largest five consumers of antimicrobials in livestock in 2010. *(B)* Largest five consumers of antimicrobials in livestock in 2030 (projected). *(C)* Largest Increase in antimicrobial consumption between 2010 and 2030. *(D)* Largest relative increase in antimicrobial consumption between 2010 and 2030. CHN, China; USA, United States; BRA, Brazil; DEU, Germany; IND, India; MEX, Mexico; IDN, Indonesia; MMR, Myanmar; NGA, Nigeria; PER, Peru; PHL, Philippines.

The increasing use of antibiotics is being driven primarily by increasing demands for animal protein accompanying growing economic prosperity. Efforts to meet this demand have caused many farmers to transition from small- to large-scale farm production systems, where animals are crowded together and the risk for infections to sweep through herds is greater.

2. Banning antibiotic growth promoters worldwide: what impact?

The European Union banned antibiotic growth promoters in 2006 and more recently, the United States and Canada have called for a voluntary cessation. Most other large producers—the same countries where increases are expected to be largest—have no such restrictions (see Table 1).

How much would eliminating antibiotic growth promotion affect productivity? Food animal production systems tend to be less efficient in LMICs, which means that antibiotic growth promoters might have a larger effect on productivity in LMICs than in high-income countries. A team led by Ramanan Laxminarayan considered this when assessing the potential economic impact of a ban on the use of antibiotics as growth promoters, concluding that high-income countries would not feel the impact as much, because their production systems are already optimized and hygiene standards are high.

In comparison, antimicrobial growth promoters play a larger role in lower-income countries with less developed production systems and hygiene practices. A ban is likely to have greater economic consequences in those countries.

Table 1. Regulation of antimicrobial use in livestock in OECD countries

OECD country	Legislative status of country in terms of animal use of antimicrobials	
	Ban on antimicrobial growth promoters	Prescription requirement to use antimicrobials in animals
Australia	No, but some AGPs are banned (fluoroquinolones, avoparcin, virginiamycin, etc.) (Australian Commission on safety and quality in health care, 2013).	Nearly all veterinary antimicrobials can only be sold on a veterinarian prescription.
Canada	No. The Canadian government issued in April 2014 a notice to stakeholders mimicking the FDA approach to voluntary phase out use of medically important antibiotics as growth promoters (Government of Canada, 2014).	No. Plan to develop options to strengthen the veterinary oversight of antimicrobial use in food animals in line with the FDA approach.
Chile	No data	No data
EU Member States	Yes. All AGP banned in 2006 (European Union, 2003).	Yes
Israel	No data	No data
Japan	No (Maron et al., 2013)	Yes
Mexico	Yes, AGP were banned in 2007 with some exceptions (avoparcin, vancomycin, bacitracin, tylosin, virginiamycin, etc.) (Maron et al., 2013).	Yes
New Zealand	Yes, for the critically and highly important antibiotics listed by both WHO and OIE (MAF New Zealand, 2011).	Yes for antibiotics identified with the potential for resistance problem.
South Korea	Yes, since 2011 the use AGP has been discontinued until a veterinary oversight system can be put in place (USDA, 2011)	Yes, the veterinary oversight system is currently being developed.
Turkey	No data	No data
United States	No. The FDA released voluntary guidelines for the industry to withdraw the use as growth promoters of medically important antibiotics (US Food and Drug Administration, 2013).	No. Under the new FDA guidance for industry, use of medically important antibiotics will be under the oversight of licensed veterinarians.

3. Banning antibiotic growth promoters in the United States: what consequences?

In the third paper, Aude Teillant from Princeton University joined Ramanan Laxminarayan to assess potential consequences of an antibiotic growth promotion ban in the United States, where over four times more antibiotics were sold for use in animals than in humans in 2012 (14.6 million compared to 3.29 million kg). They found that the impact would vary by producer, but ultimately many short-term negative effects could be mitigated by cost-savings from not purchasing growth promoters (AGPs), increased demand for and price of AGP free meats, and improved animal health and antibiotic efficiency.

GARP country-level research on antibiotics and agriculture

GARP emphasizes the importance of both human and animal antibiotic use, and has encouraged research in both areas. Most recently, Charles Brower, a CDDEP Research Analyst based in New Delhi, studied poultry farming and antibiotic resistance in Punjab, India. Brower's study is complete, but not yet published. He found high levels of resistance to many antibiotics in *Escherichia coli* isolates from chickens. The full story will come out in the published paper, which we will highlight in GARPNet News.

Global Antibiotic News

Country Highlights

• GARP-Kenya coordinator Eveline Wesangula has been appointed as the AMR focal person in the Ministry of Health. She will be working closely with other GARP members who serve on the newly formed National Antimicrobial Stewardship Advisory Committee to establish a national AMR program and develop a national plan to confront AMR.

• GARP-South Africa continues to move the national AMR strategy forward. Several multi-drug resistant organisms will now be notifiable and reported to a future National Institute for Communicable Diseases (NICD)/National Department of Health (NDOH) combined unit on communicable diseases and notifiable medical conditions. Both private and public labs will report these infections as a part of AMR surveillance. The NDOH is currently in the process of compiling the terms of reference for the Ministerial Advisory Committee and designing a hand hygiene communication strategy.

• GARP-Vietnam has received UK funding to work with the National Institute of Infections and Tropical Diseases (NHTD) and the Ministry of Health to improve AMR coordination of activities/policy development for the next two years and to continue AMR surveillance.

• GARP-India continues to build on the success of November's policy forum and workshop on antibiotic stewardship. This month, the undergraduate and post-graduate programs for microbiology were renamed as Clinical Microbiology, and GARP-India working group members will participate in revising the curriculum for the award of a medical degree in this area.

• "Impact of informational feedback to clinicians on antibiotic-prescribing rates in a tertiary care hospital in Delhi," the results of a GARP-sponsored study, was published in the Indian Journal of Medical Microbiology. The authors were C Wattal (GARP-India Working Group member), N Goel, S Khanna, SP Byotra, R Laxminarayan and A Easton.

GARP in the News

• Meet GARP-Kenya chairman Sam Kariuki: https://www.youtube.com/watch?v=NY9nxxA2grQ

• When the earth shook: a view from Patan hospital in Kathmandu: http://blog.wellcome.ac.uk/2015/05/06/when-the-earth-shook/

ReAct Toolbox

In April, ReACT published an online toolbox for action on antibiotic resistance. We are curious to know what you think about the toolbox. Do you think you will use it? What elements are the most helpful? What could be added to make it more useful? We will convey your ideas to the ReAct developers (with full credit, of course!).

Recent CDDEP publications

The Economic Costs of Withdrawing Antimicrobial Growth Promoters from the Livestock Sector (OECD) (publication #1 above)

Global trends in antimicrobial use in food animals (PNAS) (publication #2 above)

Economics of Antibiotic Use in U.S. Swine and Poultry Production (Choices) (publication #3 above)

Estimated Under-Five Deaths Associated With Poor-Quality Antimalarials in Sub-Saharan Africa (AJTMH)

To see an updated list of CDDEP's publications at any time, visit cddep.org/publications

New posts on the CDDEP blog

• How much would it cost to ban antibiotic growth promoters in the livestock sector? (March 3)

• Recent FDA Antibiotic Approvals: Good News and Bad News (March 12)

• Global livestock antibiotic use expected to increase 67% by 2030 (March 20)

• Smart Antibiotics (April 7)

• Living on Earth: Growth In Livestock Antibiotics Raises Risks For Humans (April 9)

Our thoughts are with our GARP-Nepal colleagues. We wish them the best in their time of recovery and rebuilding. Please contact us if you would like additional information on the GARP-Nepal working group.

Send us your feedback!

We welcome your comments on and additions to each newsletter. Please send any content or questions to Molly Miller-Petrie at millerpetrie@cddep.org

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