

# Antimicrobial Resistance and Human Health



A Report of the Pew  
Commission on Industrial  
Farm Animal Production



## PCIFAP Staff Summary of Industrial Farm Animal Production, Antimicrobial Resistance and Human Health

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The Pew Commission on Industrial Farm Animal Production was established by a grant from the Pew Charitable Trusts to the Johns Hopkins University Bloomberg School of Public Health. The two-year charge to the Commission was to study the public health, environmental, animal welfare and rural community problems created by concentrated animal feeding operations and to recommend solutions.

The problem of antimicrobial resistance (AMR) is growing in the United States, and worldwide. The questions posed by the Commission were several, the first being, what is the scope of the AMR problem; followed by, what is the contribution of industrial animal agriculture to the problem; what is the history of, and reasons for, the use of antimicrobials in animal agriculture; and, what can or should be done about AMR, from the standpoint of animal agriculture.

It is difficult to calculate the scope of the AMR problem as it relates to animal agriculture, because of the types of surveillance that are in place, and the way that AMR is transmitted between bacteria. Only certain infectious bacteria are tracked by the Centers for Disease Control and Prevention (CDC) and state and local health agencies. Most types of bacteria, some infectious and some not, are not tracked, so only a certain cross section of the possible resistant microbes are seen by the tracking agencies. This is a problem because of the way resistance is spread between capable bacteria. These bacteria have a small “cassette” of genes that they transmit to each other all as one piece. These cassettes can confer resistance to more than one antimicrobial, rendering formerly unexposed or nonresistant bacteria, suddenly resistant to multiple kinds of antibiotics. In addition, bacteria that are not tracked by the surveillance systems in place can still transmit resistance elements to other bacteria. For example, many bacteria live in the human digestive tract or on human skin. These are not normally harmful (and are often helpful) and are not monitored. However, these harmless bacteria may still be capable of passing resistance elements to other bacteria that *are* harmful, or could then *become* harmful.

Exposure of bacteria to antimicrobials exerts a selective pressure, killing susceptible bacteria and allowing resistant ones to survive and reproduce. Sir Ian Fleming, father of antibiotics himself, described the phenomena of antibiotic resistance and suggested in the 1940's that extensive use of antibiotics would cause bacteria to develop resistance, and further pointed out that new antibiotics would be necessary to combat this on a regular basis. While it is difficult to measure what percent of resistance is caused by antimicrobial use in agriculture, as opposed to use in other settings, it can be assumed that the wider the use of antibiotics, the greater the pressure for the development of antibiotic resistance.

Antibiotics were first used in the early 1950's as a growth promoter in food animals. As "resistance" developed, and the antibiotics lost their ability to promote growth in the animal, new generations of antibiotics and antimicrobials were used. Today, estimates vary on the amounts of antimicrobials that are used in food animal production, as well as the amounts that are used nontherapeutically, versus therapeutically.

Antimicrobials can save lives of humans and animals but must be used judiciously given their biological properties. The greater the amount of antimicrobials present in the general environmental pool, the greater is the pressure for the development of resistance within many different bacterial populations. Animal agriculture industry representatives recognized this in statements to the Commission. This report was commissioned to expand on these concepts.

By releasing this technical report, the Commission acknowledges that the author/authors fulfilled the request of the Commission on the topics reviewed. This report does not reflect the position of the Commission on these, or any other, issues. The final report, and the recommendations included in it, represents the consensus position of the Commission.

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