Testimony by *Rachel C. Fischer, MD, MPH* to the *Oregon Senate Committee on Health Care* on SB 920 – *Protecting Antibiotics*

Organ transplant, chemotherapy, and common surgical procedures like cesarean section and appendectomy – these are just a few of the medical treatments that would no longer be possible without the use of antibiotics.

Often, we associate antibiotic resistance with an inability to fight a new plague, which is accurate. But without effective antibiotics, physicians lose their ability to perform a number of life-saving measures for millions of Americans. According to Dr. Tom Frieden, director of the CDC, "antimicrobial resistance is happening in every community, in every health care facility, and in medical practices throughout the country. At least 2 million people per year in the U.S. get infections that are resistant to antibiotics, and 23,000 die."

I frequently see patients with antibiotic resistant infections, such as simple urinary tract and skin infections. In most instances, there is usually a "bigger gun" antiobiotic that will do the job. However, the more I and others use the "big guns" the quicker they will become less effective.

Antibiotic stewardship programs exist in clinics and hospitals everywhere. These are programs designed to change the behavior of prescribers – getting them to use the right antibiotic, at the right time and in the right way. Who has not been exposed to some campaign desiged to educate patients about proper antibiotic use? Unfortunately, even if these efforts were 100% effective, they would not be enough.

An estimated 80% of antibiotics sold in the U.S. are for food animal production. Many classes of the antibiotics used for this purpose are also medically important for treating human disease. Most of our meat comes from confined animal feeding operations (CAFOs) where animals are housed in very tight and unsanitary quarters, which creates an ideal bacterial breeding ground. Subtherapeutic doses of antibiotics are routinely given for growth promotion and to prevent spread of infection. In this scenerio, antibiotics seem necessary to maintain our food supply. However, even if that were true, it ignores the perhaps more catastrophic consequences of continuing on the current path.

One of the reasons bacteria are so resiliant (afterall, they have essentially been on earth since it's birth) is that they can easily exchange genetic material with or without breeding. That means a perfectly harmless bacteria species can develop antibiotic resistance and pass that resistance on to a more virulent, pathogenic species. When millions of food animals receive subtherapeutic antibiotics every day, one can only imagine the downstream effects:

- bacteria carrying resistance genes outlive those without resistance and continue to multiply;
- "resistance genes" are passed among bacteria living in the surrounding soil, in the animals and on the farm workers;
- farm workers inadvertently share their bacteria with their families and communities;
- food animals are transported on our highways when it's time for slaughter, litterly "spraying" bacteria in their path;
- animal waste from CAFOs is used to fertilize crops, further spreading bacteria carrying

resistance genes;
•□mature crops carrying antiobiotic resistant bacteria are sold directly to markets and for packaged food production.

During 2010 Congressional testimony, the FDA, USDA and CDC reported there is a ***definitive link*** between routine, non-therapeutic use of antibiotics in food animal production and the antibiotic resistance crisis in humans. And there is another often overlooked consequence of this practice that we are just beginning to comprehend – how environmentally pervasive antibiotics and resistance genes affect the human microbiome.

The human body is composed of about 30 trillion human cells, but is host to more than 100 trillion bacterial and fungal cells. Our bacteria and their DNA play a fundamental, essential role in human health. Antibiotics significantly impact our microbial diversity and have been linked to chronic diseases such as obesity. In his book, "Missing Microbes," Dr. Martin Blaser states that our bodies are an ecosystem "much like a coral reef or tropical jungle, a complex organization composed of interacting life forms. As with all ecosystems, diversity if critical... High diversity affords protection to all species within the ecosystem because their interactions create robust webs for capturing and circulating resources. Loss of diverstiy [can lead] to disease or collapse of the system."

While to some it may seem economically infeasible to pass SB 920 out of this committee, experts agree it will likely be economically catastrophic in unmeasurable ways if we do not take steps to stop the non-therapeutic use of antibiotics in all forms. Dr. Blaser sites game theory and the "Nash Equilibrium" to shed light on the phenomenon of cooperation with regards to our relationship to bacteria, "It can be summarized as a strategy in a game with two or more players in which the outcome is optimized by playing within the rules; if you cheat, your outcome is worse than if you played fair and square." Allowing unchecked use of antiobiotics is cheating the game.