because of
copywright concerns, but wanted to make sure you all had seen this.
Anne

-----Original Message-----
From: John Rebers [mailto:jrebers@nmu.edu]
Sent: Thursday, June 07, 2001 5:37 PM
To: Anne Woiwode
Subject: Drugs and bugs

Anne - the article below appeared in Nature, May 31 2001, vol 411 p. 513.
They're cautious about the conclusions, but of interest for the CAFO stuff.

John Rebers

Gene tests lift lid on drug-resistance puzzle

JONATHAN KNIGHT

[ORLANDO] Is the use of antibiotics in farm animals causing the spread of
antibiotic-resistance
genes to human pathogens? The jury is still out, say experts who gathered
last week at the
annual meeting of the American Society for Microbiology in Orlando, Florida. But this
long-standing controversy could soon be resolved, thanks to the development
of molecular tools
to help recognize resistance genes that originated on the farm.

Infections that resist treatment with antibiotics are a growing problem.
Most researchers agree
that over-prescription of antibiotics by doctors is the main cause.

But antibiotics are also routinely added to the feed of farm animals as
minor infections can stunt
their growth. This is promoting the emergence of antibiotic resistance
among bacteria that
inhabit or infect livestock. And such bacteria have been shown to cause
some cases of human
food poisoning.

More worrying, however, is the possibility that farmyard antibiotic-resistance genes could be transferred to the bacteria that inhabit our bodies, creating an insidious reservoir of drug resistance. But it has proved difficult to demonstrate whether or not such gene transfer is occurring.

"It's hard to get agreement on the extent of the problem," says Walter Hill, an official with the US Department of Agriculture's Food Safety and Inspection Service.

Among those investigating the connection between farm antibiotics and human health is David Wagner, an animal scientist at the Food and Drug Administration's Center for Veterinary Medicine in Laurel, Maryland. He collected microorganisms from beef and poultry at local supermarkets, and found that two-thirds of one species of gut bacterium, Enterococcus faecium, sampled from chicken, were resistant to Synercid. This antibiotic has only been on the market for two years, and is used as a last resort to treat infections that resist the more commonly used vancomycin.

Although Synercid is not used in agriculture, its close cousin virginiamycin has been given to cattle, pigs and poultry for more than 20 years in the United States and Europe. Genes for virginiamycin resistance also confer resistance to Synercid, and the possibility that they can be transferred to human pathogens is a serious concern. "This is not good news," says Wagner of his findings.

Synercid treatment currently fails in only a tiny proportion of cases. But Stuart Levy of Tufts University in Boston, whose work on antibiotic resistance helped to open the field, advises caution. If resistance genes do transfer from livestock bacteria to those infecting humans, they could spread rapidly if Synercid becomes more widely used.

Other researchers are now using molecular techniques that can rapidly recognize specific mutations involved in antibiotic resistance. Roustam Aminov of the University of Illinois at Urbana-Champaign has developed tests, based on the polymerase chain reaction, that can identify eight different classes of gene that confer resistance to tetracycline. Bacteria from cows and pigs carry different characteristic combinations of resistance genes, and Aminov has used his tests to track the transfer of tetracycline-resistance genes from pig farms in Illinois to soil bacteria.

Mark Maiden, a geneticist at the Forsyth Institute in Boston, Massachusetts, has used similar tests and found matching tetracycline-resistance genes in human mouth bacteria and in bacteria from animal intestines. "You've got identical sequences turning up in quite different species," he says. "That's highly symptomatic of horizontal gene transfer."

Although oral bacteria cause nothing worse than dental cavities, Maiden says they could serve as a reservoir of tetracycline-resistance genes that might transfer to opportunistic bacteria that cause pneumonia or postoperative infections, making these more difficult to treat.

Maiden says he cannot prove that the genes did transfer from the animals' bacteria to the human oral bacteria — in theory, it could have been the other way around. But microbiologists are optimistic that the application of such molecular methods by more researchers will soon reveal the extent to which the transfer of farmyard resistance genes to human pathogens is occurring. "We've needed this for many years," says Levy.