

Important Clinical Uses of Antibiotics Covered by *The Preservation of Antibiotics for Medical Treatment Act of 2009*

'The Preservation of Antibiotics for Medical Treatment Act of 2009' applies to seven classes of antibiotics both used as agricultural feed additives and designated by the Food and Drug Administration (FDA) as "critically important" or "highly important" in human medicine (see FDA Guidance 152). The bill would automatically phase out use of these drugs as agricultural feed additives unless FDA concludes within two years that their use does not contribute to antibiotic resistance affecting humans (however, the bill would not restrict use of any drugs in treating sick animals). The seven classes are penicillins, tetracyclines, macrolides, lincosamides, streptogramins, aminoglycosides, and sulfonamides. These seven classes are also covered by a Citizen Petition to FDA filed by four medical and environmental organizations in March 2005. Significant clinical uses of drugs in these classes are described below.

Penicillins

For the past sixty years, penicillins have been effective treatments for bacterial infections. The penicillin class includes not only natural penicillins, but also penicillinase-resistant penicillins, antipseudomonal penicillins, and aminopenicillins.

(Guidance 152 explicitly lists all four types of penicillins as "highly important" for human medical use.) The latter three categories have been developed in part to treat bacterial infections already resistant to the original, natural penicillins.

Natural penicillins remain the antibiotic of choice for certain types of bacterial meningitis (infection of the membranes that line the brain and nervous system), neurosyphilis (syphilis infection of the brain and spinal tract), and strep throat. They are also the antibiotic of choice for serious infections such as endocarditis (infection of heart valves), toxic shock syndrome, and tetanus.

Penicillinase-resistant penicillins are vital to treating infections of the skin, including burn wounds, and for serious infections of bones, joints and heart valves.

Antipseudomonal penicillins are essential for treating skin infections in diabetics, hospital-acquired infections, infections in cancer patients with neutropenia (low white-cell counts), and burn patients, among other uses.

Aminopenicillins are first line treatments for respiratory tract infections, urinary tract infections, bacterial meningitis, septicemia (blood-stream infections), and endocarditis if caused by susceptible organisms.

Tetracyclines

Tetracyclines are used primarily in treating upper respiratory tract infections. They are also the drugs of choice for Lyme disease, atypical pneumonia, certain sexually transmitted diseases, and sometimes for prevention of anthrax in people potentially exposed to anthrax spores.

Tetracyclines are an oral treatment option for patients with community onset methicillin resistant *Staphylococcus aureus* (MRSA) soft tissue and skin infections.

Macrolides

Macrolides, which include erythromycin, are first line treatments for upper respiratory infections like sinusitis or bronchitis, and are often used in patients with penicillin allergies, such as allergic children with strep throat. Macrolides are also essential for treatment of diarrheal disease due to *Campylobacter* (bacteria that can cause severe food poisoning), treatment of community-acquired pneumonia including pneumonia *Legionella pneumophila* (Legionnaire's Disease), treatment of whooping cough in children and adults, and treatment and prevention of certain secondary infections (e.g., *Mycobacterium avium*) in patients with AIDS.

Lincosamides

Clindamycin, the human-use drug in the lincosamide class, is vital in the treatment of skin infections, respiratory tract infections, toxic shock syndrome, abdominal infections, and gynecologic infections. It is also used for the topical treatment of severe acne. (The animal-use drug lincomycin is essentially identical to clindamycin, differing only by one atom). Clindamycin is a treatment of choice for empiric therapy of community onset methicillin resistant *Staphylococcus aureus* (MRSA) soft tissue and skin infections.

Streptogramins

The streptogramin class contains Synercid, the human drug closely related to the animal drug virginiamycin. It is one of the very few drugs that can be used in patients with infections due to highly resistant forms of *Staphylococcus aureus* and *Streptococcus pyogenes*, as well as vancomycin resistant *Enterococcus faecium*. These bacteria cause infections of the skin, gastrointestinal tract and abdominal cavity, as well as systemic sepsis (blood poisoning).

Aminoglycosides

Aminoglycosides are used for the treatment of severe infections of the abdomen and urinary tract, as well as bacteremia (invasion of the bloodstream by bacteria), and endocarditis (an infection of the heart's inner lining or the heart valves). Aminoglycosides may also be given for treatment of tuberculosis (TB).

Sulfonamides

Sulfonamides are currently used to treat urinary tract infections (UTIs) and to treat skin infection in burn patients. Sulfonamides are also used in combination with the drug trimethoprim to treat several types of bacterial diarrhea, *Nocardia* infection (a disorder that affects the lungs, brain, and skin and occurs primarily in individuals with weakened immune systems), ear infections (otitis media), acute exacerbations of chronic bronchitis and are drugs of choice to treat pneumocystis pneumonia in HIV-infected patients and other immunocompromised patients.

The assistance of Tamar Barlam, M.D., of Boston University School of Medicine in preparing this document is gratefully acknowledged. Dr. Barlam is a physician board-certified in Infectious Disease.

Sources (partial listing):

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<http://www.merck.com/mrkshared/mmanual/home.jsp>

Gonzalez and Spencer (1998). Aminoglycosides: A Practical Review. *American Family Physician* 58(8), available at <http://www.aafp.org/afp/981115ap/gonzalez.html>