

## Antibiotics—All-Purpose Agents

One of the greatest discoveries in medicine was the observation by Dr. Alexander Fleming that the fungus, *Penicillium notatum*, excreted a substance, subsequently named penicillin, that inhibited growth of bacteria. This discovery was particularly fortuitous because of penicillin's low toxicity to human cells. Penicillin is an exemplary antibiotic because its primary mechanism of action is to interfere with or inhibit the synthesis of the bacterial cell wall. The human cell does not possess a cell wall and therefore is not subject to action of penicillin. However, penicillin should not be misconstrued as being totally without potential harm for humans; e.g., anaphylaxis.

Since Fleming's discovery, many antibiotics have been developed that do not have a highly specialized mechanism of action that is unique to the bacterial cell. Many of these newer agents have the potential to interact with human cellular function. Unfortunately, these interactions are not uncovered until after millions of doses of the antibiotic have been administered.

Administering antibiotics in the absence of true bacterial infection has the potential for doing more harm than good. It is important to understand that antibiotics may result in harm to the patient and may select for resistant bacterial strains. These two facts are extremely important for the physician to bear in mind when considering the administration of antibiotics to patients.

Antibiotics are not antipyretic agents and should not be given to patients only because their body temperature is increased. This is commonly done in patients with fever and symptoms of pharyngitis. Often the patient is requesting antibiotics, and the physician agrees because he or she does not want to anger the patient. In addition, the physician often feels that the antibiotic is innocuous and cannot cause harm to the patient. Another instance when antibiotics are prescribed indiscriminately is in postoperative fever. The typical response to a patient who has had a hysterectomy or cesarean section and develops a fever is to give antibiotics without a thorough evaluation. When the patient responds, e.g., becomes afebrile in 24 hours, the physician feels justified in having administered antibiotics.

Antibiotics are not tocolytic agents. However, it is common practice to administer antibiotics to pregnant women in preterm labor in the belief that antibiotics can increase the latent phase and therefore allow the administration of steroids.

The selection of resistant bacterial strains is beginning to surface in our specialty. This has been demonstrated by the selection of *Enterococcus faecalis* in individuals receiving cephalosporin prophylaxis. It is also seen in women receiving ampicillin "prophylaxis" for the prevention of the prenatal transmission of *Streptococcus agalactiae*.

One other area of concern is in the treatment of bacterial vaginosis, not an infection but a disruption in the vaginal ecosystem. The two most common treatment regimens, clindamycin vaginal cream (Cleocin) and metronidazole administered either intravaginally or orally, are not particularly successful. They result in either multiple exposures to the antibiotic or the empiric use of other antimicrobial agents. Once again, the selective pressures exerted on the bacterial microflora of the genital tract as well as other ecosystems of the body are immense.

One other consideration is the effect of all these antibiotics on the environment. There is tremendous pressure on the environment secondary to the high volume of antibiotics used to treat humans and animals.

The infectious disease societies, IDSOG and IIDSOG-USA, should assume the responsibility of educating physicians and other healthcare providers in the proper use of antibiotics, as well as in the consequences of indiscriminate and inappropriate use of antimicrobial agents. The societies should not endorse any antimicrobial agent for a specific use unless there is sufficient data to support this indication.

There must also be sufficient safety data. The societies must be emphatic that if there are no data to support use of a particular drug in pregnant women it should be withheld from these individuals as well as from breastfeeding women.

The infectious disease societies should also assist the pharmaceutical industry in the development of these agents and not be influenced by the opportunity to gain financial support for their research. The pharmaceutical industry has been a friend to medicine, supporting research and education. The societies must, in turn, be a true friend to the pharmaceutical industry by being honest and helping to guide them through product development.

Although profit is a motivator, short-term profit can turn out to be long-term loss if unexpected adversity results from the administration of an antimicrobial agent. The academic investigator, whether or not performing clinical or basic science research supported by the pharmaceutical industry, must remain neutral with regard to the industry. The investigator must also remain distanced from the industry and, thereby, unencumbered in rendering data, opinions, and recommendations.

Infectious diseases remain a serious threat to the well-being of our patients. The members of IDSOG and IIDSOG-USA have a responsibility to our patients to bring forth not only new and better antimicrobials, but also agents that truly are an improvement over existing ones. The societies should also help to ensure that these agents are safe. Although our role in preventing selection of resistant bacteria, fungi, and parasites may seem minor, it is a significant one.

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