Table 1. Commonly encountered or important organisms and their usual antimicrobial susceptibilities.

Gram-positive cocci:

Staphylococcus aureus:

*Resistance to penicillin is almost universal. Resistance to methicillin in both community-acquired and hospital-acquired infections is very common in the USA. Such strains are referred to as "methicillin-resistant Staphylococcus aureus (MRSA)". This means resistance to all penicillins, penicillin/penicillinase-inhibitor combinations, cephalosporins (except the 5th generation cephalosporins, cefobiprole and ceftaroline), and carbapenems. These are, however, active against methicillin-susceptible Staphylcoccus aureus (MSSA).

Therefore, in areas where MRSA is prevalent (most of the USA), patients with severe infections presumed to be caused by Staphylcoccus aureus should be treated with vancomycin. If the cultures demonstrate susceptibility to methicillin, then nafcillin, oxacillin or cefazolin can be used.

Other drugs that can be used in Staphylcoccus aureus infections including those caused by MRSA, are clindamycin, linezolid, trimethoprim/sulfamethoxazole, and daptomycin.

Although rifampin is very active against Staphylococcus aureus, it should never be used alone in staphylococcal infections, due to the rapid emergence of resistance to it.

Coagulase-negative staphylococci (e.g Staphylococcus epidermidis)

Vancomycin

Streptococcus pyogenes (Group A)

Penicillin, ampicillin, cephalosporins, macrolides, clindamycin

Streptococcus agalactiae (Group B)

Penicillin, ampicillin, cephalosporins, vancomycin

Streptococcus pneumoniae

penicillin, ampicillin, cephalosporins, vancomycin, macrolides, levofloxacin

In Streptococcus pneumoniae resistance to penicillin, and/or 3rd generation cephalosporins, which can be complete or intermediate, has variable prevalence. This has particular significance for patients with meningitis (see below).

Viridans group streptococci

penicillin, ampicillin, cephalosporins, vancomycin, macrolides, clindamycin

Enterococcus faecalis

ampicillin, vancomycin (killing can occur only if there is synergy between these drugs and gentamicin or streptomycin), linezolid; nitrofurantoin can be used for only urinary tract infection.

Enterococcus faecium

ampicillin, vancomycin, (killing can occur only if there is synergy between these drugs and gentamicin or streptomycin), linezolid, quinupristine/dalfopristine

Gram-negative cocci:

Neisseria meningitidis

penicillin, ampicillin, 3rd generation cephalosporins

Neisseria gonorrhoeae

ceftriaxone (high rate of resistance to penicillin, tetracycline; increasing resistance to fluoroquinolones)

Gram-positive rods, aerobes:

Non-spore-forming:

Listeria monocytogenes

ampicillin, vancomycin, trimethoprim/sulfamethoxazole, linezolid

Corynebacterium spp. (diphtheroids)

vancomycin, variable to other antibiotics

Corynebacterium diphtheriae

penicillin, macrolides, clindamycin, doxycycline

Spore-forming, aerobes

Bacillus spp.

vancomycin, clindamycin, carbapenems, aminoglycosides

Baciilus anthracis (natural)

penicillin, ciprofloxacin, doxycycline

Bacillus anthracis (bioterrorism)

ciprofloxacin, doxycycline

Spore-forming, anaerobes:

Clostridium spp.

C. botulinum

penicillin, metronidazole, carbapenems

C. perfringens

penicillin, metronidazole, clindamycin, carbapenems

C. difficile

metronidazole, vancomycin

Gram-negative rods

These include the Enterobacteriaceae, Pseudomonas aeruginosa, and Acinetobacter.

They are particularly prevalent in intensive care units, where there is a high usage of antimicrobial agents and therefore pressure for the development of resistance.

There is increasing prevalence of "extended-spectrum" beta-lactamases among E. coli and Klebsiella.

In addition, there is a group of organisms that have the genes for the production of broad-spectrum beta-lactamases. The genes can be induced by beta-lactams to produce these beta-lactamases, thus inactivating the drugs. This would not be detected in routine susceptibility tests. These organisms include:

Serratia marcescens, Pseudomonas aeruginosa, Indole-positive Proteus spp., Citrobacter freundii, Enterobacter cloacae, Morganella morganii, and Acinetobacter baumannii. Patients with infections caused by these organisms should not be treated with beta-lactams alone (except for antipseudomonas penicillins or ceftazidime for infections caused by Pseudomonas aeruginosa.)

In such circumstances, treatment with a carbapenem, aminoglycoside, fluoroquinolone, or trimethoprim/sulfamethoxazole, should be used, depending on susceptibilities.

Antimicrobial agents that may be required in the face of infections caused by multi-resistant Gram-negative rods are colistin and tigecycline.

Haemophilus influenzae

3rd generation cephalosporins; for non-meningeal infections, ampicillin/sulbactam, amoxicillin/clavulanate or fluoroquinolones can be used

E. coli

cephalosporins, aminoglycosides, fluoroquinolones, piperacillin/tazobactam, ticarcillin/clavulanate, carbapenems, trimethoprim/sulfamethoxazole

Klebsiella pneumonia

cephalosporins, aminoglycosides, fluoroquinolones, piperacillin/tazobactam, ticarcillin/clavulanate, carbapenems, trimethoprim/sulfamethoxazole

Enterobacter cloacae

beta-lactams - see note above; carbapenems, aminoglycosides, fluoroquin trimethoprim/sulfamethoxazole

Pseudomonas aeruginosa

ceftazidime, ticarcillin/clavulanate, piperacillin, piperacillin/tazobactam, meropenem, aminoglycosides, ciprofloxacin

Acinetobacter baumannii

third-generation cephalosporins, aminoglycosides, ciprofloxacin, carbapenems; often multi -drug-resistant

Stenotrophomonas maltophilia

trimethoprim/sulfamethoxazole, ticarcillin/clavulanic acid, minocycline, ceftazidime, ciprofloxacin;
always resistant to carbapenems

Burkholderia cepacia

carbapenems, trimethoprim/sulfamethoxazole, ceftazidime, minocycline, ciprofloxacin

Burholderia pseudomallei

ceftazidime, trimethoprim/sulfamethoxazole, doxycycline, chloramphenicol

Legionella pneumophila

fluoroquinolone, macrolide

Bordetella pertussis

macrolides

Gram-negative anaerobic rods:

Bacteroides spp., Fusobacterium spp., Prevotella spp., Porphyromonas spp.

metronidazole, piperacillin/tazobactam; ticarcillin/clavulate; carbapenems

Other bacteria:

Mycoplasma pneumoniae

doxycycline, macrolides, fluoroquinolones

Chlamydia pneumoniae

doxycycline, macrolides, fluoroquinolones

Rickettsiae

doxycycline

Ehrlichiae

doxycycline

Francisella tularensis

gentamicin, ciprofloxacin

Yersinia pestis

streptomycin, gentamicin

Fungi:

Candida

Most species are susceptible to fluconazole; C. krusei is always resistant to fluconazole, and C. glabrata is relatively resistant to this drug; other drugs that can be used are echinocandins (caspofungin, micafungin, and anidulafungin) and amphotericin B.)

Aspergillus

There are many species; most are susceptible to voriconazole and amphotericin B; the echinocandins, are active but only fungistatic.

Zygomycetes (Mucor group)

These are resistant to most antifungal agents, except amphotericin B, and posaconazole (for which there is currently only an oral preparation)

Pneumocystis jirovecii

trimethoprim/sulfamethoxazole, primaquine + clindamycin[%], atovaquone, pentamidine

[%]Glucose-6-phosphate dehydrogenase deficiency should be excluded before primaquine is used.

Viruses:

Herpes simplex virus

acyclovir

Varicella zoster virus

acyclovir

Cytomegalovirus

gancyclovir, foscarnet, cidofovir

Human herpes virus 6

gancyclovir, foscarnet

Influenza virus

See Centers for Disease Control website (www.cdc.gov) as susceptibilities vary significantly over time.

HIV

Antiretroviral therapy is complicated and initiation is almost never an emergency. However, in patients receiving anti-retroviral therapy, one should be aware of potential drug-drug interactions.

Protozoa:

Also see Table 2 for therapy for specific protozoal infections

Plasmodium falciparum

quinine, atovaquone/proguanil, quinidine, artemisinin derivatives; chloroquine only in specific geographic areas

Toxoplasma gondii

pyrimethamine + sulfadiazine + leucovorin