Opportunistic Infections

Mycobacterium Avium Complex (MAC)

Mycobacterium avium complex, or MAC, is a type of bacterial infection that can cause life-threatening symptoms in people who have compromised immune systems. People who have healthy immune systems may also be infected with MAC. However, the symptoms they experience—usually involving the lungs—are not usually life threatening. In people with advanced HIV disease, MAC usually doesn’t involve the lungs. Instead, it causes disease in other organs, including the liver, the spleen, and the bone marrow, and is then considered a “disseminated” infection.

MAC organisms can be found virtually anywhere in the environment. They live in water, soil, foods, and a variety of animals. As a result, it is difficult to avoid coming into contact with MAC. However, it is possible to prevent MAC from causing disease and symptoms in HIV-positive people using drugs (prophylaxis), a type of prevention that is almost always recommended for HIV-positive people with compromised immune systems (less than 50 CD4 cells).

MAC is preventable. One of the best ways to prevent MAC is to avoid having CD4 cell counts drop below 100 by starting antiretroviral (ARV) therapy. In people whose CD4 counts do not respond adequately to ARVs, there are prophylactic drugs that can be taken to prevent MAC. Without ARVs or prophylactic medication, the incidence of MAC in people with HIV and low CD4 counts can be as high as 40 percent.

What are the symptoms, and how is it diagnosed?

Fever is the main symptom of MAC, along with night sweats, chills, weight loss, muscle wasting, abdominal pain, fatigue (often caused by anemia), and diarrhea. MAC can also cause enlargement of the liver and spleen, as well as the lymph nodes.

Occasionally, people with a latent MAC infection who start ARV therapy for the first time when their CD4 counts are below 200—and who have a rapid CD4 increase—may have a “flare” of MAC symptoms. This does not mean that the disease is active, but that the immune system is now reacting to the latent infection. This is called immune reconstitution inflammatory syndrome (IRIS). The most obvious symptoms are swollen lymph nodes and fever. If needed, corticosteroids can be used to treat the symptoms of IRIS.

To diagnose MAC, blood and/or bone marrow samples are collected and sent to a lab for testing. To collect a sample of bone marrow, a doctor inserts a needle into the hip bone, usually near the
top of the butt or the lower back. Collecting blood samples to look for MAC is no different from blood samples collected to check viral load or CD4 cell counts.

In order to check for MAC, the organisms must be “grown out” in test tubes. This can take approximately seven days, thus treatment—if MAC is suspected—is often started before a diagnosis is confirmed.

How is it treated?

MAC is treated using a combination of drugs called antibiotics. As with HIV, in which three drugs are used to help prevent resistance and keep viral load undetectable, MAC must be treated with a combination of drugs to maintain control over the infection.

It can take between two to eight weeks for a patient with MAC to start feeling better upon starting treatment. Because of this, MAC is often treated in a hospital, where resources are readily available to help manage symptoms, such as weight loss, fever, and dehydration.

Almost always, MAC combination therapy includes the following drugs:

- Clarithromycin (Biaxin): This antibiotic is extremely effective against MAC. An alternative to clarithromycin is azithromycin (Zithromax). Clarithromycin has been studied more extensively than azithromycin and appears to result in more rapid clearance of MAC from the blood. However, azithromycin is considered to be an excellent substitute, when drug interactions or side effects prevent someone from taking or continuing clarithromycin treatment. Both clarithromycin and azithromycin can cause nausea, headaches, vomiting, and diarrhea. Experts recommend testing blood samples from people with MAC to determine whether the bacteria is susceptible to clarithromycin and azithromycin.

- Ethambutol (Myambutol): This antibiotic is active against MAC, but not powerful enough to be used on its own. As a result, it is almost always combined with either clarithromycin or azithromycin. Side effects include nausea, vomiting, and vision problems.

To help prevent drug resistance and increase the potency of anti-MAC therapy, a third and sometimes a fourth antibiotic are often recommended by doctors. Rifabutin (Mycobutin) has been shown to be effective, but may cause negative drug interactions with other drugs, particularly the protease inhibitors or non-nucleoside analogues used to treat HIV. Other options include the injectible antibiotics amikacin (Amikin) and streptomycin.

If an HIV-positive person is diagnosed with MAC, he or she may be required to continue therapy for
life. This is necessary to prevent MAC from returning. In some cases, ARV therapy can help improve the health of the immune system. If the immune system improves significantly, stopping MAC therapy is possible. In other words, if an HIV-positive person with a history of MAC is able to increase his CD4 cell count to above 100, using ARV treatment, for at least six months, he or she may be able to stop MAC therapy.

Pregnant women should not take clarithromycin as either a prophylaxis or treatment for MAC. Azithromycin is recommended as primary prophylaxis for pregnant women, and pregnant women with disseminated MAC infection should be treated with azithromycin plus ethambutol and continue with this treatment as secondary prophylaxis.

How is it prevented?

As mentioned above, it is very difficult to prevent coming into contact with MAC organisms. In turn, most health care agencies, researchers, and HIV-treating physicians recommend that drugs to prevent MAC be used by patients with compromised immune systems. The risk of developing disease from MAC is greatest when a person’s CD4 cell count falls below 50. In turn, most experts recommend starting preventative therapy—called prophylaxis—when the CD4 cell count falls below 50. People whose CD4 counts increase to greater than 100 and remain above 100 for at least three months may stop taking MAC prophylaxis. They must begin taking it again, however, once CD4 counts fall below 50.

As with the treatment of MAC, both clarithromycin and azithromycin are effective prophylaxis drugs. If either drug is taken correctly, the risk of developing MAC is decreased by approximately 70 percent. In other words, they are often effective, but not always. This can be a problem if MAC occurs while a person is taking either of these drugs. If MAC disease occurs during clarithromycin or azithromycin prophylaxis, it’s possible that the organisms have developed resistance to the drugs. Because these drugs are the most effective compounds available to treat MAC, resistance will likely prevent either drug from being used as an effective therapy. What’s more, MAC resistance to clarithromycin causes automatic cross-resistance to azithromycin, and vice versa.

Most experts believe that the benefits of prophylaxis using either clarithromycin or azithromycin outweigh the potential risks of drug resistance using these drugs.

Both azithromycin and clarithromycin cause similar side effects. To prevent MAC, clarithromycin must be taken once a day; azithromycin only needs to be taken once a week.

Before clarithromycin and azithromycin were studied in clinical trials, rifabutin (Mycobutin) was the drug of choice to prevent MAC. However, it is not as effective as either clarithromycin or azithromycin and does not mix well with most ARVs.

Are there any experimental treatments?

If you would like to find out if you are eligible for any clinical trials that include new therapies for the treatment or prevention of MAC, visit ClinicalTrials.gov, a site run by the U.S. National
Institutes of Health. The site has information about all HIV-related clinical studies in the United States. For more info, you can call their toll-free number at 1-800-HIV-0440 (1-800-448-0440) or email contactus@aidsinfo.nih.gov.

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