

# Just the Facts...

## Yellow Fever

**Q. What is yellow fever?**

**A.** Yellow fever is a tropical disease that is transmitted by mosquitoes that are infected with the yellow fever virus (an arbovirus – short for **arthropod-borne virus**). The “yellow” in the name comes from the jaundice (yellowish staining of the skin and eyes) that affects some patients.

**Q. How is yellow fever transmitted?**

**A.** There are two major transmission cycles for the yellow fever virus. In tropical rainforests, **jungle yellow fever** is mainly a disease of monkeys. Various species of *Aedes* or *Haemagogus* mosquitoes transmit the virus from monkey-to-monkey. It is rare for humans to acquire this type of yellow fever but sporadic cases occur if people who visit or work in tropical rain forests are bitten by mosquitoes that have been infected by monkeys. **Urban yellow fever**, on the other hand, is a disease of humans. In towns, cities, or villages, the disease is spread by mosquitoes that have been infected by other people. *Aedes* mosquitoes, primarily *Aedes aegypti*, are the mosquitoes that transmit the yellow fever virus from human-to-human. *Aedes aegypti* have adapted to living among humans. They breed in containers, such as discarded tires, flower pots, oil drums, and water storage barrels. Urban yellow fever is responsible for large-scale epidemics. A third type of yellow fever known as **intermediate yellow fever** is a rarer form of the disease and it only occurs in parts of Africa. Certain species of *Aedes* mosquitoes can infect both humans and monkeys, resulting in small-scale outbreaks over many separate villages in an area simultaneously. In all types of yellow fever cycles, mosquitoes pass the virus via their eggs (transovarial transmission) to the next generation of mosquitoes. The eggs are resistant to drying and lie dormant through dry conditions, hatching when the rainy season begins. Therefore, transmission is ensured from one year to the next.



Female *Aedes aegypti* mosquito feeding on a human host. If the mosquito is infected, it passes yellow fever virus into the host (human or other animal) as it feeds. Photo: U. S. Dept. of Agriculture, ARS

**Q. How common is yellow fever?**

**A.** Over the past 400 years, yellow fever has caused epidemics involving thousands of deaths in North, Central, and South America, the Caribbean Islands, Africa and Europe. In the United States, significant outbreaks occurred in Philadelphia in 1793 (5,000 deaths) and Norfolk, Virginia in 1855 (3,000 deaths). Due in large part to development of a vaccine, as well as other preventive efforts such as intensive mosquito control programs, in the early 20<sup>th</sup> century, yellow fever is now limited to tropical parts of Africa (where the majority of cases occur), South America, and small areas of Central America and the Caribbean. However, many areas of the world are considered at risk because the appropriate mosquito vectors are present. The World Health Organization currently estimates that approximately 200,000 cases of yellow fever (with 30,000 deaths) occur every year in unvaccinated populations.



**Q. What are the symptoms of yellow fever?**

**A.** Symptoms of yellow fever begin 3 to 6 days after being bitten by an infected mosquito. Although many yellow fever infections are mild or exhibit no symptoms whatsoever, the disease can cause severe, life-threatening illness. Symptoms include high fever, chills, headache, muscle aches, loss of appetite, nausea and/or vomiting. After 3 to 4 days, most patients

improve and their symptoms disappear. However, in a small percentage of people (approximately 15%), after a brief recovery period of about 24 hours, severe symptoms rapidly develop, leading to shock, bleeding from the mouth, nose, eyes and stomach, and kidney and liver failure (with resulting jaundice). Half of the patients who develop severe symptoms die within 10 to 14 days, while the remainder recover without significant organ damage.

**Q. How is yellow fever diagnosed?**

A. Yellow fever may be difficult to recognize, especially in the early stages. It may be easily confused with a wide variety of tropical diseases, including malaria, typhoid, rickettsial illnesses, hemorrhagic viral fevers (e.g. Lassa fever), arboviral infections (e.g. dengue), leptospirosis, and viral hepatitis. Yellow fever is confirmed by a blood test that detects yellow fever virus antibodies which are produced in response to the infection.

**Q. How is yellow fever treated?**





A. There is no specific treatment for yellow fever. Appropriate supportive care is important. Dehydration and fever are common problems, so patients should rest and drink plenty of fluids. In severe cases, kidney dialysis may be necessary. Patients should be isolated from mosquitoes to prevent transmission to other people. Recovery from yellow fever is followed by lifelong immunity.

**Q. Is there a vaccine to prevent yellow fever?**


A. Yes. A very effective yellow fever vaccine is available. A single, subcutaneous injection confers immunity within 7-10 days in 99% of recipients. Protection lasts for at least 10 years, but likely 35 years or even much longer. Since there is no treatment for yellow fever, it is critical that persons planning to travel to endemic areas receive a vaccination.

**Q. Are there other preventive measures to help protect against yellow fever?**

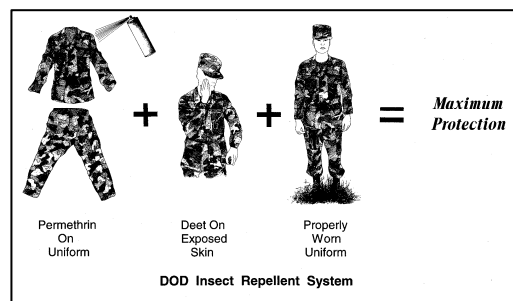
A. You can help protect yourself against yellow fever, as well as other mosquito-borne diseases, by avoiding mosquito bites, especially when visiting or deployed to tropical areas. The risk of infection is greatest during the day, because this is when *Aedes* mosquitoes are most active.


-  Stay inside well-screened areas as much as possible. Make sure that door and window screens do not have holes.
-  Wear long-sleeved shirt, long pants, and socks whenever you are outdoors.
-  Wear loose-fitting clothing to prevent mosquito bites through thin fabric.
-  Use both skin and clothing repellents that have been approved by the Environmental Protection Agency (EPA). They are safe and effective. Always FOLLOW LABEL DIRECTIONS.


- For your skin, use a product that contains 20-50% **DEET** (N,N-diethyl-meta-toluamide). **DEET** in higher concentrations is no more effective.
- Use **DEET** sparingly on children, and don't apply to their hands, which they often place in their eyes and mouths.
- Apply **DEET** lightly and evenly to exposed skin; do not use underneath clothing. Avoid contact with eyes, lips, and broken or irritated skin.
- To apply to your face, first dispense a small amount of **DEET** onto your hands and then carefully spread a thin layer.
- Wash **DEET** off when your exposure to mosquitoes, and other arthropods, ceases.
- When using **DEET** and a sunscreen, apply the sunscreen first. After 30 minutes to an hour, apply the **DEET**. This allows the sunscreen time to penetrate and bind to the skin, and will not interfere with the efficacy of the **DEET**.
- For your clothing, use a product that contains **permethrin**. **Permethrin** is available commercially as 0.5% spray formulations. Clothing that is factory-impregnated with permethrin may also be purchased commercially. Permethrin will withstand numerous launderings.

 For optimum protection, soldiers should utilize the **DOD INSECT REPELLENT SYSTEM**. In addition to proper wear of the military field uniform (pants tucked into boots, sleeves down, undershirt tucked into pants), this system includes the concurrent use of both skin and clothing repellents:

- Standard military skin repellent: 33% **DEET** lotion, long-acting formulation, one application lasts up to 12 hours, **NSN 6840-01-284-3982**.
- Standard military clothing repellents: either IDA (impregnation kit), 40% **permethrin**, one application lasts the life of the uniform (approx. 50 washes), **NSN 6840-01-345-0237**; or aerosol spray, 0.5% **permethrin**, one application lasts through 5-6 washes, **NSN 6840-01-278-1336**. Factory permethrin-treated uniforms are also available via contract [Contact the Armed Forces Pest Management Board (AFPMB) for details, DSN 295-7476; CM (301) 295-7476].



 Sleep or rest under a bed net. For added protection, treat the net with permethrin. Fine mesh, self-supporting, pop-up bed nets that are treated with permethrin at the factory are also available in the military supply system: information can be found on the AFPMB web site: <http://www.afpmb.org/pubs/standardlists/dod%20pest%20management%20material%20list.pdf>

 Eliminate mosquito breeding habitat around camp or bivouac sites by draining standing water from any ground depressions or manmade/natural containers (discarded tires, tree holes, etc.).