



## Hepatitis Can Disrupt Pilots' Careers, Present Long-term Health Risks

*Hepatitis, an inflammation of the liver usually caused by one of several viruses, can be a serious illness. Although hepatitis sometimes occurs without symptoms, other forms of the disease can be incapacitating, and chronic hepatitis can result in liver failure.*

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*FSF Editorial Staff*

The liver performs a variety of vital bodily functions, including filtering out toxins in the blood and transforming food and medicine into chemicals that can be used in other parts of the body (Figure 1, page 2).

When the liver becomes inflamed, that condition is known as hepatitis. Some forms of hepatitis can result in serious illness and death. For pilots — and other aircraft crewmembers — hepatitis and some of the medications used to treat the disease may result in at least a temporary inability to perform flight duties.

“A person with acute hepatitis is severely sick, and when the infection has abated, there may be quite a long period of recuperation,” said Claus Curdt-Christiansen, M.D., chief of the aviation medicine section at the International Civil Aviation Organization (ICAO). “When the infection has abated, if the pilot feels he is OK to fly, he probably is.”<sup>1</sup>

Nevertheless, a medical examination and appropriate laboratory blood tests should be performed to determine that the pilot's

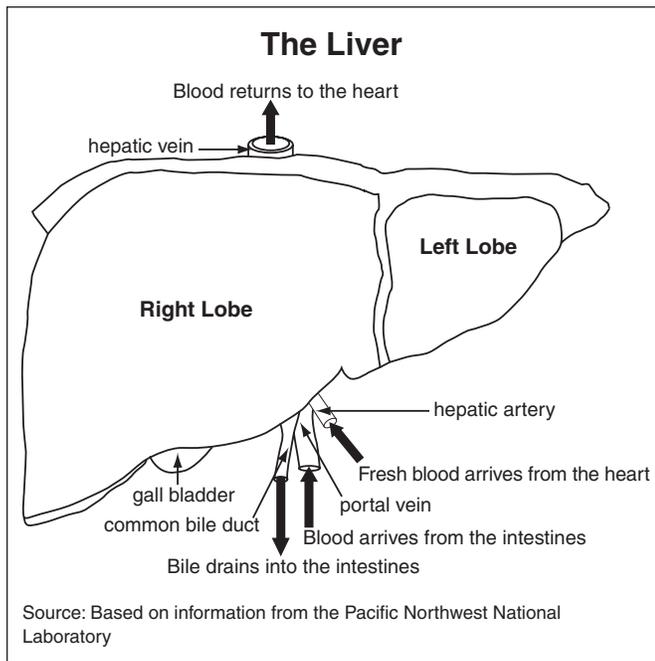


liver function has returned to normal before a resumption of flight duties, he said.

The liver is located in the upper right abdomen; its lower edge can be felt just below the right side of the rib cage. The liver is the largest organ in the body (other than the skin), weighs about 3.0 pounds (1.5 kilograms) and is divided into four sections called lobes.<sup>2</sup>

The liver receives blood from the heart via the hepatic artery and from the small intestine, stomach, pancreas and spleen via the portal vein. The blood flows from the portal vein to hepatocytes (liver cells), which perform various bodily functions, including the following:<sup>3</sup>

- As food moves through the stomach and the intestines, it is broken into pieces small enough to be absorbed into the bloodstream. About 90 percent of these small pieces then move to the liver, which sends nourishment into the bloodstream for distribution to the cells. The liver



**Figure 1**

also stores food energy in the form of carbohydrates and releases those carbohydrates whenever the cells require additional nourishment;

- The liver produces bile, an acid that helps digest fat by breaking fat particles into smaller pieces. Without bile, the body could not absorb vitamin A, vitamin D and vitamin E, all of which are found in fat. The liver stores other vitamins for release when required by the body's cells;
- Using nutrients obtained from food, the liver produces several proteins, including those that are required for blood to clot, for other substances to be transported through the bloodstream and for helping to prevent swelling. The liver also produces cholesterol, which is required in small amounts for cells to function properly, and enzymes, which aid in numerous chemical reactions within the body. The liver breaks down other proteins, such as bilirubin, which accumulates in the bloodstream as red blood cells age. If the liver does not perform this function properly, an excess of bilirubin can make the skin and the whites of the eyes appear jaundiced (yellow);
- The liver filters medicines out of the bloodstream and changes them into forms that can be used more efficiently by the body; and,
- Similarly, the liver filters out harmful substances — for example, alcohol, chemicals, pollutants, metals and waste products that are produced by the body's cells and organs — and eliminates them through the kidneys or the intestines.

The cause of hepatitis is usually a virus, especially one of three hepatitis viruses: the hepatitis A virus (HAV), hepatitis B virus (HBV) or hepatitis C virus (HCV). Less frequently, the cause may be another hepatitis virus or another type of viral infection, such as infectious mononucleosis (a disease involving fever, sore throat and enlarged lymph nodes caused by a type of virus called a herpesvirus); cytomegalovirus (a disease resembling infectious mononucleosis, also caused by a herpesvirus); yellow fever (a sometimes fatal viral disease transmitted by mosquitoes and most common in Central Africa, Central America and South America); alcohol; some medications and illegal drugs; or other toxic substances.<sup>4</sup>

Regardless of which form of hepatitis an individual has, the symptoms may include loss of appetite, nausea, vomiting, fever, fatigue, sore muscles or joints, abdominal pain, dark urine and pale stool, and jaundice.

Hepatitis can occur either as an acute disease, lasting six months or less, or — in some cases involving HBV, HCV and the less common hepatitis D virus (HDV) — as a chronic disease, which persists for at least six months and sometimes for years or even for a lifetime. Chronic hepatitis may eventually result in cirrhosis (a condition in which scarring of liver tissue prevents blood from flowing freely through the liver); liver cancer; and/or liver failure.

## Poor Sanitation Often a Cause of Hepatitis A

HAV affects 1.5 million people each year.<sup>5</sup> The disease exists worldwide, but is most common in areas with poor sanitation and drinking water. Infection usually occurs when an individual puts something in his or her mouth that has been contaminated by the feces of an individual infected with HAV.

HAV sometimes occurs in widespread epidemics, but often, cases of the disease are isolated.

Health Canada said, in a communicable-disease report, that risk factors for transmission of HAV vary according to socioeconomic conditions.<sup>6</sup>

“In developing countries, food-borne [infections] or water-borne infections are common, whereas in North America, the most commonly identified risk factor is household [exposure] or sexual exposure to a recent case,” the report said. “Overall, individuals at increased risk include residents of communities with high rates of infection, children and staff of day-care centers, staff and residents of long-term care facilities, injection-drug users, gay [homosexual] men, and international travelers.”

Sometimes, individuals — especially children — become ill with HAV without experiencing any symptoms. In other cases, symptoms develop suddenly and may become severe. Because

the symptoms resemble those of other forms of viral hepatitis, a blood test is required to obtain a specific diagnosis.<sup>7,8</sup> Symptoms sometimes persist as long as six months to 12 months, but patients usually recover without long-term effects of the disease. Fatalities are rare.

Individuals with HAV can transmit the disease to others as early as two weeks before their first symptoms appear. The Hepatitis Foundation International (HFI) says that the disease usually is transmitted through one of the following methods:<sup>9</sup>

- “Food preparers who are infected can pass the virus on if they do not wash their hands with soap and water after having a bowel movement, especially when they prepare uncooked foods;
- “Fecal contamination of food and water;
- “Anal/oral contact, by putting something in the mouth that had been contaminated with infected feces;
- “Diaper-changing tables, if not cleaned properly or changed after each use, may facilitate the spread of HAV;
- “Fecal residue may remain on the hands of people changing soiled diapers; [and,]
- “Eating raw or partially cooked shellfish contaminated with HAV.”

Preventive measures include consistent hand washing with soap and water after using a bathroom or changing a diaper and before preparing food or eating food.

Nevertheless, Curdt-Christiansen said, “It’s very difficult to protect yourself against a disease like this just by being cautious. Either you walk around abstaining from virtually everything except bottled [drinks] in the original bottles and imported food, or you are at risk. If you have never had infectious hepatitis, chances that you will get it if you visit these places are certainly not negligible. A vaccine, however, brings a very high level of protection.”

Symptoms usually occur between 15 days and 45 days after exposure to the virus.<sup>10</sup> There is no treatment, but patients probably will be advised to rest and to avoid substances such as alcohol that may impose additional stress on the liver. After recovery, the patient is immune to HAV.

Short-term protection against hepatitis A is available from an injection of immune globulin before coming in contact with HAV and within two weeks after contact. The injection can provide immunity for two months to three months.<sup>11</sup>

The United Nations World Health Organization (WHO) does not recommend the vaccine to the general population in countries where HAV is endemic (constantly present and widespread) because exposure to HAV is almost universal before age 10, and as a result, the disease is only a minor public health problem.<sup>12</sup>

Long-term protection against HAV can be provided by a vaccine that is administered in two doses, six months to 18 months apart, depending on the manufacturer’s instructions. A single dose of the vaccine usually provides protection against infection within one month after the vaccine is administered; the protection continues for at least 20 years, and possibly for a lifetime. A combination vaccine against HAV and HBV also is available, administered in three doses.<sup>13</sup>

A pilot who receives the vaccine should wait 24 hours before returning to flight duties, Curdt-Christiansen said. The 24-hour waiting period ensures that flight duties will not be affected if the pilot experiences an adverse reaction to the injection, typically pain and swelling at the injection site or, less frequently, fatigue and/or a low-grade fever.<sup>14</sup>

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The vaccine is recommended for individuals traveling to areas with high rates of HAV. The U.S. Centers for Disease Control and Prevention (CDC) says that the risk of infection “increases with duration of travel and is highest for those who live in or visit rural areas, trek in back-country areas, or frequently eat or drink in settings of poor sanitation. Nevertheless, many cases of travel-related hepatitis occur in travelers to developing countries with ‘standard’ tourist itineraries, accommodations and food-consumption behaviors.”<sup>15</sup>

A report in the *Journal of Travel Medicine* said that although hepatitis A is the “most common vaccine-preventable disease” among travelers, the travelers usually believe that visits of less than two weeks to resort areas or with tour groups present little risk.<sup>16</sup>

Nevertheless, the report said, “As short-term tourists make up the large majority of travelers to endemic countries, they may account for the majority of travel-associated [HAV] cases.”

The vaccine also is recommended for men who have sex with other men, drug users, people with hemophilia and other blood-clotting disorders, people with chronic liver disease and children who live in areas with elevated rates of HAV. The vaccine should not be administered to children younger than age 2.<sup>17</sup>

## **Hepatitis B Complications Cited in 1 Million Deaths Annually**

HBV has infected 2 billion people worldwide, including more than 350 million people with chronic infections who

are at increased risk of death from complications caused by HBV. About 1 million people die every year because of these complications, including cirrhosis and liver cancer.<sup>18,19</sup>

HBV is found throughout the world but is more prevalent in some areas than others. For example, in sub-Saharan Africa, most of Asia and the Pacific, 8 percent to 10 percent of the population has chronic HBV infection; in most of North America, Australia, northern and western Europe, and New Zealand, the rate is less than 2 percent.

People with HBV may have no symptoms of the disease or mild symptoms. A specific blood test for the virus is the only method of determining whether someone is infected with HBV or is carrying the virus (harboring the virus without visible symptoms) and therefore is a potential source of infection to others. The test may not yield a positive reaction during the incubation period (for 45 days to 180 days after exposure to the virus, while the disease is developing), however.<sup>20</sup>

Unlike HAV, HBV is transmitted through contact with the body fluids — blood, semen or vaginal secretions — of someone infected with the disease. HBV often is transmitted through sexual contact with someone who is infected, transfusions of infected blood or infected blood products or use of contaminated needles or syringes for injections. The disease also may be transmitted through acupuncture, piercing and tattooing if non-sterile needles are used. A pregnant woman with HBV can transmit the disease to her baby during childbirth.

There is no treatment for acute HBV, and about 95 percent of adults with HBV develop immunity to the virus and recover without treatment within six months. After recovery, they cannot transmit the disease to others. Nevertheless, their blood will test positive for the HBV antibody (or immune globulin, a protein produced by the body's immune system to protect against a virus, bacteria or other foreign substance).<sup>21</sup>

The remaining 5 percent are chronically infected with HBV, even though they may no longer have outward symptoms of the disease. The virus remains in their blood and other body fluids, and can be transmitted to others. Several medications are available to treat chronic HBV; their side effects, which include headache, nausea, vomiting, loss of appetite, depression, diarrhea, fatigue, and thinning hair, are "innumerable," Curdt-Christiansen said.

"If such a pilot were returned to flying duty, he would have to be closely monitored by an aeromedical specialist, hepatologist [blood specialist] and psychiatrist," he said.

The medications typically used to treat chronic HBV are interferon (in injections) and lamivudine (administered

orally), either separately or together. Fewer than 50 percent of HBV patients are treated with interferon; of those who receive the medication, about 40 percent benefit initially, although some of those experience a relapse when treatment is stopped.<sup>22</sup>

Since 1982, vaccines have been available to prevent HBV infection. The vaccines protect against the disease for at least 15 years, probably longer.<sup>23</sup>

As with the HAV vaccine, a pilot should wait 24 hours after receiving the injection before resuming flight duties, Curdt-Christiansen said. Side effects typically involve pain at the injection site and fever.<sup>24</sup>

WHO has recommended since 1991 that all countries include HBV vaccines in their national immunization programs, and 116 countries — including most countries in Eastern Asia, Southeast Asia, the Pacific islands, Australia, North America, South America, Western Europe and the Middle East — had complied with the recommendation by March 2000.<sup>25</sup>

"However, many low-income countries in sub-Saharan Africa, the Indian subcontinent and the newly independent states [in Eastern Europe] do not use the vaccine," WHO said. "The price of the hepatitis B vaccine has been one of the main obstacles to its introduction in many of these countries."

Individuals who are exposed to HBV and have not been vaccinated against the disease can avoid infection by receiving either a vaccination or an injection of HBV immune globulin, or both, within 14 days of exposure.<sup>26</sup>

Cirrhosis and liver cancer are potentially fatal diseases that can result from the liver cell damage caused by chronic HBV.

In cirrhosis — which also occurs as a result of other forms of hepatitis, including chronic HCV, chronic HDV and autoimmune hepatitis; excessive consumption of alcoholic beverages; and blocked bile ducts — healthy liver tissue is replaced by scar tissue that blocks the flow of blood through the liver and interferes with liver function.

Some people with cirrhosis initially have no symptoms; others may experience a loss of appetite, weight loss, jaundice, itching or the formation of small yellow nodules on the skin. More severe symptoms involve coughing up blood or vomiting blood as a result of bleeding from enlarged blood vessels at the lower end of the esophagus; portal hypertension, or high blood pressure in veins between the intestine and the liver; accumulation of fluid in the abdomen (ascites); kidney failure; and liver encephalopathy (deterioration of brain function because of the buildup of toxic substances in the bloodstream). Eventually, other

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symptoms may include wasting away of the muscles, redness of the palms, curled-up fingers, formation of small veins in the skin, male breast enlargement, enlargement of the salivary glands in the cheeks, hair loss, shrunken testicles, and abnormal nerve function.<sup>27</sup>

Cirrhosis may lead to other problems, including the following:<sup>28</sup>

- The reduction in the flow of blood through the liver may result in an increase in pressure in the blood vessels of the stomach and the lower throat, which in turn may lead to enlargement of the spleen, which produces and destroys blood cells;
- Production of blood-clotting proteins may decrease, and those proteins may not be available in sufficient numbers to stop bleeding from cuts on the skin and from bruised blood vessels;
- The liver may stop filtering medications from the bloodstream. This condition may result in increased sensitivity to the medications; and,
- Bodily waste may no longer be cleared from the bloodstream, resulting in itching, confusion and — in severe cases — coma.

There is no cure for cirrhosis. Treatment usually includes eliminating alcohol from the diet and providing proper nutrition and nutritional supplements. Cirrhosis patients sometimes receive liver transplants, with “varying success,” WHO said.<sup>29</sup>

Liver cancer resulting from cirrhosis or hepatitis is often fatal. The first symptoms often are abdominal pain, weight loss and a mass in the upper right section of the abdomen, but someone who has been ill with cirrhosis may feel much sicker and may develop a fever.<sup>30</sup> In some cases, surgery or chemotherapy can prolong the patient’s life for several years.<sup>31</sup>

## **No Vaccination Exists for Hepatitis C**

HCV infects about 200 million people worldwide, including about 170 million who have chronic forms of the disease and are at risk of transmitting the virus to other people. Three million to 4 million new cases of HCV are reported each year.<sup>32</sup>

WHO calls HCV a “viral time bomb” because most people have no immediate symptoms.<sup>33</sup> Nevertheless, between 75 percent and 85 percent of those who are newly infected eventually develop chronic HCV, about 70 percent develop liver disease, and 15 percent develop cirrhosis. Less than 3 percent die from the consequences of chronic HCV infection.<sup>34</sup>

“In cases where infection leads to clinical hepatitis, the onset of symptoms is usually gradual, with [loss of appetite], abdominal discomfort, nausea and vomiting, followed by the development of jaundice in some cases (less commonly than in hepatitis B),” WHO said.<sup>35</sup>

HCV exists worldwide, but the prevalence varies according to region and is highest in some counties in Africa, the Eastern Mediterranean, Southeast Asia and the Western Pacific.

HCV is transmitted primarily through direct contact with infected blood, either through blood transfusions that are not examined for infection; repeated use of unsterilized needles, syringes or other medical equipment; shared needles among intravenous-drug users or shared straws among drug users inhaling drugs; or use of unsterilized needles in body-piercing, tattooing or circumcision. Other methods of transmission include shared razors, toothbrushes, nail files and barber’s scissors, and sexual contact.<sup>36</sup>

The disease can be treated with some of the same medications used to treat HBV, with the same success rate and the same side effects.

There is no vaccine against HCV.

Recommendations for preventing HCV infection include avoiding handling objects that may contain infected blood, sterilizing contaminated objects and cleaning up blood spills with a 10-percent solution of household bleach, avoiding the sharing of drug paraphernalia such as needles and straws and using latex condoms during sex.<sup>37</sup>

## **Less Common Viruses Also Cause Hepatitis**

Several other viruses also have been identified as causing hepatitis infections.

HDV is present only in individuals also infected with HBV; these individuals may be infected with both viruses simultaneously (coinfection), or those with HBV may subsequently be infected with HDV (superinfection). People who are coinfecting may have a greater risk than those infected only with HBV of developing fulminant hepatitis (a form of the disease that develops suddenly and with severe symptoms). Those with coinfection are less likely to develop chronic hepatitis than those who are infected only with HBV, however, and those with HDV superinfection usually develop chronic hepatitis.<sup>38</sup>

HDV is transmitted in the same manner as HBV, through contact with infected blood. An HDV infection can be confirmed only by a specific blood test. Those most at risk of infection are intravenous-drug users with HBV, and individuals with HBV who have sexual contact with someone infected with HDV.

Others at risk include people who received a transfusion of unscreened blood or unscreened blood products.<sup>39</sup>

There is no vaccine to protect against HDV, which is most prevalent in areas of the world where HBV is prevalent. Nevertheless, coinfection can be prevented through vaccination to protect against HBV.

The hepatitis E virus (HEV) is usually transmitted through water contaminated by the feces of someone infected with the disease. Specialists are investigating the possibility that ingestion of contaminated food may result in infection.<sup>40</sup>

There is no vaccine to protect against HEV, which can be identified only with specific blood tests, and no treatment. The CDC said, however, that vaccines are being developed. Symptoms of HEV usually subside within several weeks to several months.<sup>41</sup> The disease never becomes chronic.

HEV has been reported in parts of Asia, Mexico, the Middle East, Northern Africa and sub-Saharan Africa.

The hepatitis G virus (HGV) is similar to HCV. HGV was discovered in the mid-1990s, after recipients of blood transfusions developed hepatitis that could not be identified as any other known form of the disease. People with HGV may also have HAV, HBV or HCV.<sup>42</sup>

HGV is transmitted through infected blood and infected blood products. Those most at risk of the disease are people who receive transfusions of infected blood or infected blood products, inject drugs or are tattooed or undergo body piercing with infected needles.

There is no treatment for HGV and no vaccine against the disease. Although between 15 percent and 30 percent of individuals infected with HGV have a persistent infection, the long-term outcome for HGV patients is not yet known.

The existence of the hepatitis F virus (HFV) has not been proven, despite reports in 1994 of hepatitis cases involving a virus that did not resemble other known hepatitis viruses.<sup>43</sup>

## Medications, Abuse of Alcohol and Drugs Can Cause Non-viral Hepatitis

Several forms of hepatitis have causes other than viruses, including the following:<sup>44</sup>

- Autoimmune hepatitis (formerly known as lupoid hepatitis) occurs when the body's immune system attacks liver cells. About 70 percent of those with autoimmune hepatitis are women between age 15 and age 40; specialists believe that a genetic factor may make some people more likely than others to develop

the disease. The disease usually is chronic and can result in cirrhosis and liver failure.

This form of hepatitis is not contagious and often can be controlled with medication; and,

- Toxic hepatitis is an inflammation of the liver caused by consumption or inhalation of medications, illegal drugs, industrial solvents, pollutants or other chemicals. Regular consumption of alcoholic beverages can increase the likelihood that medications — especially the pain-reliever acetaminophen — and illegal drugs will produce a toxic reaction in the liver.

Treatment of toxic hepatitis includes immediately ending exposure to the chemical that has caused the disease. In some cases, improvement then occurs within days; in other cases, improvement may occur only after several months.

## Liver Weakened by Alcohol, Environmental Pollutants

The same substances that can cause toxic hepatitis also — in smaller amounts — can interfere with the health of the liver.

For example, medical specialists say that drinking too much alcohol can reduce the liver's ability to act as a filter.

“More than two drinks a day for men — and more than one drink a day for women — may even be too much for some people,” said HFI. “Overworking your liver by heavy alcohol consumption can cause liver cells ... to become permanently damaged or scarred.”<sup>45</sup>

Acetaminophen, when taken with alcohol, can cause “sudden and severe” hepatitis, which can lead to fatal liver failure, HFI said. Other dietary items that can damage the liver include excessive amounts of vitamin A and vitamin D and some herbal medicines.

The various forms of hepatitis — especially HAV — present risks not only to pilots' careers but also to their long-term health. Nevertheless, proper precautions — especially vaccines against HAV and HBV — can significantly reduce a pilot's risk of becoming ill with the disease.♦

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#### **Further Reading From FSF Publications**

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