



Allergy Symptoms May Interfere With Pilot Performance

New types of antihistamines have been approved by civil aviation authorities for use by pilots. In most instances, these antihistamines eliminate allergy symptoms without the side effects that were common for users of earlier medications.

—
Stanley R. Mohler, M.D.

An allergy is an individual's hypersensitivity to a specific substance — in many instances pollen, dust or a type of food — that is harmless to most people. When the hypersensitivity is a nasal response to an airborne particle, such as pollen or dust, the ailment — called allergic rhinitis — may cause pilots to be uncomfortable and more susceptible to other physical problems while on the flight deck.

The U.S. *Federal Air Surgeon's Medical Bulletin* said, "Aside from being uncomfortable and [annoyed], the pilot with allergic rhinitis is more prone to barotraumas [pain or discomfort in the ear because of differences in air pressure inside the eardrum and outside the eardrum], changes in vision and cockpit distractions."¹

Allergy symptoms typically include a clear, watery nasal discharge (rhinitis); sneezing; itching in the nose, the roof of the mouth, the back of the throat and the eyes; watery eyes and conjunctivitis (inflammation of the membrane that covers the inner eyelid and the surface of the eye); irritability; and sleep disturbances.² In some instances, symptoms may be more



severe and may include hives (pale or reddened swellings in the skin), itching over the entire body, changes in blood pressure, shortness of breath, swelling in the throat, or attacks of asthma, in which the bronchial tubes narrow and breathing becomes difficult (see "Comparison of Symptoms of Colds, Allergies and Related Ailments," page 2).

In some instances, allergic rhinitis is a seasonal ailment, also known as hay fever, caused by grass pollens and tree pollens in the spring, and ragweed pollens and the pollens of other weeds in the fall. In other instances, allergic rhinitis is perennial, or year-round, most frequently caused by dust, feathers, animal dander (very small scales from hair, feathers or skin) and mold.

Both forms of allergic rhinitis — as well as other types of allergies — are reactions by the body's immune system to the presence in the body of a substance to which the immune system previously was sensitized.

The U.S. National Institute of Allergy and Infectious Diseases explains the body's response during an allergic reaction as follows:³

Normally, the immune system functions as the body's defense against invading agents such as bacteria and viruses. In most [non-infectious] allergic reactions, however, the immune system is responding to a false alarm. When an allergic person first comes into contact with an allergen, the immune system treats the allergen as an invader and mobilizes to attack. The immune system does this by generating large amounts of antibody (a disease-fighting protein) called immunoglobulin E, or IgE. Each IgE antibody is specific for one particular allergenic (allergy-producing) substance. In the case of pollen allergy, the antibody is specific for each type of pollen: One type of antibody may be produced to react against oak pollen and another [to react] against ragweed pollen, for example.

These IgE molecules are special because IgE is the only class of antibody that attaches tightly to the body's mast cells, which are tissue cells, and to basophils, which are blood cells. When the allergen next encounters its specific IgE, it attaches to the antibody like a key fitting into a lock, signaling the cell to which the IgE is attached to release (and in some cases, to produce) powerful inflammatory chemicals like histamine, cytokines and leukotrienes. These chemicals act on tissues in various parts of the body, such as the respiratory system, and cause the symptoms of allergy.

Medical specialists believe that the tendency to be allergic is inherited, although the substances that cause allergic reactions in children are not necessarily the same substances that affect their parents. Specialists also have observed that an individual is more likely to develop allergies during pregnancy, after a viral infection or at other times when the body's immune system has been weakened.

Allergies often are diagnosed by using skin tests to determine whether IgE antibodies that react to a specific substance are present in the skin. A physician injects diluted extracts from common allergens under the patient's skin or applies the extracts to a puncture on the patient's back or arm. If the IgE antibodies are present in the skin, a raised red spot surrounded by a flush on the skin will appear where the extract was applied. Nevertheless, the presence of the antibodies in the skin does not necessarily mean that the allergen is responsible for the patient's symptoms.

Blood tests also can be used in diagnosis. Blood taken from the patient is examined to determine the level of IgE antibodies to a particular allergen.

Three general methods are used to help people with allergies. One method is avoidance of the substances that cause allergic reactions. Pollens, for example, typically are not present in significant amounts in air-conditioned buildings — or in aircraft cabins at high altitudes. Molds and dust in buildings may be more difficult to avoid, but air conditioners, dehumidifiers and air-filtering devices all help reduce indoor allergens.

Comparison of Symptoms of Colds, Allergies and Related Ailments

Differentiating between colds, different types of allergies and related ailments often is difficult. The following are the symptoms most often associated with different ailments:

- Colds — An uncomfortable feeling in the nose or throat, followed by sneezing, watery nasal discharge, coughing and, in some instances, a low-grade fever. Symptoms typically do not appear until several days after exposure and typically disappear within seven days to 10 days;
- Seasonal allergic rhinitis — Watery nasal discharge; sneezing; watery eyes; itching of the nose, roof of the mouth, back of the throat and eyes; headaches; coughing; irritability; depression; loss of appetite; difficulty sleeping; conjunctivitis (inflammation of the eyelids and whites of the eyes); swelling and discoloration of the nasal lining. Diagnosis is based on skin tests and the individual's history of symptoms, which typically are used to identify which pollen or pollens most likely are responsible for the problem. Symptoms typically begin soon after exposure and persist until exposure has ended;
- Perennial allergic rhinitis — Symptoms are similar to those of seasonal allergic rhinitis (although conjunctivitis is unlikely) but persist year-round at varying degrees of severity. Symptoms may resemble those of recurrent sinus infections and polyps (growths) inside the nose, or recurrent sinus infections and polyps may be present along with perennial allergic rhinitis. Causes typically are house-dust mites, molds, animal dander (very small scales from hair, feathers or skin) or feathers. Skin tests or blood tests are used to identify specific allergens; and,
- Vasomotor rhinitis — Watery nasal discharge, swollen blood vessels in the nasal mucous membrane and sneezing. The cause is unknown, but dry air may aggravate the condition, which medical specialists say is not an allergy. †

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Nevertheless, avoidance is not always possible for flight crewmembers who live in regions where allergens are plentiful or whose work schedules take them to such regions.

Another method of treatment involves desensitization injections. The injections, administered regularly over a period

of time, are prepared using small amounts of the substances that cause allergic reactions in the patient. The concentration of the allergens used in preparing the injections is increased over time to bind and reduce the IgE antibodies in the blood and to cause the body to manufacture a protective antibody known as immunoglobulin G (IgG). In many instances, the injections reduce allergy symptoms significantly within one year. Many patients eventually discontinue the injections and continue to experience relief from their symptoms; others find that their symptoms become more serious after the injections are discontinued.

Flight crewmembers should wait long enough after receiving an injection containing an increased concentration of allergens to ensure that they will not experience an allergic reaction during a flight.

The duration of the waiting period may depend on a physician's assessment of the patient's condition and on the patient's reaction to the injections, said Christopher Schenk, MBBS (bachelor of medicine and bachelor of surgery), a medical officer in the aeromedical section of the U.K. Civil Aviation Authority.⁴

"In so many cases of this nature, an individual assessment is so important," Schenk said. "If [a] ... pilot undergoes a series of desensitizing injections, he/she would clearly have to be grounded for the time it would take to assess the wanted/unwanted effects of the treatment. If [a] ... pilot has an allergic condition severe enough for their physician to recommend desensitizing injections, they would probably be grounded anyway, as their condition is likely — by definition — to be severe."

The third treatment method involves the use of antihistamines and other medications, available with or without a prescription, depending on the country where they are sold. Antihistamines reduce the effects of histamine on the body, thereby reducing the symptoms of allergy. Antihistamines have been used for more than 50 years.

The earliest antihistamines (such as diphenhydramine [Benadryl] and chlorpheniramine [Chlor-Trimeton]) often cause drowsiness, loss of alertness, loss of coordination and other side effects; for that reason, their use has included cautions, especially for individuals operating aircraft and other machinery and for those involved in other activities that require alertness.^{5,6}

Many civil aviation authorities restrict use of these antihistamines by pilots, but the form of the restriction varies.

The U.S. Federal Aviation Administration (FAA), for example, generally allows pilots to take these medications on a long-term basis as long as they are not administered within 24 hours before flight duty begins;⁷ in New Zealand, the time limit is 48 hours before flight duty begins.⁸ In the United Kingdom, pilots are advised to refrain from flying until the underlying condition that prompted them to take the antihistamine has been remedied and until sufficient time

has elapsed for side effects of the medication to have worn off. The length of time varies, depending on the medication.⁹ In Australia, the *Designated Aviation Medical Examiner's Handbook* says that, because antihistamines are "typically sedative in their action," their use "should be discouraged during flying activities."¹⁰

During the 1990s, new types of "non-sedating" antihistamines (such as loratadine [Claratin] and fexofenadine [marketed as Allegra or Telfast]) with fewer side effects were introduced. Because the chemical composition of these newer antihistamines prevents them from being transmitted to brain tissue, they are less likely than earlier antihistamines to cause drowsiness, loss of alertness and loss of coordination.¹¹

Many civil aviation authorities, therefore, allow pilots to operate aircraft while using these antihistamines, under specific conditions.

For example, FAA requires pilots to use the approved antihistamines on the ground for several days; if they experience no side effects, flight is permitted. Nevertheless, the pilot must report use of the approved antihistamines during the next routine FAA medical examination. In the United Kingdom, fexofenadine or loratadine are permitted for treatment of mild allergic rhinitis, but pilots are advised to test their reactions to the medications during two weeks on the ground and to visit an aeromedical examiner before returning to flying.¹² In Australia, use of non-sedating antihistamines is acceptable under some circumstances and under a medical examiner's supervision.¹³ The New Zealand Civil Aviation Authority permits use of fexofenadine and loratadine after pilots have used them on the ground and after they have received permission from a medical examiner; other non-sedating antihistamines are not permitted.¹⁴ In South Africa, loratadine is the only acceptable non-sedating antihistamine; others are being reviewed. South Africa requires pilots to discuss the medication with an aviation medical examiner before using it, and a two-week trial period on the ground is recommended to determine possible side effects before using medication during flight. Use of the medication must be disclosed during subsequent aviation medical examinations.¹⁵

The U.S. National Transportation Safety Board (NTSB) cited the use of the sedating antihistamines diphenhydramine and chlorpheniramine as the probable cause or a contributing factor in at least 15 accidents that occurred from 1996 to 2000 — most of which involved small, general aviation aircraft.¹⁶

One accident however, involved a Douglas C-54A-DC cargo airplane that overran a runway, struck a vacant building and exploded during takeoff at Griffin-Spalding County Airport in Griffin, Georgia, U.S., on April 4, 1997. The airplane was destroyed, and both pilots were killed. The NTSB said in its final report that the probable causes of the accident were "the flight crew's inadequate procedures during a rejected takeoff

following a possible engine malfunction at a critical time in the takeoff and the [first officer's] physical impairment" because of medication. Toxicological tests on the first officer's blood and urine showed the antidepressant paroxetine (at a therapeutic-dosage level) and diphenhydramine (at a level in the blood that was about "10 times the levels found following a dosage at twice the recommended strength," the report said).¹⁷

In another report, involving an RV-6A experimental airplane that struck terrain during climb-out after a dark-night takeoff from Grassy Meadows Sky Ranch near Hurricane, Utah, U.S., on Oct. 12, 1996, NTSB said that diphenhydramine caused "impairment of [the pilot's] judgment and performance," which led to spatial disorientation and loss of aircraft control." The pilot and a passenger — the only people in the airplane — were killed.¹⁸

The report quoted an NTSB medical officer as saying, "Diphenhydramine ... would be expected to have mild to moderate effects, including drowsiness and mental impairment. ... The levels [of diphenhydramine found in the pilot's blood and liver fluid] indicate fairly recent use and suggest that the pilot was having cold [symptoms] or allergy symptoms prior to the flight. It is likely that the diphenhydramine resulted in impaired performance, particularly if high demands were placed on cognitive skills, such as might be expected in a night takeoff with limited visual cues."¹⁹

In a report on a Sept. 14, 2000, fatal accident involving an Air Tractor AT-502 that struck an antenna tower during an aerial application flight near Lariat, Texas, U.S., NTSB said that toxicology tests on the body of the 15,750-hour commercial pilot revealed diphenhydramine in his blood and urine.²⁰

In that accident report, NTSB cited a report published by the American College of Physicians on the effects of fexofenadine, diphenhydramine and alcohol on the performance of 40 licensed motor-vehicle drivers.

The report said, "Participants had significantly better coherence after taking alcohol or fexofenadine than after taking diphenhydramine. ... After participants took diphenhydramine, driving performance was poorest, indicating that diphenhydramine had a greater impact on driving than alcohol did."²¹

Another study found that fexofenadine, when taken at the recommended dosage of 60 milligrams twice a day, had no effect on the driving performance of 24 volunteers.²²

Among the other types of medications used to treat allergies are decongestants, administered orally or in the form of nasal sprays or nose drops. They contain substances such as pseudoephedrine (found in Sudafed), which is approved by many civil aviation authorities for use by pilots. Decongestants constrict the blood vessels in the nose (as well as blood vessels elsewhere in the body), thereby opening the nasal passages and reducing the amount of watery discharge from the nose.

Side effects may include an increased heart rate, elevated blood pressure and, for some men with prostate problems, difficulty urinating. Decongestants that are administered in nose drops or nasal sprays should be used no longer than several days; use for a longer period may result in increased nasal congestion and swelling (a condition called rebound).

Because decongestants often cause difficulty falling asleep, they often are combined with sedating antihistamines. These combinations are not approved for use by pilots within a few hours of flight duty or while they are on call.

Nasal steroids are anti-inflammatory medications that stabilize cells that are exposed to allergens to prevent them from releasing histamine. As a result, nasal congestion and swelling are reduced. Nasal steroids are most useful for individuals who can predict accurately when their allergy reactions will begin; if they begin administering nasal steroids several days or weeks ahead of time, the medication may block most allergy symptoms. Consultation with the pilot's aviation medical examiner is recommended when this approach is used.

Nasal steroids are considered relatively safe over long periods, and many civil aviation authorities approve their use. FAA, for example, allows their use and requires pilots to report during their next FAA physical examination that they have been using the substances.

Cromolyn sodium is another medication — administered as a nasal spray or as eye drops — that, in some individuals, can help prevent allergic reactions by inhibiting the release of histamine from mast cells. Again, consultation with an aviation medical examiner is recommended before initial use of this medication.

Although the symptoms of allergic rhinitis may interfere with a pilot's performance, some medications, including the newest types of antihistamines, have been approved by civil aviation authorities for use by pilots. For many pilots, the newest antihistamines relieve sneezing, itching and watery nasal discharge without drowsiness and other side effects that often accompanied earlier medications. ♦

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Mohler received the 1998 Cecil A. Brownlow Publication Award for journalism that enhances aviation-safety awareness.

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