



## AIDS — Precautions for Ophthalmic Practice

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Since 1981 a new and much publicized infection (AIDS) has come to the attention of the health care community and the public. The reason for the tremendous publicity generated by the disease is the devastating outcome once diagnosis has been made, and the rapid rate at which it appears to be spreading.

### History

In 1981, physicians in Los Angeles, San Francisco and New York City noticed an increase in the number of cases of young men suffering from extremely rare opportunistic infections. Accompanying these infections was an apparent breakdown in the immune system of the victims. Due to the unusual circumstances and the increase in cases, reports were made to the Center for Disease Control in Atlanta. Further investigation revealed that most of the patients were young homosexual males with multiple sexual partners. As more cases were diagnosed, four main risk groups emerged, homosexual men, intravenous drug users, hemophiliacs and people of Haitian origin. Since that time, as more information has been forthcoming, people of Haitian origin are no longer regarded as a high risk group.

The major clinical finding in those afflicted was the breakdown of the immune system, predisposing the person to severe infection and unusual malignant neoplasms. Consequently, the term "acquired immune deficiency syndrome" (AIDS) was given to the disease.

In 1983 a virus called Human T-Cell Lymphotropic (Leukemia) Virus type III (HTLV III) was isolated simultaneously in France and the U.S.A. from victims of the disease.<sup>1</sup> Since that time victims of AIDS have been diagnosed who did not fit into the major risk categories, for example, heterosexual and pediatric cases. It has also been shown that some people are carriers but do not develop the disease and that an incubation period of up to three years

may occur before the disease manifests as a disease process.<sup>2</sup>

After diagnosis, over 85% of the patients have died within three years, despite the use of antiviral and other therapies. Now that the virus has been identified, it is possible to test individuals with AIDS and to learn more about its mode of transmission. The virus has been isolated from the seminal fluid, blood, saliva and, very recently, from the tears of AIDS victims.<sup>3</sup> Two main factors influence the rapid spread of the disease in some groups. In homosexuals, anal intercourse leads to hemorrhaging of the mucus membranes and easy access for viral entry into the bloodstream from the seminal fluid. People may be infected after receiving blood from carriers of AIDS (hence the higher incidence in hemophiliacs). Recently, however, a test has been developed for screening blood for HTLV III antibodies and this should reduce (but not eliminate) the risk of contaminated blood.<sup>4,5</sup> It has become clear that heterosexual transmission is possible if one of the partners is a carrier. Some cases of AIDS have been diagnosed in infants born to mothers who have the disease or are carriers. Many of these mothers are drug-abusers and a few are married to infected men.

A major clinical finding in AIDS is the collapse of the body's defense mechanism against invaders.<sup>6</sup> When an antigen, such as a virus, enters the body, it stimulates the release of free antibody into the blood and other fluids. It also stimulates cell bound antibodies, which are sensitized lymphocytes. There is a division of labour in the immune system that is based on the production of two populations of cells, the B and T cells. All lymphocytes have their origins in the stem cells of the bone marrow. Some then pass to bursa equivalent, from where they migrate to the peripheral sites of lymphoid activity, becoming B cells. Antigen stimulates the B cells to proliferate and many transform into pre-plasma cells. These have the appearance of small lymphocytes but possess the endoplasmic reticulum and ribosomes associated with antibody production. Pre-plasma cells become plasma cells and these newly educated cells then flow to the efferent

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lymphatics and the bloodstream via the thoracic duct and subclavian vein. When these cells arrive at the site, they are able to synthesize 2000 antibody molecules per second and will live from a few days to several weeks. Approximately 10% of lymphocytes in the normal peripheral blood are B cells.

Another group of the lymphocytes travel to the thymus and become T cells. Their function is to mediate cellular immunity. On leaving the thymus, where they are "educated", the T cells are immunologically competent and able to react to antigen. After re-entering the bloodstream the cells settle in the paracortical zones of peripheral lymph nodes, the periarteriolar areas of the spleen and the interfollicular zones of submucosal lymphoid aggregates such as the tonsils and intestinal Peyer's patches. T cells seem to circulate continuously from the blood, through the tissues, back to the lymphatics, to the thoracic duct, and back to the bloodstream. Approximately 70% of the human blood lymphocytes are T cells. Functional assays have shown that T cells are stimulated by antigen to release low molecular weight proteins called lymphokines. These lymphokines have various functions the descriptions of which are beyond the scope of this paper. T cells not only have the function of producing inflammatory molecules and attacking the invading cells, they also have another function related to the B cells. A separate set of T cells function as helper cells to promote B cell function and others as suppressor cells to control the manufacture of antibodies by B cells.

AIDS victims characteristically show a diminished peripheral lymphocyte response to antigens and mitogens. Patients generally have a decreased total T cell number, and virtual elimination of the T cell helper populations.<sup>6</sup>

## Problems in Ophthalmic Practice

Now that the HTLV virus has been identified in the tears, the problems which may be encountered in ophthalmic practice are two-fold: theoretically, the practitioner may be at risk from contact with the ocular fluids and patients may be at risk from the use of applanation tonometers and trial contact lenses.

As yet, there is little evidence of infection of health personnel dealing with AIDS victims.<sup>7</sup> Clinical tests have been carried out on many health care workers for antibodies reactive with HTLV III, and to date no evidence exists to demonstrate a significant risk. Where the HTLV III virus and the antibodies have been found, there has usually been some other confounding factor involved. (eg. the person was also in one of the high risk groups). In the *Journal of the American Medical Association*, January 11, 1985, Weiss and co-workers reported on testing for HTLV III antibodies in 188 laboratory and health care employees working with AIDS victims of their

specimens. None showed any reactivity, while those with AIDS showed 82% positive and 16% borderline findings.

Thus, it appears that the risk to the practitioner is small but not absent. Precautions should therefore be taken regarding people in the high risk categories. These should include initial questioning during the case history regarding the possibility of infection, the avoidance of ocular fluids, especially if there are open sores and the copious use of disinfectant type soaps after patient handling.

This brings up the question of disinfection. It appears that the virus is sensitive to heat, isopropyl alcohol, ethyl alcohol and hydrogen peroxide 3% in vitro.<sup>8</sup> No laboratory had any knowledge of the effectiveness of thimerosal, chlorhexidine, or benzalkonium chloride in killing the virus. This is extremely important in light of the extensive use made of trial lenses and applanation type tonometers in ophthalmic practice. Both of these diagnostic procedures can lead to epithelial abrasions through which infection possibly could occur. Systemic infection via the cornea with other viruses (eg. hepatitis B and rabies) have been reported.

We must emphasize the importance of disinfecting tonometers and contact lenses after each use. Tonometers can easily be disinfected using either isopropyl alcohol or ethyl alcohol. Contact lenses, however, are more of a problem. Hydrophilic lenses, for example, are known to absorb fluids and become contaminated quite readily on insertion. So although disinfection has been a major part of contact lens care since its inception,<sup>9</sup> only certain methods of disinfection have proved to be safe and compatible with both the lenses and the eye.

As previously mentioned, the HTLV III virus is sensitive to heat and needs to be heated to 55° for 30 minutes or to 60° for 10 minutes in order to be destroyed. These temperatures are readily attained in most contact lens heat disinfection units and in the office aseptic designed for lens disinfection. It would thus seem prudent for all practitioners using trial contact lenses to heat disinfect the lenses after every use as chemical disinfection has not been proven with the currently available systems, for HTLV III. Similarly, patients considering contact lenses would be well advised to ask the practitioner, before allowing a lens to be placed on the eye, if heat disinfection is used in the office.

However, some hydrophilic contact lenses and rigid gas permeable lenses cannot be heat treated. In this instance, further research is required to determine effective disinfection techniques, although at this stage certain guidelines should be followed.

In the opinion of the author, gas permeable rigid lenses and high water content lenses should be disinfected in the office by the use of isopropyl



alcohol and hydrogen peroxide (H2O2). There is currently available a contact lens cleaning solution which contains 20% mg./ml. isopropyl alcohol.<sup>10</sup> Several (H2O2) systems are on the Canadian market for use with gas permeable rigid and hydrophilic lenses. H2O2 is an effective cell killing agent due to its strong oxidative potential. Free radical species (eg. hydroxyl ion) are generated under certain conditions and it is the hydroxyl radical that destroys the target cell. The hydroxyl radical will react with any group of phospholipids, proteins, or carbohydrates which will then undergo oxidative degradation. Three percent H2O2 has been shown to be effective against a wide variety of micro-organisms, including the herpes simplex virus. (HSV-1)

It appears that using a combination of an isopropyl alcohol cleaner and H2O2 (3%) for 2 hours would result in the destruction of the HTLV III virus. However, this is still to be proven. An ethylene oxide sterilizing system should also be effective but the residue has a vesicant action and would be difficult to move from contact lenses.

In conclusion, it appears that there is a remote possibility of infection with HTLV III via the tears of affected individuals in the use of tonometers and contact lenses.

Practitioners should be aware of the risks involved and take appropriate measures to eliminate them as far as possible. It is the responsibility of the doctor to ensure effective disinfection of the devices used in practice. The patient should question, and be assured, to his/her satisfaction.

Apparently it is the practice of some dispensers of contact lenses to accept the return of such lenses if the patient is not satisfied. Returned lenses may later be applied to the eyes of other patients. Patients should be warned of the attendant dangers inherent in such practices, especially if effective disinfection procedures are not in use.

Although the risk of AIDS infection through the use of contact lenses has not been demonstrated, it would benefit us all to keep it that way by taking the appropriate precautions.

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**Mitogen:** Substance or agent capable of inducing mitotic activity in an otherwise dormant cell.

**Antigen:** Substance or agent capable of inducing antibody formation and of reacting specifically with antibodies produced.

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## Recommendations for Preventing Possible Transmission of AIDS from Tears

**Dr. A. J. Clayton, MB, ChB, DPH, MFCM, FRCP(C), Director General of Health and Welfare Canada Laboratory Center for Disease Control/Ottawa, has transmitted to the Canadian Association of Optometrists' National Office on August 30th, 1985 at 2:15 p.m., the following enclosed recommendations telexed earlier by the U.S. Center for Disease Control (CDC) in Atlanta.**

**Dr. Bruce Rosner, President of the Canadian Association of Optometrists, requested immediate circulation of this information to every optometrist in Canada because of its importance to optometrists and their patients.**

*Recommendations for Preventing Possible Transmission of Human T-Lymphotropic Virus Type III/Lymphadenopathy-Associated Virus from Tears.*

Human T-lymphotropic virus type III/lymphadenopathy-associated virus (HTLV-III/LAV), the etiologic agent of acquired immunodeficiency syndrome (AIDS), has been found in various body fluids, including blood, semen and saliva. Recently, scientists at the National Institutes of Health isolated the virus from the tears of an AIDS patient (1). The patient, a 33-year-old woman with a history of Pneumocystis carinii pneumonia and disseminated mycobacterium avium-intracellulare infection, had no ocular complaints, and her eye examination was normal. Of the tear samples obtained from six other patients with AIDS or related conditions, three showed equivocal culture results, and three were culture-negative.

The following precautions are judged suitable to prevent spread of HTLV-III/LAV and other microbial pathogens that might be present in tears. They do not apply to the procedures used by individuals in



caring for their own lenses, since the concern is the possible virus transmission between individuals.

1. Health-care professionals performing eye examinations or other procedures involving contact with tears should wash their hands immediately after a procedure and between patients. Hand-washing alone should be sufficient, but when practical and convenient, disposable gloves may be worn. The use of gloves is advisable when there are cuts, scratches, or dermatologic lesions on the hands. Use of other protective measures, such as masks, goggles, or gowns, is not indicated.
2. Instruments that come into direct contact with external surfaces of the eye should be wiped clean and then disinfected by: (a) a 5- to 10-minute exposure to a fresh solution of 3% hydrogen peroxide; or (b) a fresh solution containing 5,000 parts per million (mg/L) free available chlorine — a 1/10 dilution of common household bleach (sodium hypochlorite); or (c) 70% ethanol; or (d) 70% isopropanol. The device should be thoroughly rinsed in tap water and dried before reuse.
3. Contact lenses used in trial fittings should be disinfected between each fitting by one of the following regimens:
  - a) Disinfection of trial hard lenses with a commercially available hydrogen peroxide contact lens disinfecting system currently approved for soft contact lenses. (Other hydrogen peroxide preparations may contain preservatives that could discolor the lenses.) Alternatively, most trial hard lenses can be treated with the standard heat disinfection regimen used for soft lenses (78-80 C (172-176F) for 10 minutes). Practitioners should check with hard lens suppliers to ascertain which lenses can be safely heat-treated.
  - b) Rigid gas permeable (RGP) trial fitting lenses can be disinfected using the above hydrogen peroxide disinfection system. RGP lenses may warp if they are heat-disinfected.
  - c) Soft trial fitting lenses can be disinfected using the same hydrogen peroxide system. Some soft lenses have also been approved for heat disinfection. Other than hydrogen peroxide, the chemical disinfectants used in standard contact lens solutions have not yet been tested for their activity against HTLV-III/LAV. Until other disinfectants are shown to be suitable for

disinfecting HTLV-III/LAV, contact lenses used in the eyes of patients suspected or known to be infected with HTLV-III/LAV are most safely handled by hydrogen peroxide disinfection.

The above recommendations are based on data from studies conducted at the National Institutes of Health and CDC on disinfection/inactivation of HTLV-III/LAV virus (2-4). Additional information regarding general hospital and laboratory precautions have been previously published (5-9). Reported by the U.S. Food and Drug Administration; National Institutes of Health; Centers for Disease Control.

**Editorial Note:** All secretions and excretions of an infected person may contain lymphocytes, host cells for HTLV-III/LAV; therefore, thorough study of these fluids might be expected to sometimes yield this virus. Despite positive cultures from a variety of body fluids of infected persons, however, spread from infected persons to household contacts who have no other identifiable risks for infection has not been documented. Furthermore, there is no evidence to date that HTLV-III/LAV has been transmitted through contact with the tears of infected individuals or through medical instruments used to examine AIDS patients.

## References

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