

# **THE RISK OF HIV INFECTION BEING TRANSMITTED BY THE ORAL ROUTE**

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## **ABSTRACT**

This review shows that HIV is present infrequently in saliva, and when detected the amount is very small. The density of HIV cells in saliva has been estimated to be less than one viral particle per millilitre of saliva. In addition, saliva has anti-viral properties, which inhibit the infectivity of HIV-1. These findings are consistent with epidemiological data, which have failed to support a role of saliva in transmission of HIV. Apparently, the risk of HIV infection being transmitted by the oral route is small. This information should serve to alleviate fears and concerns of the rapidly growing number of household members and other close contacts of patients with AIDS, professionals attending these patients, as well as the population at large. Conceivably,

understanding the nature of salivary anti-viral activity may be useful in developing therapeutic measures to control HIV-1 infection.

## **INTRODUCTION**

HIV cells have been found in saliva of infected persons (1), most likely originating from infected leukocytes that have entered the mouth from gingival blood vessels or through oral mucosa (2). These cells escape when the gingiva is inflamed, as in gingivitis, or through breaks in the mucosal barrier. There is, however, no obvious relationship between a patient's clinical condition and the detection of HIV in saliva (2). The presence of HIV in saliva has raised concern about the possible causal transmission of this virus via the oral route (1). This review will attempt to show that HIV is not

transmissible via the oral route. For this purpose, it will examine; i) the isolation frequency and oral load of HIV cells in saliva, ii) the antiviral activity of saliva and iii) the risk of HIV infection in special groups such as; dental professionals, household contacts of patients with AIDS and individuals indulging in oral-genital sexual practices, who are exposed to saliva of infected individuals.

#### **HIV cells in saliva: isolation frequency and oral load**

Following the detection of HIV cells in saliva, some research workers went on to determine the regularity of the virus in the oral fluid of infected individuals (3,4). In these studies, Ho and co-workers (3) could isolate HIV in 1 out of 83 saliva specimens, compared to 4 out of 71 whole and glandular saliva samples found by Levy and Greenspan (4). The conclusion drawn from these investigations was that HIV cells were very infrequently found in saliva of infected individuals. Ho and co-workers (3), in attempt to determine the relative amount of

HIV cells in saliva as compared to blood, cultured both the saliva specimen found to contain HIV and the patient's blood. The saliva culture demonstrated reverse transcriptase activity after 21 days, in contrast to the blood culture which showed activity on day 3. This finding suggests that the HIV titre of the patient saliva was substantially less than that of his blood. Levy and Greenspan (4), judging from the length of time required to recover the HIV in culture (over two months of passage), estimated the concentration of HIV in saliva to be less than one viral particle per millilitre of saliva. From these it can be concluded that the amount of virus when present in saliva is small.

The low isolation frequency and oral load of HIV in saliva certainly account for the lack of transmission of the virus via the oral route.

#### **Saliva inhibits HIV infectivity**

A preliminary report has shown that the whole saliva from chimpanzees and humans could

inhibit infection of human lymphocytes by HIV (5). In an in vitro study, incubation of HIV-1 with whole or gland salivas for one hour, decidedly reduced the ability of HIV-1 to infect lymphocytes (6). The antiviral activity has been documented in children, young adults and elderly subjects, including HIV-infected individuals (7). These researchers suggested that the inhibitory activity of saliva was conferred by a macromolecule, most likely a protein, and just recently, a protein in saliva called secretory leukocyte protease inhibitor (SLPI) has been discovered, which attaches to white blood cells and protect them from infection (8). Just how SLPI does this is unclear, but being a natural and nontoxic product it may open up new strategies for AIDS medicines. SLPI circulates in blood, but in extremely low levels. There is a possibility, however, of injecting SLPI directly into the blood stream to keep the virus from attacking blood cells (8). Another group of substances in saliva called mucins, which are glycoproteins, also fight HIV infection by clumping viral

particles together and facilitating their removal by swallowing, thereby reducing infectivity. It is worth noting that saliva does not contain broad spectrum antiviral activity, that this HIV-1 inhibitor is specific. For example cytomegalovirus has been shown to survive incubation in whole for 2 hours at 37°C (9), whereas Epstein-Barr virus can be readily cultured from saliva (10). Additionally, hepatitis B virus-containing whole saliva has been shown to contain and transmit hepatitis B in experimental transmission studies (11).

#### **Low occupational risk of HIV infection among dental personnel**

Dental health care workers have been shown to have an extremely low occupational risk of acquiring HIV infection despite frequent occupational exposure to persons at increased risk for HIV infection (12). As a matter of fact, only 1 dental health care among 1309 without behavioural risks for AIDS had antibodies to HIV. In a parallel observation, Saviteer and co-workers (13) followed up two

nurses who participated in a mouth-to-mouth resuscitation of a patient with AIDS related complex, and found them to be seronegative nine months after exposure. This case provides further evidence that the risk of seroconversion after a point exposure to oral secretions of an infected person is low. However, this should not obviate the need for dentists and other oral health care workers to practice appropriate infection control procedures. It should be borne in mind that a number of saliva borne bacterial and viral infections associated with HIV infection could be transmitted via the oral route (14).

#### **Lack of transmission of HIV infection to household contacts of patients with AIDS or constitutional disease with oral candidiasis**

Epidemiological data and intensive study of patients with aids or constitutional disease with oral candidiasis have failed to show transmission of HIV via house contacts (15,16). In the latter study, contacts had shared

household items and facilities and had personal interaction with AIDS patients for median months (range, 3 to 48 months) during the period of proven infectivity. Despite prolonged and close contact with the patients, 100 out of 101 household contacts did not contract HIV infection. The only contact who became infected was a five year old child whose mother had AIDS. This infection appeared to have been acquired by perinatal transmission, since the child had signs and symptoms of HIV infection since infancy. The detection of HIV antibodies in married AIDS patients and their spouses, but not their offspring (17), strongly support that household contact is not a significant mode of HIV transmission.

#### **Minimal risk of transmission of HIV infection by oral-genital contact**

The HIV seroconversion rates in homosexual individuals engaged in oral-genital practices, without receptive or insertive anal intercourse, have been found to be

very low. Kingsley and co-workers (18) found no seroconversion in such individuals, while Lyman et al (19) found the risk of such individuals to be the same as that of individuals without sexual partners and much less than those who practised anal sex. These data, suggest a low risk of infection from oral-genital (receptive semen) exposure.

### Conclusion

The low isolation frequency and oral load of HIV cells in saliva, coupled with the presence of antiviral activity in the oral fluid and lack of epidemiological data supporting a role of saliva in HIV transmission does suggest the improbability of the oral route in the transmission of the HIV infection. These observations, should help to quieting public or professional anxiety concerning the risk of AIDS being transmitted by the oral route. The antiviral activity in saliva should be investigated further for possible usage in developing therapeutic measures to control HIV-1 I infection.

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