Heterosexual transmission of AIDS by male drug users

SIR—May and Anderson state that "In developed countries at present and into the near future, it is probable that sexually-transmitted human immunodeficiency virus (HIV) infections among females are likely to come mainly from bisexual males"[1]. Current epidemiological information from the United States, however, suggests that a substantial percentage of sexually-transmitted HIV infections among females will be derived from male intravenous drug abusers. It is important to appreciate the extent and transmission of HIV infection in the population of intravenous drug abusers and their sexual partners as this group accounts for a large proportion of the heterosexually-transmitted HIV infections and perinatal HIV transmissions[2,3].

Three parameters should be compared to assess the relative contributions of bisexual men and male intravenous drug abusers to the number of women who acquire HIV infection through sexual transmission.

First is the total pool of each. In the US state of Maryland for the year of 1986, 16.7% of AIDS (acquired immune deficiency syndrome) cases were bisexual men while 11.0% were male intravenous drug abusers; only 4.2% of the men with AIDS were both bisexual/homosexual and intravenous drug abusers[4]. Of all reported AIDS cases in the United States from before 1982 to 1986, 13.4% occurred in male intravenous drug abusers[3] and although homosexuals are not distinguished from bisexuals it is likely that as in Maryland around 16.0% of all AIDS cases in the United States are bisexual men.

The second parameter is the number of new female partners each bisexual man encounters compared with the number of female partners each intravenous drug user encounters. Few data are available but in a survey of 212 heterosexual men without a specific history of intravenous drug abuse in San Francisco, 47.2% had two or more sexual partners in a six-month period of time, 12.2% had over four and 5% had none, whereas of 173 bisexual men in this survey only 32% had any female sexual partners during the same six-month period and 3.5% had over four[5].

The third parameter is the rate of acquisition of HIV infection by sexual contact, which one could assume would be equal for both groups if one considers only vaginal intercourse and both groups were to use condoms to the same extent. There are insufficient data available to say whether bisexual men practice rectal intercourse with women more frequently than male intravenous drug abusers or whether rectal intercourse with women results in a higher rate of transmission than vaginal intercourse[6]. Receptive rectal intercourse is a significant risk factor for HIV infection in homosexual men[7,8].

In summary, in the state of Maryland if only a third of bisexual men have sexual encounters with women during a specific period of time, the number of heterosexual drug abusers who may have sexual intercourse with females is greater. In addition, a larger percentage of male heterosexual intravenous drug abusers are likely to have a greater number of new female sexual partners than bisexual men. Therefore, it is probable that the number of sexually-transmitted HIV infections among females in the United States from male intravenous drug abusers will be at least as great as that from bisexual men.

PRISCILLA A. FURTH
University of Maryland Medical School, Baltimore, Maryland 21201, USA

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AIDS vaccine strategies

SIR—It is universally agreed that development of a vaccine represents the most effective means to contain and prevent AIDS. Based on wide experience with vaccines against some acute viral infections, the scientific premise upon which that strategy seems currently to rest is that it will be possible to elicit antibodies that neutralize the human immunodeficiency virus (HIV) or otherwise prevent infection. The principal concerns that have been aired relate to the heterogeneity of the virus, the problem of identifying antigens and epitopes required for neutralization, the formidable problems associated with testing and evaluating candidate vaccines, and the vexing issues of liability in the developed world and availability in the developing world.

While everyone hopes that this research will lead to an effective vaccine, I believe it worth mentioning the concern of some immunologists that the basic premise may not be entirely correct. The observations that the genome of HIV is detectable in only 1 in 50,000–100,000 lymphocytes of patients with AIDS and that only low levels of virus or reverse transcriptase can be found in seminal fluid and serum, raise the possibility that infection is acquired not only, or even primarily, from free virus, but through transmission of already infected lymphocytes, macrophages or spermatozoa. The apparent ability of HIV-encoded proteins to induce cell fusion and syncytia formation, particularly if an allograft reaction is mounted by the host against the intruding virus-infected cells, could enhance cell-to-cell transmission. This could greatly complicate the development of an effective vaccine because antibodies are generally ineffective in eliminating virus-infected or transformed cells. The immunologic problem would become how to eliminate already infected cells rather than to neutralize free virus. Currently the cell-mediated immune mechanisms involved in killing cells infected by acute and persisting viruses are less well understood than antibody-mediated phenomena, and they bring the complexity that the epitopes presented to T cells are at least as much a function of the individual's major histocompatibility antigens as of the structure of the viral proteins, and will vary from individual to individual.

In my judgement, recognition of this possibility would call for great caution in promising the public an effective vaccine in the short term, for intense efforts to ascertain whether the virus is transmitted primarily by infected cells or by free virus, and for greater consideration of cell-mediated immune strategies for developing immunity against virus infected cells. The hopeful aspect of these considerations is that if a vaccine can be developed that effectively and safely eliminates virus-infected cells, it could be effective therapeutically as well as prophylactically.

BARRY R. BLOOM
Department of Microbiology and Immunology,
Albert Einstein College of Medicine, Bronx, New York 10461, USA

Giant luminous arcs from gravitational lensing

SIR—The giant luminous arcs observed by Soucail *et al.*[1] and by Linds and Petrosian[2] have stimulated a number of speculations about their nature. In particular, in a recent News and Views piece, Paczyński proposed that they could be gravitationally lensed images of galaxies[3]. Although this proposition can be directly tested by measuring the redshifts of the arcs, the measurements are difficult because the arcs are faint.

So I have carried out an immediately available, if less conclusive test, which is to estimate an *a priori* probability for the proposition to be realized. Such an estimate may not be very meaningful for a giant black hole lens, because very little has been established observationally regarding the existence or numbers of such objects. Much more is known about clusters of galaxies, which are an alternative possibility as a suitable lens.

From available cluster statistics, there are about 2,000 possible clusters for such