BACK

Patient to patient transmission of HIV in a surgeon's private rooms: Invited deposition to the Royal Australasian College of Surgeons

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SUMMARY

In a letter to the Editor of the *Lancet*, (December 18th, 1993), Chant *et al* present details of what is described as a "compelling" case for patient to patient transmission of HIV that occurred in November 1989 and involved a male and four female surgical cases. In my view, the authors' conclusion cannot be made on the evidence currently available or the evidence they present. The *Lancet* letter does no more than affirm that four women and one man, who all attended a surgeon's rooms on the same day in November 1989, a day on which they were all of unknown HIV serostatus, were later discovered to be HIV seropositive. The HIV seropositivity detected, even if defined by the most stringent criteria available, cannot be regarded as proof of HIV infection or transmission (see below), but rather, should be regarded as evidence either that the presence or development of HIV antibodies is far more common in patients with skin lesions attending general surgeons than hitherto has been suspected or documented, or that "highly unlikely" events, such as the attendance of 1 male and 4 females all HIV seropositive, at the rooms of a surgeon on the same day, may occur. No scientific evidence has been presented that provides "compelling evidence" for the transmission of a retrovirus.

INTRODUCTION

It goes without saying that the most significant element of the authors' argument for transmission of HIV is based on the results of HIV antibody testing. In other words, in the five cases discussed, the authors appear to believe that the detection of HIV antibodies is synonymous with the presence, *in vivo*, of HIV. If this is the credible case then, as a *sine qua non*, there must exist a body of scientific knowledge which establishes beyond reasonable doubt that the HIV antibody tests, especially the HIV Western blot (WB), are standardised, reproducible and that their sensitivity and specificity have been authenticated. As in all tests used in clinical medicine, only after these conditions have been satisfied, can the tests be used meaningfully to predict the presence or the absence of HIV infection.

In June 1993 my colleagues and I published extensive evidence in the international journal *Bio/Technology*, a sister publication to *Nature*, where we argued that no scientific data has yet been presented confirming any of the above prerequisites. The paper examines data published by many renowned HIV/AIDS researchers and institutions and clearly shows that the HIV antibody tests are not reproducible, not standardised and that the specificity of these tests has never been established. We also presented evidence that similar criticisms apply in relation to molecular

techniques (HIV DNA/RNA/polymerase chain reaction (PCR)) and below is presented a brief summary of our paper regarding the HIV antibody tests as well as some additional relevant information.

THE HIV ANTIBODY TESTS

1. The HIV antibody tests are not standardised:
This is of particular importance in relation to the HIV WB, believed to be the most specific of the HIV antibody tests and widely used to "confirm" all other HIV antibody tests. WB are interpreted according to the presence of various combinations of particular antigen/antibody bands but, with little or no supporting data, different criteria are used by different laboratories to define positive results. Results which do not satisfy the positive criteria for a given laboratory, but which are not negative (no bands whatsoever), are reported as indeterminate. Thus it is possible for an individual tested in one laboratory to be positive, and when tested in another laboratory to be indeterminate, although in both cases the individual has antibodies that react with "HIV proteins".

2. The HIV WB is not reproducible, not even in HIV reference laboratories. (see figure 3 in our paper which illustrates the WB of a single serum sample tested in 19 different laboratories). Also, a given serum sample may test positive on one day and negative on another.

3. There is ample data attesting to the fact that none of the "HIV specific proteins" are specific to HIV.

4. In the AIDS scientific literature there are no data relating to the use of an authentic gold standard for HIV infection. A gold standard is the quintessential element in the verification of any diagnostic test and is the yardstick against which the "test" (in this case the presence or absence "HIV antibodies"), is judged able to discriminate between the presence or absence of HIV. It is obvious that for determining the presence of HIV, the gold standard for the HIV antibody tests can be none other than HIV itself. This means that:

    (i) the technique of HIV isolation must use the well established method for retroviral isolation as outlined in our paper, (but which to date has never been reported for HIV);

    (ii) attempts at HIV isolation must be made in many appropriate individuals, preferably thousands, while simultaneously determining the presence or absence of HIV antibodies;

    (iii) appropriate individuals include AIDS patients as well as healthy individuals and non-AIDS patients with clinical and laboratory abnormalities similar to AIDS. If the latter are not included there can be no assessment of the potential for antibodies produced for a variety of other reasons to cross-react with the so called HIV antigens, that is, to produce false positive reactions. Antibodies are renown for their ability to

interact ("cross-react")with antigens that are not the stimulus for their production.

Failure to utilise the authentic gold standard for HIV infection has resulted in several unresolved problems:

(a) The specificity of the HIV antibody tests cannot be assessed. Notwithstanding, the National HIV Reference Laboratory (and others) have adopted the practice of testing large numbers (5000) of blood donors but this cannot be regarded as a valid method of determining specificity because:

(i) in these presumably healthy individuals, the absence of HIV infection is not determined by the results of viral isolation (the gold standard), but is inferred by inappropriate clinical and laboratory data;

(ii) *a priori*, one would not presume Australian blood donors to possess antibodies that cross-react with HIV antigens.

Thus, in these healthy individuals, an incorrectly deduced, erroneously high estimate of HIV antibody test specificity will be obtained;

(b) the prevalence of HIV infection cannot be obtained. Together with specificity and sensitivity, prevalence is required to estimate the positive predictive value (PPV) of the HIV antibody tests, that is, when an individual is tested and is found to be HIV seropositive, the likelihood that this result is a true positive and indicates HIV infection (See reference 38 in *Bio/Technology* and *Addendum II*).

5. Eminent HIV/AIDS researchers also agree that the HIV antibody tests may not be specific. According to Philip Mortimer, Director of the Virus Reference Laboratory of the Public Health Laboratory Service, London, UK: "Diagnosis of HIV infection is based almost entirely on detection of antibodies to HIV, but cross-reactions between HIV-1 antigens and antibodies formed against other antigens may lead to false-positive reactions. *Thus it may be impossible to relate an antibody response specifically to HIV-1 infection* [italics mine]. Mortimer also points out that "In the presence of clinical and/or epidemiological features of HIV-1 infection there is often little doubt, but anti-HIV-1 may still be due to infection with other related retroviruses". However:

(a) the specificity of an antibody test for determining HIV infection can be determined only by the use of a gold standard, which in the case of HIV antibody tests can be none other than HIV itself. That such a gold standard does not exist is acknowledged by eminent HIV researchers. According to William Blattner, a leading and internationally respected epidemiologist from the

Viral Epidemiology Section, United States National Cancer Institute: "One difficulty in assessing the specificity and sensitivity of human retrovirus assays is the absence of a "final gold standard". In the absence of gold standards for both HTLV-I [claimed to be another human retrovirus] and HIV-1 [HIV], the true sensitivity and specificity for the detection of viral antibodies remains imprecise";

(b) clinical and/or epidemiological features cannot be used to "relate an antibody response specifically to HIV-1 infection".

But, even if we were to accept that the specificity of the HIV-1 antibody tests can be determined on this basis given that:

> (i) the female cases had no clinical features suggestive of AIDS (the transient abnormalities experienced by 3 cases are extremely common and do not constitute AIDS);
>
> (ii) there is no epidemiological evidence to even suggest that HIV can be transmitted from patient to patient (see below);

one cannot but conclude that in cases A, B, C and E "it is impossible to relate an antibody response specifically to HIV-1 infection", that is, these are false-positive results and do not indicate HIV infection.

6. This conclusion is further substantiated by consideration of the mathematics of test evaluation. Although AIDS experts consider the specificity of HIV antibody tests for HIV infection to be extraordinarily high, in the order of 99.5% to 99.9% specific, no AIDS expert claims that the tests are perfect, that is, 100% specific. This being the case, AIDS experts must therefore concede that there are some false positive tests and that a positive test is not due to HIV infection in every case. Although not commonly appreciated, in low prevalence populations, that is, populations where, *a priori*, HIV infection is uncommon, most tests which are positive by even the most stringent criteria, are false positives. For example, if the prevalence of HIV infection could be calculated and was, for example, to be 1/1000 for women with skin lesions attending doctors' rooms then, for HIV antibody tests that are 99.9% specific, half (50%) of the positive tests would not indicate HIV infection. If the HIV prevalence was 1/2000, two-thirds (67)% of positive tests would not indicate HIV infection. (See *Addendum II)*.

7. There is abundant independent evidence that antibodies present in AIDS patients which react with "HIV antigens" are non-specific. Some examples are: an HIV seronegative man became WB positive after immunisation with an HIV negative, Rh positive serum. (Haemophiliacs, the majority of whom test HIV positive but who rarely develop AIDS indicator diseases, are also exposed to foreign proteins [including the immunoglobulins] of 2000-30,000 individuals each time they are treated with one unit of factor VIII concentrate); although Luc Montagnier, the discoverer of HIV regards p24 as the most specific HIV

protein, antibodies to HIV p24 are present in 1/150 healthy individuals, 13% of randomly selected individuals with generalised warts, 24% of patients with cutaneous T-cell lymphoma and prodrome and 41% of patients with multiple sclerosis; 30% of individuals who receive WB negative blood develop antibodies to p24, while both donors and recipients remain healthy; blood collected from healthy HIV seronegative individuals when irradiated and re-transfused is followed by the appearance of antibodies to HIV p24 and p17/18; uninfected mice immunised with lymphocytes from other healthy uninfected mice develop antibodies to the HIV p24 and p120 proteins--the latter protein, (now known to be an oligomer of p41, an HIV glycoprotein), is regarded by Robert Gallo as the most specific HIV protein; normal human serum contains natural antibodies which react with the HIV p41 and p120/160 glycoproteins; mitogenically stimulated cultures of peripheral B-cells obtained from 14/26 HIV seronegative individuals and from whose blood peripheral mononuclear cells were also HIV PCR negative, produced antibodies to HIV p66 and p120/160.

HIV CULTURE

The results of viral culture were not reported in the *Lancet* letter. However, in relation to HIV culture both in general and as a gold standard for assessing the specificity of the antibody tests, there are several important observations:

1. By "HIV isolation" is meant the **detection** of virus-like particles, reverse transcription (RT), p24 or bands on WB strips. These cannot be considered to be viral isolation, and in fact, none of these phenomena are specific to HIV. Some are not even specific to retroviruses.

2. Even if we accept that these phenomena are HIV specific, it is not possible to "isolate" HIV from between 17-80% of HIV seropositive cases.

3. The detection of HIV p24 in cultures, (currently a popular and accepted method of "HIV isolation"), using unfractionated blood, yielded positive results in 49/60 (82%) of "presumably uninfected but serologicaly indeterminate" individuals and 5/5 "seronegative blood donors".

4. As far back as 1988 the United States Center for Disease Control (CDC) realised that no correlation exists between "HIV isolation" and a positive antibody test (which the CDC referred to as "documented infection")--"correlation between these two methods is limited; they are inconsistent, in that virus cannot be detected in every person with documented infection".

5. When no efforts are spared, HIV can be cultured from individuals who are persistently antibody negative and at no risk for HIV infection/AIDS.

   [As far as molecular studies (HIV DNA/RNA/PCR) are concerned, there are many reasons why these cannot be used to confirm case to case transmission of HIV or even to diagnose HIV infection. In fact, researchers from the Pasteur Institute who have performed the majority of genomic studies, reported both in 1989 and 1992 that "the task of defining HIV in molecular terms will be difficult".

This is a view also shared by Kary Mullis, recipient of the 1993 Nobel prize for Chemistry, who invented the PCR].

6. The non-specificity of the p24 antigen test is so obvious that it is accepted by no less an authority on HIV testing than Philip Mortimer and his colleagues from the UK Public Health Laboratory Service, "Experience has shown that neither HIV culture nor tests for p24 antigen are of much value in diagnostic testing. They may be insensitive and/or non-specific".

EXAMINATION OF OTHER EVIDENCE

For the sake of argument, let us assume that the HIV antibody tests are both 100% sensitive and specific for the presence *in vivo* of HIV. Then, on the index day (ID), the following are necessary but not sufficient conditions for proving "cross-infection from case D to A, B, C and E":

(a) there was evidence case D was HIV positive;
(b) there was evidence cases A,B,C and E were HIV negative;
(c) there was evidence case D was the first case on the surgeons's operating list and;
(d) both before and after the ID, cases A,B,C and E had no other reasons for being at risk for the development of HIV antibodies.

According to the evidence presented, the HIV serostatus of all cases, including case D, was unknown on the index day. The fact that cases A and C were known to be HIV negative months to years prior to the ID, and, at these times, cases B and E were of unknown status, cannot be construed as evidence that any or all of these cases were seronegative on the ID. Some additional points are:

(i) why was case A, who was detected as HIV positive in December 1992, deemed to have become "seropositive between June 1989, and November, 1990"?

(ii) why and when was case B, a lady in her late seventies, tested for the presence of HIV antibodies?

There is no evidence that case D was the first case on the operating list, the authors "suspect that case D was operated on before the other 4 on the index day". In fact, if the "experienced specialist surgeon" had planned his list prior to or even on the ID, he may well have followed the usual practice of putting the "infected discharging epidermoid cyst" (case D), last. If this was so, there would be no case against D. If case D occupied other positions on the list then some of the other four cases cannot have been "infected" by case D.

OTHER POINTS IN RELATION TO CASE TO CASE TRANSMISSION

1. The authors of the report stated that "some failure of infection control procedures resulted in cross-infection from D to A, B, C and E". However, they were unable to specify the nature of this failure. Thus we must speculate:

(i) the surgeon was untruthful in his description of his sterilisation procedures;

(ii) foul play;

(iii) the procedures are not sufficient to kill HIV;

(iv) the surgeon was not aware that he was not faithfully following his own procedures.

It is inappropriate to speculate on (i) or (ii), and it is believed that the sterilisation methods described are sufficient to kill HIV. However, it is possible that the surgeon may have been less than perfect in his instrument and/or field preparation. The possibilities include the presence of a contaminated vector that was used unchanged for each case, or that the same vector was reused but subject to imperfect sterilisation and/or dilution after each procedure. It is difficult to see how an experienced general surgeon who presumably had no previous problems with cross-infection, could fail to notice the use of the same unaltered vector on five consecutive occasions. If the same vector was reused on each occasion it is difficult to see how it carried an unnoticed inoculum at the beginning of the second procedure but could still prove effective after four passages through a sterilisation/dilution process, even if the sterilising medium was imperfect.

2. The authors of the *Lancet* letter state "the probability, by chance alone of 1 male and 4 females with HIV infection attending the one session is no greater than $5X10^{-14}$". However:

(a) it is impossible for the authors to derive the probability of HIV infection without the use of an HIV gold standard as this is required to derive the specificity of the tests and the prevalence of HIV infection. No such data exists;

(b) if the authors are referring to the probability of five instances of detection of HIV antibodies, neither can this be calculated since the prevalence of HIV antibodies either in the general population or in the population of persons with skin lesions attending general surgeons is unknown. HIV antibody tests are not performed in the absence of "clinical and/or epidemiological features" and not without permission of the patient. Thus, the seroprevalence in a random sample of the population or a population subgroup is unknown. If it were possible to calculate the prevalence of HIV infection it is likely, as the authors state, that "HIV infection in women in NSW is uncommon". Thus the majority of positive antibody tests will not indicate HIV infection, even if the specificity of the HIV antibody tests is 99.9% (see above and *Addendum II*);

(c) the statistic in no way whatsoever implicates case D as the source of

"HIV transmission". In fact, there are many ways in which case D could be exonerated from being the source of the "HIV transmission" of which all five cases being HIV seropositive is only one. For example, case D would be exonerated if all four female cases were seropositive on the index day, regardless of the serostatus of case D. None of the evidence presented justifies the statement that "some failure of cross-infection control resulted in cross-infection from D to A, B, C, and E" and this statement, in my opinion, is unwarranted and unethical.

(d) some observers would regard a probability of 1/200 as signifying an unlikely event but this is the probability that from four Australian adult females chosen at random, any two will be blood donors. Two of the four females cases in the present report were blood donors and obviously, the circumstances outlined in the letter to *Lancet* make the probability of this event even less likely;

(e) the authors do not appear hesitant in accepting illnesses experienced by three female cases who attended the same surgeon on the same day in November 1989, as "HIV seroconversion illness", although "HIV seroconversion illness", as shown by large prospective cohort studies, is an unusual accompaniment of HIV seroconversion, and the female cases' symptoms are explained by far more common pathologies.

3. On a global scale, since 1981, many surgeons and other practitioners have operated on similar patients under similar conditions and therefore one would expect many more reports of this nature in the medical literature. In New South Wales, over the past ten years, it has been reported that 66 million operative procedures have been performed. If we assume:

(a) the same rate per head of population of surgery in the United Kingdom, the rest of Europe and in the United States;

(b) the average population in all these countries over the past ten years is equal to the 1983 population (714 million);

one can conservatively estimate that over the past ten years, 10 billion surgical procedures have been performed. But, as the authors admit, "There have been no previous reports of between-patient HIV transmission associated with surgical procedures", that is, no reports of even a single instance of HIV transmission between two, not four patients. Thus it is reasonable to assume that the likelihood of the occurrence of four consecutive cases of patient to patient transmission of HIV is virtually zero, which means that the likelihood of coincidental HIV seropositivity, an event which the authors regard as "highly unlikely", is many orders of magnitude greater.

4. The data available precludes any accurate estimate of the HIV inoculum size.

Although otherwise possible, it appears likely that the putative inoculum was small, perhaps microscopic, perhaps of "needlestick size", and since the authors report make no contrary comment, it is reasonable to assume that their conclusion is not contingent upon a critical inoculum size. Arguing from this perspective and assuming that for each case the circumstances operating resulted in a similar pathogenic potential to a needlestick injury, and that there is scientific proof of a causal relationship between needlestick injuries and HIV seroconversion (but see *Addendum I*), the following comments are pertinent:

(a) Of the estimated 800,000 needlestick injuries occurring annually in United States hospitals, seroconversion occurs after 6-30% of hepatitis B virus exposures and after 0.4% (1/250) of HIV exposures;

(b) assuming they are independent events, the risk of all four patients seroconverting is $(1/250)^4$, that is, $2.65X10^{-10}$;

(c) The majority of gay AIDS patients are hepatitis B (HBV) seropositive. If case D was HBV positive and if it were fact, rather than the authors' suspicions, that "case D was operated before the other 4 on the index day", one would expect a strong association between "the transmission of HIV" and the transmission of hepatitis B virus. If case D was HBV seropositive, because of the 15-75 times greater likelihood of HBV transmission, it would be enigmatic for all four female patients to become HIV seropositive following the index day and none become HBV seropositive, especially since case D was in his early sixties and if HBV positive is more likely to be infectious;

(d) case D was reported as having an "infected discharging epidermoid cyst". Surgeons do not need to be reminded that despite the best intentions and the most careful operative technique, excision of such cysts, especially if thin walled or ruptured, is often difficult to perform without some degree of seepage or spillage of the cyst contents which always mixes with the blood shed after skin incision and cyst dissection. If the spillage was small, even if microscopic, and, in the circumstances that permitted "patient to patient transmission of HIV", it would not be unreasonable to expect at least some the four female cases to develop some degree of wound infection. In fact, patient to patient transmission of bacteria would seem to be more likely under the conditions postulated during these operations than any other outcome, and would at least provide corroborative evidence of the fact of physical contact between case D's tissues and all the other cases.

(e) the surgeon categorically denies use of a multi-dose local anaesthetic vial.

5. According to the report " A structured interview with cases A,B C and E *or* their relatives, and review of their medical records, did not elicit recognised HIV risk factors" [italics mine]. However:

(a) studies clearly indicate that risk factor status changes with subsequent interviews;

(b) information about risk factor status from relatives cannot be considered consequential;

(c) the details required for risk factor analysis are not likely to be present in medical records, especially those obtained by surgeons;

(d) given:

(i) that non-parenteral cocaine use is associated with high seroprevalence rates for HIV;

(ii) published evidence that in one woman, cessation of exposure to semen (anal, oral as well as vaginal), was followed by HIV sero-reversion (from positive to negative), suggesting that factors other than HIV may cause seropositivity (with HIV "once infected, always infected");

were these practices considered "recognised risk factors for the investigators"?

6. Case D was presumed to be HIV positive on the index day because he had a low (290/uL) CD4 count in September 1990. (normal >500/uL). However:

(a) CD4 counts are not reproducible. In one study, patient measurements repeated by one laboratory within 3-days showed a "minimum $CD4^+$ cell count of 118 cells/mm^3 and a maximum $CD4^+$ cell count of 713 cells/mm". In the Multicenter AIDS Cohort Study, consisting of 4954 "homosexual/bisexual men", it was stressed that physicians and patients should be "aware that a measured CD4 cell count of $300X10^6$/L really may mean it is likely that the "true" CD4 cell state is between 178 and $505X10^6$/L";

(b) low CD4 counts are not proof of HIV infection. Many seronegative gay men have low CD4 counts and a recent study of IV drug users in New York showed that a CD4 count of <500 cells/uL was a risk factor for seroconversion and not *vice versa*;

(c) in gay men seroconversion ("HIV infection") is well known to occur *after* the development of low T4 cell counts;

(d) even if case D had a low T4 cell count on the ID, that is, ten months prior to having a T4 cell count of 290/uL, this does not prove he was unhealthy on the ID. One study found that 5% of healthy persons seeking life insurance had abnormal T4 cells counts, and that "In a subgroup of patients, the low T-cell numbers or ratios appear to be stable findings". The authors concluded: "In the absence of a history of a

specific infection or illness or major abnormalities on a physical examination, it is not worthwhile to attempt to find a specific cause for the abnormality of T-cell subsets...A uniform approach to this problem throughout the medical community will help alleviate patients' anxiety and reduce the concern of the insurance industry about this relatively common problem";

(e) unless the diagnosis of *Pneumocystis carinii* pneumonia in case D was established by lung biopsy, one must question whether this patient had AIDS;

(f) even if, on the ID, case D had *Pneumocystis carinii* pneumonia definitely diagnosed, this is not proof of HIV infection since the 1987 AIDS definition permits a diagnosis of AIDS under this circumstance even if the patient has "laboratory evidence *against* HIV infection" [italics mine], including being HIV seronegative, and regardless of CD4 counts.

7. At least two of the four female cases were reported as blood donors. In the United States, using the most stringent (Food and Drug Administration) criteria for WB interpretation, [p24 *and* p32 *and* (p41 or p120 or p160) bands], 127/1306 (10%) of low risk controls including "specimens from blood donor centers" had a positive WB. (In the United States blood donors are paid and are therefore not strictly comparable to Australian blood donors but arguably, they may be more representative of patients attending physicians in Australia).

8. In the United States, over an eighteen month period in 1988/89, analysis of 89,547 anonymously tested blood specimens from hospitals in 21 cities showed an overall HIV seroprevalence rate between 0.1% to 7.8% (ELISA confirmed with WB). At the five hospitals with the highest seroprevalence rate, the median male to female ratio was only 2.9. It is important to note that this study not only excluded patients from the known AIDS risk groups but also those with even meagre HIV/AIDS risks including "gunshot and knife wounds, conditions which have been reported to be associated with a higher than expected rate of HIV-1 seroprevalence". The relatively high seropositive rates in a large number of low-prevalence hospital patients is greatly at odds with the number of AIDS cases reported among heterosexual females and are therefore most likely to be false positive test results. The list of conditions excluded in this study is HERE.

CONCLUSION

The lack of data relating to a gold standard for HIV infection means that the relationship between HIV serology and HIV infection is unknown. Thus the presently available data does not permit the use of HIV seropositivity as proof of HIV infection or HIV transmission. The additional evidence presented by the authors of the report does not provide necessary and sufficient evidence for the conclusion reached. The HIV seropositivity observed in the four female cases is explained either by the occurrence

of a set of observations that the authors did not expect, or that HIV seropositivity is more common than previously appreciated. These data argue strongly against the notion that antibodies to "HIV" are proof of infection with "HIV".

NOTE

This article was written in early 1994 and forwarded to the Royal Australasian Surgeons Task Force set up in response to the *Lancet* report. Although the Committee replied in writing that it would comment on these views, no further correspondence was received.

ADDENDUM I RE NEEDLESTICK INJURIES

Proof that needlestick injuries cause HIV seroconversion ("HIV infection"), requires the same burden of proof as that detailed above. No such proof has ever been presented and the belief that there is a particular measurable risk of "transmitting HIV infection" following needlestick injuries is only an estimate based on very problematic evidence.

For example [1], for twelve months post-exposure, the US Center for Disease Control (CDC) serially tested 963 Health care workers exposed to the blood of body fluids of AIDS/HIV patients and found that 4 seroconverted. The CDC concluded that the risk of seroconversion after such incidents is therefore 0.42%. The exposures were mostly from AIDS patients (85%), and consisted of needlestick injuries (80%), cuts with sharp objects (8%), open-wound contamination (7%), and mucous membrane exposure (5%). However:

1. In an unspecified number of "source patients", a number which may be as high as 85% of such patients, confirmation of HIV infection was made by a "diagnosis of AIDS", not by HIV serology.

2. The criteria for a positive WB (seroconversion) were the presence of both p41 and p24 bands, which are not stringent criteria for a positive WB. In Australia these would not be regarded as a positive test.

3. Of the four cases who seroconverted, one was first tested ten months post-exposure, and was not further discussed.

4. The CDC did not similarly test a control population, that is, a similar number of healthcare workers not exposed to "blood or body fluids from persons infected with the human immunodeficiency virus (HIV)", but who were in all other ways identical to the test group including their exposure to foreign proteins (see below). Notwithstanding, the seroprevalence rate reported in the healthcare workers, 0.42%, is no higher than that in the United States general population [2]. This implies that in healthcare workers, exposure to the blood of AIDS patients, does not incur any additional risk for seroconversion.

5. Post-exposure, but before evidence of seroconversion was obtained, an unknown number of individuals were also exposed to foreign proteins (immune globulins and hepatitis B vaccine).

6. The analysis of healthcare workers included patients with known risk factors for HIV infection (6 bisexual men, 4 IV drug users and 6 who had contact with a person at risk for HIV infection).

7. None of the three individuals discussed who seroconverted had p24 detected in their serum.

8. The three seroconversion patients discussed had "viral cultures" performed (detection of p24 and reverse transcriptase). Two were negative on all

occasions tested and one was initially positive, then negative, then positive.

9. Detection of reverse transcriptase and p24 are not specific to HIV.

10. There were no instances of seroconversion after 103 episodes of contamination of mucous membranes or nonintact skin.

11. The authors commented that "the workers might have denied other kinds of high-risk behaviour".

12. The authors of this paper referred to studies similar to their own where no instances of seroconversion occurred.

Also, it is important to note that "About 5% of the cases of AIDS and HIV infection in the United States have occurred in health care workers, a percentage that has remained stable over time. Nearly all of these infections are related to lifestyle factors, not occupational risk" [3].

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ADDENDUM II RE FALSE POSITIVE RATES

Consider a large city with a population of 1 million individuals.

Assume 1/1000 of this population is known to be HIV infected, that is, by some means, HIV, the virus itself, can be proven present in one in every thousand individuals from this population.

Assume the HIV antibody test is 100% sensitive, 99.9% specific.

In the population there are 1000 infected persons, (1,000,000*.001).
All these persons are HIV antibody positive. (Test is 100% sensitive, that is all infected persons have a positive test).

99.9% specificity means that 99.9% of non-HIV-infected persons will have a negative HIV antibody test. Thus, 0.1% of the 999,000 (1,000,000-1000) non-HIV-infected persons, 999 persons, will also have a positive HIV antibody test.

Thus, in the sample of 1,000,000 persons there are 1999 antibody positive persons, 1000 who are HIV-infected and 999 who are not.

Thus, (999/1999), 50%, of the positive tests do not signify HIV infection.

If these figures are repeated on the same population assuming:

specificity 99.7%, 99.6%, 99.4%, 99.2%, 99.0% then only 25%, 20%, 14%, 11%, 9% of positive tests signify HIV infection.

If the prevalence is 1/2000, for the same specificities, only 14%, 11%, 8%, 6%, 5% of positive tests signify HIV infection.

It is apparent in these examples that the specificity of the HIV antibody tests needs to be extraordinarily high in order that positive tests indicate HIV infection.

These prevalence rates are realistic for Australia.