Int J Leg Med (1991) 104:109–110

International Journal of
Legal Medicine

Postmortem viability of the human immunodeficiency virus*

K. Püschel[1], F. Mohsenian[1], R. Laufs[2], S. Polywka[2], and M. Ermer[2]

[1]Institute of Forensic Medicine, University of Hamburg, Butenfeld 34, W-2000 Hamburg 54, Federal Republic of Germany
[2]Institute of Microbiology and Immunology, University of Hamburg, Martinistrasse 52, W-2000 Hamburg 20, Federal Republic of Germany

Received June 6, 1990 / Received in revised form September 10, 1990

Summary. In 1989 blood samples from 2581 fatalities investigated at the Institute of Forensic Medicine in Hamburg were screened for HIV-1-antibodies. Sera from 13 corpses were confirmed positive for HIV-1 (prevalence rate approx 0.5%).-Viable HIV was found in blood cultures of 4 cadavers stored under non-refrigerated conditions up to 36 hours after death.

Key words: HIV-1-infection – HIV-1-cultivation – Viability of HIV – HIV, occupational risk – HIV in postmortem specimens

Zusammenfassung. Im Jahre 1989 wurden Blutproben von 2581 in das Institut für Rechtsmedizin der Universität Hamburg eingelieferten Leichen auf HIV-1-Antikörper untersucht. 13 Fälle (Prävalenz 0.5%) waren HIV-positiv. – Die Virusisolierung aus Vollblut war bei 4 Verstorbenen bis zu maximal 36 Stunden postmortaler Leichenliegezeit ohne Kühlmaßnahmen erfolgreich.

Schlüsselwörter: HIV-Infektion – HIV-1-Anzüchtung – Überlebenszeit des HIV – HIV, postmortale Infektionsgefahr – Autopsie, HIV

Introduction

Sudden and unexpected deaths and unnatural deaths of persons at high risk of acquiring HIV-1-infections, especially intravenous drug abusers, must be investigated by forensic autopsy [2, 5, 6]. The long-term stability of HIV-antibodies even in putrefied cadavers and in vitro in stored blood samples (for years at 4°C) has been described by many authors [3, 4, 7]. However, until now there has been a lack of adequate information about the viability of the virus in an HIV-infected corpse and about the risk of transmission of the AIDS-virus during autopsy procedures and handling of postmortem specimens and body fluids.

* This study was supported by a grant from the Ministry for Research and Technology of the Federal Republic of Germany (FKZ Nr. I-077-89)

Offprint requests to: F. Mohsenian

Materials and methods

In 1989 all corpses that were brought to the Institute of Forensic Medicine in Hamburg (sudden unexpected deaths and unnatural deaths in the city) were tested for HIV-1-antibodies. Only highly putrefied cadavers were not examined. If possible, 2 blood samples were taken from the vena femoralis within 12 h of arrival. One of these samples was transported to the laboratory and investigated at once. Positive results in the ELISA (enzyme immunoassay, testkit Organon-Teknika) were confirmed by the immunofluorescence test (self-production) and Western Blot (Dupont).

Cultivation of HIV-1 from the second blood sample that had been stored at 4°C was initiated after positive result by the ELISA. The following method was used: lymphocytes were separated in Ficoll. Cells were washed twice in RPMI 1640 and resuspended in 10 ml RPMI 1640 containing L-glutamine, 80.000 µ/l penicillin, 80 mg/l streptomycin, 15% fetal calf serum and 5 mg/l phythemagglutinin. Lymphocytes were cultivated in this medium for 3 days and then co-cultivated with peripheral mononuclear cells derived from HIV-seronegative donors. The lymphocytes were stimulated with 10% interleukin 2. Cultures were observed for 28 days for the appearance of giant cells. The cell culture medium was renewed twice weekly. – An aliquot of supernatant was centrifuged at 4000 rpm for 15 min. Supernatants were concentrated (5 ml supernatant + 2.4 ml PEG (30%) + 100 µl 4 *M* NACL) for at least 2 hours at 4°C. Samples were re-centrifuged at 4000 rpm for 15 min and the pellet was re-dissolved in 500 µl cell culture medium and tested for p24 antigen by commercial ELISA (Dupont). A culture was considered positive for HIV-1 if the supernatant samples were positive for p24 antigen.

Results

In 1989 a total of 2581 fatalities were tested for HIV-1-antibodies. Sera from 13 corpses (prevalence rate 0.5%) proved positive by the ELISA (see Table 1 and 2). Detailed data concerning the autopsy material and the HIV-1 prevalence in this region are described and discussed elsewhere [5, 8].

Table 1. Results of anti-HIV and antigen tests

Case number	Place where dead body was found	Time of taking blood (hours post mortem) at room temp.	Presence of anti HIV-1		Immunoblot: positive results in antibody response to the following core and surface antigens of HIV	Presence of HIV-1 p24 antigen
			EIA	IFT		
1	in bed at home	24 h	+	+	17/24/31/41/66/120/160	−
2	in bed at home	24 h	+	+	17/24/31/41/55/66/120/160	−
3	in a public toilet	24 h	+	+	24/41/55/66/120/160	−
4	in bed at home	36 h	+	+	24/31/41/55/66/120/160	+ (460 E/ml)

EIA: Enzyme-Immunoassay
IFT: Immunofluorescence test
+: Positive result
−: Negative result

Table 2. Results of virus cultivation

Case number	Time elapsed after death before cultivation of the blood sample (in days)	Proof of p24 antigen in the supernatant	Postmortem persistence of the virus	
			a) in the cadaver	b) incl. blood-storage at 4°C
1	2 days	after 4 days	24 h	2 days
2	4 days	after 17 days	24 h	4 days
3	4 days	after 7 days	24 h	4 days
4	2 days	after 8 days	36 h	2 days

In 9 cases cultivation of HIV-1 was carried out from the second blood sample. In the remaining 4 cases there was insufficient material for cultivation.

In 4 of these 9 cases the cultures were positive for HIV-1 after 4, 7, 8 and 17 days as were the supernatants that proved positive for p24 antigen in the ELISA. − Only 1 serum sample, tested directly after death, gave positive results for p24 antigen using ELISA. These 4 corpses had been brought to the Institute 1 to 2 days after death; the exact hour of death was unknown.

The deceased were 2 homosexuals and 2 intravenous drug addicts who had died after accidental or suicidal intoxication. Only 1 person (case no. 4) had clinically suffered from fullblown AIDS (Pneumocystis carinii-pneumonia, cryptosporidical enteritis, oesophagitis candidiasica, cytomegalo-retinitis). The other 3 persons showed no clinical manifestations. The autopsy revealed generalized hyperplasia of lymph nodes and marked hyperplasia of the spleen.

Discussion

In a similar investigation Henry et al. [1] were able to isolate viable HIV in serum from blood samples obtained at clinical autopsy 18 h after death.

The results of this study show a persistence of HIV in cadavers stored under non-refrigerated conditions up to 36 h after death and in stored blood samples for several days. Moreover it should be emphasized that Penning et al. [4] pointed out that body fluids and tissues of HIV-infected corpses are potentially infectious as long as 1 week after death.

These studies underline the need for caution during autopsy and the handling of postmortem specimens and body fluids.

References

1. Henry K, Dexter D, Sannerud K, Jackson B, Balfour H (1989) Recovery of HIV at autopsy. N Engl J Med 321:1833
2. Janssen W, Trübner K, Püschel K (1989) Death caused by drug addiction: A review of the experiences in Hamburg and the situation in the Federal Republic of Germany in comparison with the literature. Forensic Sci Int 43:223–237
3. Klatt EC, Shibata D, Strigle SM (1989) Postmortem enzyme immunoassay for human immunodeficiency virus. Arch Pathol Lab Med 113:485–487
4. Penning R, Tutsch-Bauer E, Beer G, Gürtler L, Spann W (1989) HIV-Infektion bei gerichtlichen Leichenöffnungen. Beitr Gerichtl Med 47:23–29
5. Püschel K, Mohsenian F, Bornemann R, Bschor F, Schneider V, Penning R, Spann W, Karger J von, Madea B, Metter D (1990) HIV-1-Prävalenz bei Drogentoten in verschiedenen Großstädten der Bundesrepublik Deutschland und in Westberlin zwischen 1985 und 1988. Z Rechtsmed 103:407–414
6. Püschel K, Lieske K, Hashimoto Y, Karch H, Laufs R, Racz P, Janssen W (1987) HIV-infection in forensic autopsy cases. Forensic Sci Int 34:169–174
7. Püschel K, Lieske K, Janssen W, Racz P, Karch H, Laufs R (1987) AIDS-Diagnostik unter postmortalen Bedingungen. Beitr Gerichtl Med 45:129–134
8. Püschel K, Penning R (1990) HIV-1-Prävalenz bei rechtsmedizinisch untersuchten Todesfällen (Hamburg und München 1989). Beitr Gerichtl Med 48 (in press)