

# **OCCUPATIONAL TRANSMISSION OF HIV**

## **Summary of Published Reports**

**December 1999 Edition  
DATA TO JUNE 1999**

**PHLS AIDS & STD Centre at the Communicable Disease Surveillance Centre  
& Collaborators\***

\* Contributors are listed on page 4/5/6

Latest version will be available at  
PHLS web site on <http://www.phls.co.uk>

Contact details:  
PHLS AIDS & STD Centre  
61 Colindale Avenue  
London NW9 5EQ  
United Kingdom

Tel: 44-0208-200 6868 Extensions 4459/4462  
Fax: 44-0208-200 7868 Email: [bevans@phls.nhs.uk](mailto:bevans@phls.nhs.uk)

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# Occupational transmission of HIV Summary of published reports to June 1999

## Explanatory notes and commentary

### Background

Since the first case of documented seroconversion after a specific occupational exposure to HIV was reported in 1984<sup>(1)</sup>, national or regional systems for the surveillance of occupationally acquired HIV infection have been developed in most of the countries mentioned in these summary tables. These tables contain details of all the published cases of occupationally acquired HIV infection of which we are aware (tables 3 and 4), but the true incidence of occupationally acquired HIV infection is unknown, and is likely to be much higher. Early case descriptions appeared in mainstream journals but newly recognised cases are now likely to be included in aggregate data in routine surveillance output from national or regional surveillance centres, rather than being the subject of a detailed report in a peer reviewed journal, and, inevitably, some loss of detail results. Cases may be reported late to national centres, or not reported at all.

### Case definition

Cases of occupationally acquired HIV infection are usually categorised as either "definite" or "possible", but the definitions used vary slightly from country to country. Tables 3 and 4 have been compiled by listing cases according to locally used definitions, rather than applying the definitions in use in the UK. New information may become available to investigators after a case report has been published. This may lead to reclassification of a possible case as either a definite case or as non-occupationally acquired. Some of the changes between this edition of the summary tables and the previous one reflect this.

There is little variation between countries on what constitutes a "definite case". A "definite case" is one for which there is documented evidence of HIV seroconversion (a recorded negative result of a test for anti-HIV followed by a subsequent positive result) temporarily associated with a specific occupational exposure to a source of HIV. Most of the cases included in table 3 fulfil this definition. Sometimes, however, the HIV infectivity of the source may have been inferred, rather than documented. Alternatively, the specific exposure incident leading to HIV infection may have passed unnoticed or unreported, or the source may not have been precisely identifiable, but subtyping or genotyping of HIV from an infected health care worker may have shown the strain to be indistinguishable from that of the putative source (see case A21, Table 3 Appendix).

The definitions used by different countries for "possible" cases are more variable. In general, the term implies that a health care worker has been found to be HIV infected, and that subsequent investigations have revealed no other identified risk for infection other than occupational exposure. In the UK, a restrictive definition of "possible" is used, requiring likely exposure to an HIV infected source, and criteria are stringently applied, so that the term "probable" might better describe the UK cases.

Categorisation of health care workers by occupation also varies from country to country, as do the tasks which different groups of health care workers undertake. In France, Italy and Spain, venepuncture is usually undertaken by nurses, whereas in the United States, venepuncture is performed by phlebotomists, who are categorised as clinical laboratory workers.

Large numbers of cases are reported from Germany including several with "occupational work area" exposure. The excess of male cases amongst these (all the update ones in Table 4 are male) would suggest that some of these may have additional risk factors. Other countries use the possible occupational tables more to record 'probable' cases.

## **Update**

Since the publication of the last summary of published reports on occupational transmission of HIV (December 1997 edition), 6 new definite cases and 24 possible cases have been reported. Additional information has been added to a number of cases, duplicated cases taken out and some cases have been recategorised. Table 9 has not been updated from the previous version. Two additional tables (Table 3 Appendix & Table 4 Appendix) have been put in to show details of documented and possible cases in the USA published in literature. Diagrammatic representation in table 7 and 7a remains the same but the case numbers have been altered.

Even given the delay in reports reaching the international literature and/or national surveillance centres there have been only a small number of new definite cases (6) since these tables were last updated. This would suggest that in countries with either the ability to treat their diagnosed HIV infected population or to use post exposure prophylaxis it has resulted in this fall. The incidence of blood exposures falling could be due to better implementation of prevention. In countries with much more extensive epidemics, treatment is often non available (or far less readily accessed) and diagnosis and reporting of occupational exposure is not reported – hence comparisons are not possible.

## **Risk by country and adequacy of surveillance systems**

The occupational risk of HIV infection depends on the population prevalence of HIV infection and working conditions and it is impossible to get accurate worldwide figures for definite or possible occupational transmissions as the data is dependent on the adequacy of reporting systems. 92% (291/316) of all occupationally acquired infections have been reported from countries with well developed surveillance systems most of which have low HIV prevalences. The numbers of definite occupationally acquired cases reported are proportionate to the incidence of AIDS cases in these countries (table 5). Only 5% of definite cases were reported from African countries however, and there is a striking absence of reports from countries in the Indian subcontinent and South East Asia. In many of these countries, the prevalence of HIV is high, but systems for monitoring and reporting occupational exposure are poorly developed or do not exist, and the information in this report cannot be used to evaluate the occupational risk in such settings. It is noteworthy that seven of the eight UK health care workers with possible occupationally acquired HIV infection had been working in high HIV prevalence countries in Africa.

## **Health care worker involved**

Nurses and clinical laboratory workers together accounted for 72% (73/102) of the definite occupational HIV infections, and 39%(85/217) of the possible cases, whereas surgeons and dental workers accounted for 11% (23/217) of the possible cases but only 1% (1/102) of the documented cases. Doctors, including medical students, but excluding surgeons, accounted for 14% (14/102) of the definite cases and 11% (23/217) of the possible cases (see table 6).

## **HIV transmission rates following single exposures**

Information from follow up studies of exposed health care workers (tables 1 and 2) suggests that the overall rate of HIV transmission from a single percutaneous (eg needlestick) exposure to HIV infected blood is around 0.31% (1 in 319). This compares with a transmission risk of around 1 in 3 for an unvaccinated person who has an equivalent exposure to a hepatitis B e antigen positive individual<sup>(2)</sup>, and a risk of around 1 in 30 after an equivalent exposure to hepatitis C virus<sup>(3)</sup>.

The risk of seroconversion after a mucocutaneous exposure to HIV infected blood is estimated to be about 0.03% (1 in 3000), much lower than the risk estimated for percutaneous exposure. Some percutaneous exposures to HIV may be of higher risk than others however. A recent case control study identified the following risk factors for seroconversion: injury by a device visibly contaminated with blood; injury with a needle that had previously been placed directly in the source patient's

artery or vein; a deep injury, and exposure to a source patient with late stage HIV infection. Among the 48 source patients where clinical status is documented, 32 (66%) had AIDS. These increased risks are probably associated with relatively larger volumes of blood (more blood is transferred by a hollow needle than a solid one, and a hollow needle used for venepuncture is more likely to contain blood than a hollow needle used to give an intramuscular injection) and to a relatively high viral load in the source patient.

Table 8 shows there have been 28 case reports of PEP failure (22 in health care workers and six to other individuals exposed percutaneously). A recent follow up in the USA of two supposedly PEP failures show how complex situations can become<sup>4</sup>.

### **Risks to patients**

Two HIV infected health care workers have now been shown to have transmitted HIV infection during exposure prone procedures: a dentist in Florida and, more recently, an HIV-infected orthopaedic surgeon in France. A summary of results of published lookbacks is found in table 11.

Patients may also be put at risk of HIV infection by inadequacies in infection control. Iatrogenic transmissions are summarised in table 11. Though many of the incidents occurred in resource poor countries, iatrogenic patient to patient transmission of HIV has been reported from the United States, Australia, and Denmark.

### **Contributors**

This tabular summary of information relevant to occupationally acquired HIV was developed by others at CDSC. A particular debt of gratitude is owed to all involved in this work and previous versions of these tables, especially Dr J Heptonstall<sup>(5 to 7)</sup>. Those involved in the production of this version were Mrs W Duggan, Dr BG Evans, and Dr D Abiteboul (GERES, Paris). Thanks are given also to Ms J Farley who patiently typed the tables. We also acknowledge the input of individuals from other National Surveillance Centres.

We would like to be informed of errors or omissions.

Correspondence should be addressed to Dr BG Evans, PHLS AIDS & STD Centre CDSC, 61 Colindale Avenue, London NW9 5EQ (email bevans@phls.co.uk).

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(7) Heptonstall J, Porter K, Gill ON. Occupational Transmission of HIV - Summary of published reports - December 1995 Internal PHLS report.

Below is a list of HIV occupational surveillance contacts, names and addresses for countries who have cases included in tables 3 and 4.

#### **Australia**

Professor John Kaldor , Deputy Director  
National Centre in HIV Epidemiology and  
Clinical Research, University of New South  
Wales

Level 2, 376 Victoria Street  
Sydney NSW 2010

AUSTRALIA

Tel: 61 2 9332 4648

Fax: 61 2 9332 1837

Email: [jkaldor@nchechr.unsw.edu.au](mailto:jkaldor@nchechr.unsw.edu.au)

Margaret Macdonald

[mmacd@nchechr.unsw.edu.au](mailto:mmacd@nchechr.unsw.edu.au)

#### **Belgium**

Dr A Stroobant

Institut d'Hygiene et d'Epidemiologie

14 rue Juliette Wytsman

1050 Brussels, BELGIQUE

Tel: 32 2 642 50 29/51 11

Fax: 32 2 642 54 10/50 01

Email: [andre.stroobant@ihe.be](mailto:andre.stroobant@ihe.be)

#### **Canada**

Dr Chris Archibald

Room 01088, Brooke Claxton Building

Tunney's Pasture

0900B1 Ottawa, CANADA K1A OK9

Tel: 613941 3155

Fax: 61 39 54 54 14

Email: [chris\\_archibald@hc-sc.gc.ca](mailto:chris_archibald@hc-sc.gc.ca)

Dr Michael V. O'Shaughnessy

Centre Director

B.C. Centre for excellence in HIV/AIDS

St Paul's Hospital

613-1081 Burrard Street, Vancouver, BC

CANADA V6Z 1Y6

Tel (604) 806-8477 Fax (604) 806-8464

Email: [oshaughnessy@hivnet.ubc.ca](mailto:oshaughnessy@hivnet.ubc.ca)

#### **Denmark**

Dr E Smith

Department of Epidemiology, Statens

Seruminstitute

5 Artillerivej

2300 Copenhagen S, DENMARK

Tel: 45 32 68 37 53

Fax: 45 32 68 38 74/68

#### **England, Wales & N. Ireland**

Dr Barry Evans, PHLS AIDS & STD Centre

61 Colindale Avenue, London NW9 5EQ,

ENGLAND

Tel: +44 0208-200 6868

Fax: +44 0208-200 7868

Email: [bevans@phls.co.uk](mailto:bevans@phls.co.uk)

#### **France**

Dr Florence Lot

Surveillance du SIDA, Reseau National de Sante  
Publique – 12 Rue du Val d'Osne,

94415 Saint-Maurice Cedex, FRANCE

Tel: 33 1 41 79 67 46

Fax: 33 1 41 79 67 66

Email: [lot@b3e.jussieu.fr](mailto:lot@b3e.jussieu.fr)

#### **Germany**

Dr Jens Jarke, Ärztlicher Leiter

Beratungsstelle Gesundheit, AIDS Beratung

Behörde für Arbeit Gesundheit und Soziales

Lübeckertordamm 5

20099 Hamburg, Germany

Tel: 040 42863 6012

Fax: 040 42863 6062

Dr Osamah Hamouda

Robert Koch-Institut,

Infektionsepidemiologie/AIDS-Zentrum

Stresemannstrasse 90-102

10963 Berlin, Germany

Tel: 49 30 45 47 34 20

Fax: 49 30 45 47 35 66

Email: [hamoudao@rki.de](mailto:hamoudao@rki.de)

#### **Israel**

Dr D Chemtob

Department of Epidemiology, Ministry of Health

PO Box 1176

91010 Jerusalem, ISRAEL

Tel: 972 2 70 68 75/70 68 14

#### **Italy**

Dr Giuseppe Ippolito, Centro di Riferimento

AIDS – Servizio di Epidemiologia delle Molattie

Infettive

IRCCS for Infectious Diseases "Lazzaro

Spallanzani" Via Portuense 292

00149 Roma, ITALY

Tel: 396 5594223

Fax: 396 5594224

Email: [CRAIDS@tiscalinet.it](mailto:CRAIDS@tiscalinet.it)

#### **Mexico**

Dra Patricia Uribe Zuniga, Coordinadora General

Ministerio de Salud, Consejo Nacional de

Prevencion y Control del SIDA

Calzada de Tlalpan 4585, 2 Piso

Colonia Toriello Guerra, CP 14050

Mexico, DF, MEXICO

Tel: 525 379 9017

Fax: 525 379 9157

#### **Netherlands**

Dr H Houweling

Department of Infectious Diseases (R.I.V.M.)

PO Box 1, 9 Antonie van Leeuwenhoeklaan

3720 Bilthoven, NETHERLANDS

Tel: 31 30 274 33 17/35 05

Fax: 31 30 27 44 409

Email: [ciehh@rivm.nl](mailto:ciehh@rivm.nl)

### **Portugal**

Dr Maria Teresa Paixao

Instituto Nacional de Saude, Avenida Padre Cruz

1699 Lisbon Codex, PORTUGAL

Tel: 351 1 757 70 70/759 9828/751 92 00

Fax: 351 1 759 04 41

Email: [cvedt.insa@mail.telepac.pt](mailto:cvedt.insa@mail.telepac.pt)

### **Scotland**

Dr David Goldberg

Scottish Centre for Infection & Environmental Health (SCIEH), Clifton House, Clifton Place Glasgow G3 7LN, SCOTLAND

Tel: +44 141-300 1100

Fax: +44 141-300 1170

Email: [goldberg@SCIEH.com.co.uk](mailto:goldberg@SCIEH.com.co.uk)

### **Spain**

Dr Jordi Casabona

Epidemiology Committee, Plan Nacional SIDA, Centre d'Estudis Epidemiologia sobre la SIDA (CEESCAT), Hospital Universitari,

Germans Trias I Pujol – Crt. De Canyet s/n

08916 Bardalona, SPAIN

Tel: 34 3 465 88 58

Fax: 34 3 465 85 88

Dr Jesus Castilla Catalan

Centro Nacional de Epidemiologia

Instituto de Salud Carlos III, Sinesio Delgado 6 28029 MADRID

Tel: 34 91 387 78 02 Ext.2606

Fax: 34 91 387 78 15/16

Email: [jcastill@isciii.es](mailto:jcastill@isciii.es)

### **Switzerland**

Dr Martin Gebhardt, Division of Epidemiology & Infect. Diseases, Federal Office of Public Health 3003 BERN, SWITZERLAND

Tel: 41 31 323 87 48

Fax: 41 31 323 87 95

Email:

[Martin.gebhardte@mbox.bag.admin.ch](mailto:Martin.gebhardte@mbox.bag.admin.ch)

Dr Christian Ruef

Abteilung Infektionskrankheiten und Spitalhygiene

Department für Innere Medizin

University Hospital

CH-8091 Zurich, Switzerland

Tel: 41 1 255 33 22

Fax: 41 1 255 44 99

### **USA**

Dr Ann Do, Project Officer, Occupational Surveillance for HIV

Centers for Disease Control and Prevention

1600 Clifton Road, Atlanta, Georgia 30333, USA

Mailstop E-47

Tel: 404-639 2050

Fax: 404 639 2980

Email: [aad9@cdc.gov](mailto:aad9@cdc.gov)

### **Japan**

Dr Mitsuhiro Kamakura

Department of Preventive Medicine & Public Health

Clinic for Infectious Diseases, School of Medicine

Keio University, Shinanomachi 35, Shinjuku-Ward

Tokyo, 160-8582 Japan

Table 1

**ESTIMATE OF HIV TRANSMISSION RATE AFTER A SINGLE PERCUTANEOUS EXPOSURE**  
**Prospective and Cross Sectional Studies of Health Care Workers**

Study number, Author of first report	Country	Post-exposure serology (number of subjects in each category)				Comment
		Initial & follow-up	Follow-up only	Serocon- version	Presumptive infection	
1. Wormser/Joline	USA		50		0	
2. Weiss	USA		39		3	Subjects A & C = table 4 appendix, cases A2 & A3. Subject B = subject 1, study 3 below. = table 4 appendix, case A4.
3. Thomas/McCray/ Marcus/Tokars	USA	<b>1271</b>	429	<b>4</b>	1	Subject 1 (McCray) = subject B, study 2 above. = table 4 appendix, case A4. Documented seroconversions = table 3 appendix, cases A1,A5,A6&A13..
4. Henderson/Fahey	USA	<b>179</b>		<b>1</b>		Table 3 appendix, case A12.
5. McEvoy/CDSC	UK	<b>212</b>		<b>2</b>		Table 3, cases 22 and 26.
6. Gerberding	USA	<b>327</b>		<b>1</b>		Table 3 appendix, case A7.
7. Elmslie	Canada	<b>289</b>		<b>0</b>		
8. Kuhls	USA		10		0	
9. Hernandez	Spain	<b>20</b>		<b>0</b>		
10. Ramsey	USA	<b>55</b>		<b>1</b>		Table 3 appendix, case A9.
11. Ippolito	Italy	<b>1637</b>		<b>3</b>		Table 3, cases 6, 25 and 40.
12. Strickler	Canada	<b>13</b>		<b>0</b>		
13. CA Madrid/Arranz	Spain	<b>1230*</b>		<b>3</b>		Table 3, cases 7, 11 and 28.
14. Jorbeck	Sweden	<b>85</b>		<b>0</b>		
15. Arva	Norway		29		0	

\* An underestimate of the exposures included in this study.

Continued .....

**Table 1 (continued)**

Study number, Author of first report	Country	Post-exposure serology (number of subjects in each category)				Comment
		Initial & follow-up	Follow-up only	Serocon- version	Presumptive infection	
16. Abreu/Calvacante	Brazil	255		0		Table 3, case 30.  Table 3, cases 10, 12, and 13.  Table 3, cases 15, 16, 17.
17. Francioli/Iten	Switzerland	256		1		
18. Tait	S. Africa	52		3		
19. Lot/Abiteboul	France	592		3		
20. Roumeliotou	Greece	34		0		
21. Nelsing	Denmark	28		0		
22. Inagaki	Japan	88		0		
23. Castillo	Mexico	175		0		
24. Di Vito	Italy	129		0		
25. McCormick	USA	28		0		
<b>Totals</b>		<b>6955</b>	557	<b>22</b>	4	

Prepared by PHLS Communicable Disease Surveillance Centre, London. December 1999

**Overall Rate = 22 in 6955 (1 in 316) or 0.32% (95% confidence intervals = 0.18%- 0.45%)**

**Notes: inclusion criteria, definition of exposure and length of follow up after exposure vary from study to study.**

**Table 2 ESTIMATE OF HIV TRANSMISSION RATE AFTER MUCOCUTANEOUS EXPOSURE  
Prospective and Cross sectional Studies of Health Care Workers**

<b>Study number, Author of first report</b>	<b>Country</b>	<b>Number exposed</b>	<b>Serocon- versions</b>
1. Wormser/Joline	USA	7	0
2. Thomas/Marcus/Tokars	USA [A] [B]	160 210*	0
3. Henderson	USA	346	0
4. McEvoy/CDSC	UK	54	0
5. Gerberding	USA	398	0
6. Elmslie	Canada	115	0
7. Kuhls	USA	15	0
8. Hernandez	Spain	8	0
9. Ippolito	Italy	673	1 (T3, case 4)
10. Strickler	Canada	11	0
11. CA Madrid/Arranz	Spain	312	0
12. Jorbeck	Sweden	15	0
13. Abreu/Calvacante	Brazil	86	0
14. Roumeliotou	Greece	16	0
15. Nelsing	Denmark	5	0
16. Inagaki	Japan	32	0
17. Castillo	Mexico	37	0
18. Ramsey	USA	27	0
19. Lot	France	153	0
20. Di Vito	Italy	61	0
21. Francioli/Iten	Switzerland	169	0
<b>Totals</b>		2910	1

Prepared by PHLS Communicable Disease Surveillance Centre, London. December 1999

Overall Rate = 1 in 2910 or 0.03% (95% confidence intervals = 0.006%, 0.19%).

48. Exposures for which outcome at six months known, but baseline antibody result not available. Outcome at 6 months post exposure may not be known for all incidents.

There are other studies reporting on the outcome of occupational exposure to HIV among health care workers, but these are not included in tables 1 and 2, either because of insufficient information to distinguish percutaneous exposures from mucocutaneous exposures, or because of incomplete reporting of follow-up post exposure serology. These include Bowden et al, Mallon et al, Josephson et al, Hoffman et al, Romea et al, Robillard et al and Pinto et al, references for which are included on page 47-48.

Table 3

**OCCUPATIONALLY ACQUIRED HIV IN HEALTH CARE WORKERS**  
**Cases of documented seroconversion after a specific exposure incident**

Case number, Author of first report (year of exposure, year of report)	Country	Case	Patient source	Details of exposure	HIV antibody Days before(-)/after(+) exposure		Acute illness	PEP
					Negative(s)	First pos.		
1. Anon (NR,84)	UK	F Nurse	AIDS	"Injection" needlestick while resheathing after obtaining blood from arterial line.	27+	49+	Fever, macular rash, 3 <sup>rd</sup> week.	None
2. Oksenhendler (85,86)	France	F Nurse	PGL HbsAg+ve	Superficial self-inflicted needlestick to finger while recapping needle contaminated with bloody pleural fluid.	1+ 13+	68+	Fever, vomiting, 4 <sup>th</sup> week.	None
3. Neisson-Vernant (85,86)	France (Martinique)	F Student nurse	AIDS	Pricked index finger with needle during venepuncture.	30+	180+	Fever, macular rash, 9 <sup>th</sup> week.	None
4. Gioannini (87,88)	Italy	F Nurse	HIV+ve asymptomatic	Heavy blood splash to hands, eyes and mouth while disoccluding arterial catheter (study 9, table 2).	1+, 21+	43+ (21+Ag+ve)	Fever, arthralgia, 2 <sup>nd</sup> week.	NR
5. Michelet (87,88)	France	F Nurse	AIDS	Needlestick without injection from large bore needle of vacutainer tube (venepuncture).	13+	45+	Generalised lymphadenopathy, fever, weight loss, 4 <sup>th</sup> week.	None
6. Lima(86,88)	Italy	F Student nurse	HIVAg+ve, anti-HIV-ve IDU (anti-HIV+ve 14 mths later)	Superficial needlestick injury from phlebotomy needle (study 11, table 1).	<7+	300+	None.	None
7. CA Madrid(NR,88)	Spain	F Nurse	HIV+ve (clin status not reported)	'Inoculation injury' (table 1, study 13).	NR	52+	Not reported.	None
8. Serra (88,89)	Spain	F Student nurse	HIV+ve asymptomatic	Needlestick while recapping needle after venepuncture.	0, 32+	71+ (32+ Ag+ve)	Hepatitis SC1 Symptoms, day 71	None

PGL = persistent generalised lymphadenopathy

NR = Not reported

Continued .....

Table 3 (continued)

Case number, Author of first report (year of exposure, year of report)	Country	Case	Patient source	Details of exposure	HIV antibody Days before(-)/after(+) exposure		Acute illness	PEP
					Negative(s)	First pos.		
9. Looke (90,90)	Australia	M HCW occupation not known	AIDS CD4 count NK	Deep needlestick after taking blood. AZT given (table 8, case 1).	0	42+	Flu-like symptoms, generalised lymphadenopathy, 5 <sup>th</sup> week.	Yes (AZT)
10. Tait (90,91)	S Africa	Intern	HIV+ve & PTB	Finger pulp injury from lancet while drawing blood – AZT given (table 8, case 2; table 1, study 18).	0	24+	Lymphadenopathy, fever, diarrhoea, malaise, 3 <sup>rd</sup> week.	Yes (AZT)
11. CA Madrid (90,91)	Spain	F Nurse	NR	Needlestick (table 1, study 13).	NR	3-5 mths	Not reported.	None
12. Tait (90,92)	S Africa	F Nurse	HIV+ve & PTB	Puncture of palmar skin by stilette of IV cannula (table 1, study 18).	0	180+	Not reported.	None
13. Tait (NR,92)	S Africa	F Nurse	HIV+ve	Deep needlestick injury with IV cannula (restless patient) – AZT given (table 8, case 3; table 1, study 18).	0	63+	16 weeks pregnant, no seroconversion illness.	Yes (AZT)
14. Lot (89,92)	France	F Nurse	AIDS terminally ill	Needlestick during venepuncture.	8+	39+	2 <sup>nd</sup> week.	None
15. Lot (90,92)	France	F Nurse	AIDS terminally ill	Deep needlestick involving vacuum tube system – AZT given (table 8, case 4; table 1, study 19).	0	52+ (Ag+ve24+)	3 <sup>rd</sup> week.	Yes (AZT)
16. Lot (90,92)	France	Nurse	HIV+ve symptomatic	Superficial needlestick when penetrating a rubber stopper after sampling for blood culture (table 1, study 19).	0	87+	None.	None
17. Lot (91,92)	France	F Nurse	AIDS	Moderate needlestick involving vacuum tube system – AZT given, course not completed (table 8, case 16; table 1, study 19).	0	112+	3 <sup>rd</sup> week.	Yes* (AZT)
18. Lot (92,92)	France	F Nurse	AIDS	Deep needlestick involving vacuum tube, impaling foot, after venepuncture. AZT for 48 hours (table 8, case 17).	0	69+ (32+Ag+ve)	4 <sup>th</sup> week.	Yes* (AZT)

PTB = pulmonary tuberculosis

Continued.....

**Table 3 (continued)**

Case number, Author of first report (year of exposure, year of report)	Country	Case	Patient source	Details of exposure	HIV antibody Days before(-)/after(+) exposure		Acute illness	PEP
					Negative(s)	First pos.		
19. Lot (91,93)	France	Nurse	AIDS	Deep needlestick during disposal after venepuncture	22+	186+	3 <sup>rd</sup> week	None
20. Gurtler (88,92)	Germany	F Nurse	AIDS	Needlestick during disposal after venepuncture.	0	49+	Flu-like symptoms, day 28.	NR
21. Gurtler (91,93)	Germany	M Nurse	AIDS	Deep needlestick while attempting to penetrate plastic stopper of specimen bottle with needle after venepuncture.	0	49+	None.	None
22. Anon/Winceslaus (92,93)	UK	F HCW	AIDS	Percutaneous injury – used IV cannula introducer (18-20G) discarded during resuscitation. Given AZT (table 8, case 5, table 1, study 5).	0, 42+	56+ (43+Ag+ve)	2 <sup>nd</sup> week.	Yes (AZT)
23. Perez (NR,93)	Belgium	Nurse	NR	Needlestick.	NR	NR	None.	None
24. Perez (NR,93)	Belgium	M HCW	NR	Cut with sharp object.	NR	NR	None.	None
25. Ippolito (NR,93)	Italy	F Nurse	AIDS	Deep percutaneous injury – used IV cannula introducer (table 1, study 11)..	1+	43+	3 <sup>rd</sup> week.	None
26. CDSC (92,93)	UK	F Phlebotomist	HIV+ asymptomatic	23G needlestick during venepuncture vertically infected child (table 1, study 5).	4+	90+	None.	None
27. CDSC (92,93)	UK	F HCW	AIDS	21G needlestick during venepuncture.	0	81+	6 <sup>th</sup> week.	None
28. CA Madrid (92,94)	Spain	F Nurse	NR	Seroconversion after percutaneous exposure (needlestick) to blood (table 1, study 13).	NR	180+	6 <sup>th</sup> week.	None
29. Baird (93,94)	Australia	M Doctor	HIV+ve CD4 normal no AZT	Percutaneous exposure via “butterfly” needle after phlebotomy, pre-disposal.	1+	14+, 21+	3 weeks.	None
30. OFSP/Jost (94,94)	Switzerland	F Nurse	AIDS	Percutaneous exposure to blood via needle in sharps bin. Matched on sequencing (table 1, study 17).	0	91+	Not reported.	None

Continued.....

Table 3 (continued)

Case number, Author of first report (year of exposure, year of report)	Country	Case	Patient source	Details of exposure	HIV antibody Days before(-)/after(+) exposure		Acute illness	PEP
					Negative(s)	First pos.		
31. NCHECR/Menzies (92,95)	Australia	F HCW occupation not known	HIV+, CD4 count 150	Hollow needle (21G butterfly) injury after venepuncture. Gloves worn.	0	38+	16-35 days.	None
32. NCHECR/Menzies (94,95)	Australia	F HCW occupation not known	HIV+ve	Hollow needle injury after venepuncture. Gloves worn.	NR	NR	Not reported.	None
33. Lot F (96,97)	France	F Nurse	seroconverting P24 Ag+ve	Needlestick injury during taking blood for culture	0	83	Not reported.	None
34. Lot (94,95)	France	F Nurse	AIDS terminally ill	Deep needlestick after venepuncture, no gloves. AZT given (table 8, case 9).	0	87+	None.	Yes (AZT)
35. O'Shaughnessy (95,95)	Canada	M Physician	AIDS terminally ill	Shallow puncture wound from 21-25G needle.	17+	Ab 70+ Ag+ 17+	3 <sup>rd</sup> week.	None
36. Garcés (93,96)	Spain	F Nurse	HIV+ve PTB, HCV+ve	Needlestick after venepuncture. Acute HCV also.	0	44+	Viral illness 7 <sup>th</sup> week, jaundice 8 <sup>th</sup> week.	None
37. Weisburd (91,96)	Argentina	F Nurse	HIV+ve	Piercing wound from butterfly needle drawn back from sick patient. Given AZT (table 8, case 10).	0	131+	Jaundice, vomiting 8 <sup>th</sup> week.	Yes (AZT)
38. Jost/OFSP (95,97)	Switzerland	F Nurse	AIDS terminally ill	Needlestick injury after injection.	0	95+	Not reported.	None
39. Ippolito/SIROH (NR,97)	Italy	F House keeper	HIV+ve samples in lab	Splash face/mucous membranes/ eyes from residual samples in biochemistry lab. Acute HCV also. Given AZT (table 8, case 11).	0	53+	3 <sup>rd</sup> week.	Yes (AZT)
40. Ippolito/SIROH (94,96)	Italy	F Surgeon	HIV+ve	Scalpel cut of gloved finger during incision of perianal abscess. Oral KS one year post- exposure (table 1, study 11).	0	40	None.	No, declined
41. Kasongo (NR,97)	Zambia	F Doctor	HIV+ve	Needlestick after venepuncture.	NR	NR	Not reported.	None

Continued .....

**Table 3 (continued)**

Case number, Author of first report (year of exposure, year of report)	Country	Case	Patient source	Details of exposure	HIV antibody Days before(-)/after(+) exposure		Acute illness	PEP
					Negative(s)	First pos.		
42. Brink (95,97)	S Africa	F Doctor	HIV+ve infant	Injury with 25G needle while drawing arterial blood sample	0	60	Hepatitis,SCI week 4	None
43. Jarke (93,93)	Germany	F Nurse	AIDS	Mucocutaneous exposure; blood in and on mouth. Herpetic lesion on lip. Given AZT (table 8 case 18)	3+	42+	5 <sup>th</sup> week	Yes (AZT)
44. Lot (96,99)	France	F Doctor	HIV+ asymp- tomatic untreated	Deep needlestick while recapping after obtaining arterial sample for blood gases	-	97	Day 45	Yes (AZT+DDI)
45. Lot (97,99)	France	F Nurse	AIDS treated with AZT+3TC+IDV	Deep needlestick with a blood-filled needle (large gauge) incorrectly discarded in a waste plastic bag.	4	55	Day 40	(AZT+3TC +IDV)
46. Hawkins (99,99)	UK	M Nurse	AIDS treated	Needlestick in finger web. Initial triple therapy changed after first dose.	-	(90?)	Day 26	Yes (3 drugs)
47. Anon (93,96)	Australia	M Doctor	-	Details awaited – understood to be definite.	-	-	-	-
48-102. CDC (98,99)	USA	55 HCWs	-	As reported to CDC Surveillance system	-	-	-	-

Documented seroconversions have also been reported in a prison officer after stabbing (Jones PD. Lancet 1991; 338:884; see Tables 8 & 9) and two non-hospital sanitation workers in France, after needlestick injuries which occurred during trash collection and transportation respectively (Lot F, Abiteboul D, Bull Epid Hebdo 1994; 25:111-113).

Table 3 Appendix

Details of US cases published in literature

Case number, Author of first report (year of exposure, year of report)	Country	Case	Patient source	Details of exposure	HIV antibody Days before(-)/after(+) exposure		Acute illness	PEP
					Negative(s)	First pos.		
A(1) Stricof (86,86)	USA	F Nurse	AIDS	'Deep' IM needlestick with large bore needle (1.67mmd) inflicted by co-worker during emergency resuscitation procedure (study 3, table 1).	9+	184+	Fever, erythematous macular rash, 3rd week.	None
A(2) CDC (NR,87)	USA	F HCW	AIDS	Index finger pressure for 20 minutes to arterial bleeding point. Chapped hands, no gloves.	240-	112+ (16 weeks)	Fever, vomiting, lymphadenopathy, 3 <sup>rd</sup> week.	None
A(3) CDC (86,87)	USA	F Phlebotomist	HIV+ve	Vacuum tube accident (venepuncture), blood on face and in mouth. Needle scratch on hand 2 months later from IDU of unknown HIV status.	1+, 8 weeks	270+	None.	None
A(4) CDC (86,87)	USA	F Med technologist	HIV+ve	Apheresis machine accident, blood covered most of ungloved hands + forearms - several minutes. Ear with dermatitis.	5+	90+	Fever, hives, erythematous macular rash, 8th week.	None
A(5) CDC (87,88)	USA	F HCW	AIDS	Deep 21G needlestick inflicted by coworker during resuscitation procedure (study 3, table 1).	1+	88+	Fever, chills, night sweats, lymphadenopathy, 5th week.	None
A(6). CDC (87,88)	USA	F HCW	AIDS & HIV+ve	Two self-inflicted needlesticks in 10-day period. One (21G) while recapping, second (25G) during venepuncture (study 3, table 1).	21+ after 1st exp	121+ after 1st exp (42+: culture +ve)	Fever, chills, lymphadenopathy, weight loss, 5th week after 1st exposure.	None
A(7)Gerberding(87,87)	USA	Nurse	AIDS	Deep needlestick hollow bore needle used to flush a heparin lock (study 6, table 1).	(3 months before)	28 days (14 days – Ag+ve)	Yes.Fever,pharyngitis, lymphadenopathy & fatigue 2 weeks after exposure	None
A(8) Weiss (NR,88)	USA	M Research lab worker	Virus culture	Injury with potentially contaminated needle while cleaning needle of elutriator used to concentrate virus.	NR	180+	Not reported.	None

NR = nor reported

Continued .....

**Table 3 Appendix (continued)**

Case number, Author of first report (year of exposure, year of report)	Country	Case	Patient source	Details of exposure	HIV antibody Days before(-)/after(+) exposure		Acute illness	PEP
					Negative(s)	First pos.		
A(9) Ramsey (NR,88)	USA	HCW	AIDS	Needlestick injury (study 10, table 1).	90+	288+	None.	None
A(10) CDC (NR,88)	USA	F HCW	AIDS	"Injection" needlestick filling vacuum collection tube (venepuncture).	NR	NR	Not reported.	NR
A(11) Wallace (85,88)	USA	M Hospital Corpsman	AIDS	Puncture while disposing of a phlebotomy needle.	14+, 90+	180+	Swollen neck glands fever, myalgia, 5th month.	NR
A(12)Henderson(NR,89)	USA	M Clin lab worker	AIDS	Vial containing infected blood broke, and cut through glove & skin (study 4, table 1).	1+	63+	Fever, weight loss, 5th week.	NR
A(13) CDC (92,93)	USA	F Phleb/ Clin lab worker	AIDS	21G syringe needlestick during venepuncture (table 1, study 3). Given AZT (table 8, case 6).	0, 6 wks	121+	6th week (day 38).	Yes (AZT)
A(14) CDC/Ciesielski (91,93)	USA	F Phlebotomist	HIV+ve	Percutaneous exposure, 22G phlebotomy needle, AZT failure (table 8, case 7).	NR	90+	14 days.	Yes (AZT)
A(15) CDC/Ciesielski (90,93)	USA	M HCW	HIV+ve on AZT	Percutaneous exposure, 16G IV cannula, AZT failure (table 8, case 8).	NR	94+	36 days.	Yes (AZT)
A(16) Pincus (90,94)	USA	Lab worker	concentrated HIV	Exposure of skin and mucous membranes to highly concentrated virus. Positive molecular match.	NR	NR	Not reported.	NR
A(17) Ridzon (90,95)	USA	HCW	HIV+, HCV+ 7/12 AZT	Deep needlestick injury, HCV infection acquired also while performing phlebotomy	0, 1, 5, 7, 8 months+	9.5 months+	Acute onset hepatitis, 8th month.	None
A(18) Anon (90,95)	USA	M Anaesth technician	HIV+ve	Hand punctured by IV cannula protruding from opening of sharps box.	0	2 months	Not reported.	NR
A(19) Floyd (91,92)	USA	F Doctor	HIV+ve	Percutaneous exposure after venepuncture.	0	3 months	Not reported.	NR
A(20) Verhovek(88,93)	USA	F Nurse	HIV+ve	Needlestick injury caused by blood filled "intermittent IV needle", incident occurred during management of epileptic fit.	0	? 3 months	Not reported.	NR

Continued .....

**Table 3 Appendix (continued)**

Case number, Author of first report (year of exposure, year of report)	Country	Case	Patient source	Details of exposure	HIV antibody Days before(-)/after(+) exposure		Acute illness	PEP
					Negative(s)	First pos.		
A(21) CDC (85,94)	USA	M Research lab worker	concentrated HIV	Inapparent exposure by unknown route. Virus found to match laboratory strain (previously table 4, case 8, 1995 edition).	Not applicable		None recalled.	None
A(22) Favero (NR,93)	USA	Dialysis technician	HIV+ve haemodialysis	Puncture injury from a blood contaminated trochar (15G).	0, 5 months	8 months	5 ½ months.	None
A(23). Pratt (NR,95)	USA	HCW	AIDS, CMV retinitis CD4 <10/mm <sup>3</sup>	Needlestick while drawing and transferring blood from central venous catheter. AZT given (table 8, case 15).	0	20+ (Ag+ 17+)	3rd week.	Yes (AZT)
A(24)Johnson (92,97)	USA	M Pathologist	AIDS	Scalpel cut 1 cm deep during autopsy while reflecting scalp from head. Two pairs of gloves worn.	1+	42+	None	None
A(25) Many (NR,97)	USA	F Nurse	Unknown source patient	Deep palmar injury from contaminated orthopaedic pin.	0, 210+	AIDS at 18 months	No, rapid progression to AIDS.	No, declined
A(26) Jochimsen/CDC (92,97)	USA	HCW	AIDS terminally ill	Biopsy needle injury. Given AZT (table 8, case 12).	0	23+	Day 23.	Yes (AZT & ddl)
A(27) Jochimsen/CDC (93,97)	USA	HCW	HIV+ve on AZT	Cut with broken glass vacuum tube. Given AZT (table 8, case 13).	0	73+	3rd week.	Yes (AZT)
A(28) Jochimsen/CDC (92/97)	USA	Nurse	HIV+ve	Mucocutaneous exposure to blood. Given AZT (table 8, case 14).	0	134+	11th week.	Yes (AZT)
A(29) Ciesielski/CDC (NR,96)	USA	HCW	HIV+ve	25G "moderate" needlestick injury, gloves worn.	0, 182+	310+	None.	None
A(30) Ridzon (90,97)	USA	Phlebotomist	AIDS	A deep needlestick injury while drawing blood from a patient with AIDS.	14	28	3 weeks	None
A(31) Perdue (98,99)	USA	F Nurse	HIV+	21G Butterfly	-	83	Day 70	Yes (4 drugs)

The Centers for Disease Control and Prevention's (CDC's) surveillance for occupational HIV infection relies primarily on the voluntary reporting of individual cases in the US. Regarding documented occupational HIV infection, the total reported to CDC are the 55 cases given in the main part of table 3. Case reports in the literature are included in table 3 appendix most of which are also among the 55 cases in CDC's surveillance system.

Continued .....

Table 4

## POSSIBLE OCCUPATIONALLY ACQUIRED HIV INFECTIONS IN HEALTH CARE WORKERS WITHOUT OTHER RISK FACTORS

Case number, Author of first report (year of report)	Country	Case	Details of exposure and outcome
1. Bygbjerg (83)	Denmark	F Surgeon	Surgical practice in rural Zaire. Presumptive AIDS 1976.
2. Anon (84)	France	F Doctor	Worked in various intensive care units in France, newly qualified resident. AIDS 1984.
3. Houweling (87)	Holland	M Surgeon	European, worked in Africa for 3 years: 1984-86. Undertook emergency manual removal of placenta without gloves on several occasions. HIV+ve 1986.
4. Ponce de Leon (88)	Mexico	M Blood bank technician	Many puncture accidents including one gross plasma contamination of a deep hand cut. AIDS 1987.
5. Schmidt (88)	Germany	F Nurse	Developed M. tuberculosis lymphadenopathy and found to be HIV+ve in 1987, 5 years after needlestick exposure (1982) to a patient who died from AIDS 3 years after the exposure.
6. Bonneux (88)	Belgium	Surgeon	European who experienced multiple needlestick injuries and cuts while working in Africa. HIV+ve between 1985 and 1987.
7. Porter (90)	UK	M Surgeon	"Most probably" infected during work as a surgeon in Africa in 1983-86. AIDS 1988.
8. Houweling (91)	Holland	M Doctor	Two needlesticks – one was a deep stick with solid needle while treating patient with suspected HIV disease in Africa in 1983-86. AIDS 1988.
9. Tait (92)	S Africa	M Surgeon	No particular incident. HIV neg 1990, positive June 1991. Worked with patients likely to be HIV infected in Natal, South Africa.
10. Lot (92-95*)	France	F Nurse	Needlestick injury 1986 with exposure to blood after injection, nobaseline test. HIV+ve month 3.
11. Lot (92-95*)	France	M Nurse-aid	Severe needlestick injury to thumb in 1992 while collecting used instruments prior to sterilisation, HIV+ve month 7 (neg day 1 and 90).
12. Lot (92-95*)	France	F Nurse	Two needlestick injuries in 1991; one with used lumbar puncture needle; other with IV needle. AIDS patient. No baseline test HIV+ve month 2, AIDS 1995.
13. Lot (92-95*)	France	M Doctor	Cut L index finger with scalpel during tracheotomy, 1983, HIV patient. HIV+ve 1987, AIDS 1991.
14. Lot (92-95*)	France	F Clin lab worker	Cur while manipulating broken blood specimen tube, 1986. HIV+ve patient. No baseline test on HCW. HIV+ve month 8, AIDS 1989

Continued.....

**Table 4 (continued)**

Case number, Author of first report (year of report)	Country	Case	Details of exposure and outcome
15. Lot (92-95*)	France	F Nurse	Needlestick injury with blood filled IV needle 1984, during recapping after removal post transfusion. HIV+ve 1988 AIDS 1989.
16. Lot (92-95*)	France	F Nurse-aid	Prolonged blood contact with non-intact skin 1989 HIV+ patient HIV+ve 1992, AIDS 1992.
17. Lot (92*)	France	F Dental assistant	Needlestick injury to finger (resulting in paronychia) by dental instruments for sterilisation 1988. No baseline test. HIV+ve month 7, AIDS 1991.
18. Lot (92*)	France	M Nurse	Needlestick injury while collecting blood for culture, 1988. AIDS patient terminally ill. No baseline test. HIV+ve 1991.
19. Lot (92*)	France	F Nurse	Lancet injury while obtaining sample for blood glucose estimation, 1988. AIDS patient. HIV+ve month 11.
20. Lot (92*)	France	M Nurse-aid	Needlestick injury while collecting used instruments for sterilisation, 1989. HIV+ve month 9 (neg day 0 and day 37).
21. Lot (92*)	France	M Nurse	Needlestick injury while attempting to obtain arterial sample for blood gases, 1990. AIDS patient terminally ill. HIV neg day 0 and 92. HIV+ve month 8.
22. Lot (92*)	France	F Nurse	Prolonged blood contact with non-intact skin, 1992. AIDS patient. No baseline test. HIV+ve month 6.
23. Lot (92*)	France	F Nurse	Needlestick injury while disposing of needle used for IV infusion into sharps container, 1989 HIV+ve month 7.
24. Lot (92*)	France	F Lab worker	Cut to index finger with sharp object contaminated with live HIV, 1985. HIV+ve 1991, AIDS 1995.
25. Lot (92*)	France	M Orthopaedic surgeon	Penetrating cut to index finger caused by used surgical instrument, 1983. HIV+ve 1994, AIDS 1994.
26. Lot (92*)	France	M Dentist	Needlestick injury with exposure to blood, 1988, HIV+ve 1994, AIDS 1994.
27. Lot (92*)	France	M Lab worker	Injury involving exposure to concentrated HIV infected lymphocytes, 1987. HIV+ve 1989, AIDS 1994.
28. Lot (92*)	France	F Operating dept assistant	Cut with contaminated blade used to lay open abscess of HIV+ve patient, 1989. HIV+ve 1994, AIDS 1995.
29. Lot (93*)	France	Medical stdt	Details not available.
30. Lot (93*)	France	Medical stdt	“ “ “
31. Lot (93-95*)	France	F Nurse	“ “ “

\*Details provided by F. Lot, Unite des maladies infectieuses/SIDA-RNSP, France: personal communication and updated 1997. Continued

**Table 4 (continued)**

Case number, Author of first report (year of report)	Country	Case	Details of exposure and outcome
32. Lot (93-95*)	France	F Doctor	Cut with scalpel in 1985. The doctor was diagnosed with AIDS in 1991.
33. Lot (93-95*)	France	HCW	“ “ “
34. Lot (93-95*)	France	HCW	“ “ “
35. Meyohas (95)	France	F Clinic cleaner	Unknown source patient. Needle pierced bin liner in operating room. Seroconversion 8 months after exposure (previously table3, case 33).
36. Gurtler (93)	Germany	F Nurse	Emergency AIDS case, glove ruptured. Blood contact with eczematous lesion, HIV-ve 1984, HIV+ve 1989.
37. Fernando (92)	UK	F Nurse	Never had sexual intercourse; worked in Africa for many years in general nursing and midwifery. Died AIDS 1995.
38. Fernando (92)	UK	F Nurse	Worked in Accident & Emergency in Africa.
39. Fernando (92)	UK	F Nurse	Worked as midwife in Africa.
40. Eves (92)	Canada	F Biochemist	Exposures to HIV contaminated blood in Canada. AIDS 1990.
41. Heptonstall/CDSC (93)	UK	F HCW	Worked in adverse conditions in Africa, known HIV infected patients.
42. Heptonstall/CDSC (93)	UK	F Nurse	Worked with HIV+ve patients in USA and Italy, recalled several unreported percutaneous exposures.
43. Siegel-Itchkovitch (94)	Israel	M Surgeon	HIV+ve at insurance medical 1993, suspects he became infected from patient in Israel while performing surgery.
44. Logie (96)	UK	M Doctor	1 needlestick and 2 mucocutaneous splashes (in close succession) to HIV+ve patients in Zambia. Non-specific pyrexial illness followed 6 weeks later.
45. LCDC/Robillard (95)	Canada	M Research lab worker	Exposed to inadequately inactivated HIV, repeated exposures of non intact skin. HIV+ve at blood donation.
46-53. Ponce de Léon (96)	Mexico	8 HCWs (4M, 4F)	Details not reported.
54. CDSC/Evans (98)	UK	M Doctor	Worked in S. Africa. Needlestick with known, HIV+ve patient. Seroconversion illness 4 weeks later.

\*Details provided by F. Lot, Unite des maladies infectieuses/SIDA-RNSP, France personal communication and updated 1997.

Continued .....

**Table 4 (continued)**

Case Number Author of first report (year of report)	Country	Case	Details of exposure and outcome
55. Jarke (95)**	Germany	M Surgeon	Worked as aid volunteer, specific exposure from blood filled butterfly needle from child with AIDS - seroconversion like illness 8 weeks later, HIV+ve 4 months later.
56. Jarke (95)**	Germany	F Nurse dialysis unit	Blood from arterial shunt into glove, contaminating wound on HCW's hand. Seroconversion like illness 11 weeks post exposure. HIV-ve 6 weeks before incident, HIV+ve 10 months later, diagnosed by blood transfusion service.
57. Jarke (95)**	Germany	M Nurse	Extensive blood contact on hands and forearms in 1983 with two patients who died soon afterwards. 3 weeks later seroconversion like illness. Not HIV tested till 5 years later.
58. Jarke (95)**	Germany	F Lab asst	Exposure to blood and body fluids. Tested when her child became ill and found to be HIV+ve.
59. Jarke (95)**	Germany	F Med stdt	Exposed to blood, often cuts on hands, some patients were HIV+ve. HIV-ve 1986, HIV+ve mid 1988
60. Jarke (95)	Germany	M Nurse	Regular contact with AIDS patients, chronic skin disease, HIV-ve mid 1987, HIV+ve mid 1988
61. Jarke (95)	Germany	M Autopsy Asst	Deep cut sustained by saw during autopsy, serostatus of patient not known. HIV+ve 1991.
62. Jarke (95)	Germany	M Nurse	Cared for HIV infected patients. No specific exposure.
63. Jarke (95)**	Germany	M Nurse	Needlestick injury in 1988 to two HIV positive patients
64. Jarke (95)	Germany	M Nurse	Multiple needlestick injuries to several HIV positive patients
65. Jarke (95)	Germany	M Doctor	Exposure in dialysis unit. Source unknown.
66. Jarke (95)	Germany	F Clinical Lab Worker	Exposure in clinical laboratory. Source unknown.
67. Jarke (95)	Germany	M Nurse	Exposure in intensive care unit. Source unknown.
68. Jarke (97)	Germany	F Medical Secretary	Exposure occurred in outpatient clinic for HIV/AIDS. Several patients with HIV/AIDS
69. Jarke (97)	Germany	F Clinical Lab Worker	Exposure occurred in clinical laboratory. Several patients HIV positive.
70. Jarke (97)	Germany	F Nurse	Exposure in intensive care unit. Source unknown.
71. Jarke (97)	Germany	M Medical Secretary	No details
72. Jarke (97)	Germany	M Nurse	Exposure in endoscopy/university clinic. Several patients with AIDS.
73. Jarke (97)	Germany	M Nurse	No details
74. Lot (98)	France	F Nurse	Needlestick injury after taking blood in 1992. HIV+ve 1995 AIDS 1995.

\*\*published as part of a review of those who applied for compensation via accident insurance for occupationally acquired HIV infection.

Continued.....

**Table 4 (continued)**

<b>Case Number Author of first report (year of report)</b>	<b>Country</b>	<b>Case</b>	<b>Details of exposure and outcome</b>
75. Lot (98)	France	F Nurse	HIV+ve 1996, AIDS 1996.
76. Jarke (99)	Germany	M Rescue Worker	Massive exposure to blood. HCW has paronychia. Patient serostatus unknown in 1995.
77. Jarke (99)	Germany	M Doctor	Exposure details and patient's details unknown.
78. Jarke (99)	Germany	M Doctor	Needlestick injury and sharp cut with contaminated glass in 1996. African patients (AIDS).
79. Jarke (99)	Germany	M Nurse	Blood splash to left eye in 1996. Patient has AIDS.
80. Heese (98)	Germany	M Nurse	Nurse working in intensive care. Source patient's details unknown.
81. OFSP/Jost (NR)	Switzerland	M Student Pharmacist	Exposure occurred in 1996. Source patient unknown. Needlestick injury from an already disposed needle which penetrated the sharps container. HIV test on HCW not done on day of exposure. HIV positive first occurred in 1997, 3 months after exposure. Acute illness not reported. Not on PEP.
82-217. CDC	USA	136 HCWs	Insufficient detail on each case to report individually.

Prepared PHLS Communicable Disease Surveillance Centre, London. December 1999

Table 4 Appendix

## Details of US cases published in literature

Case number, Author of first report (year of report)	Country	Case	Details of exposure and outcome
A1. Belani (84)	USA	M Porter	Palm pricked on hospital waste in USA. AIDS 1983.
A2. Weiss (85)	USA	F HCW	2 needlesticks to hand in 1983 & 1984 in USA involving 2 different AIDS patients (table 1, subject A, study 2). HIV+ve 1984.
A3. Weiss (85)	USA	M Lab worker	2 occupational exposures involving blood of unknown status. Cut hand while handling blood from multiple-transfused leukaemic patient in first exposure. Second exposure involved injury to palm with capillary tube containing platelets pooled from 16 donors (table 1, subject C, study 2). HIV+ve 1985.
A4. Weiss (85)	USA	F HCW	Punctured finger with colonic biopsy forceps used on AIDS patient. Serum tested 10 months post exposure. Heterosexual transmission could not be ruled out. (table 1, subject 1, study 3, table 1, subject B, study 2). HIV+ve 1983.
A5. Klein (88)	USA	M Dentist	History of sustaining needlestick injuries and having ungloved hands whilst providing dental care. HIV+ve 1987.
A6. Haley (89)	USA	F Lab technologist	Scratch from blood contaminated needle, October 1984. Weeping lesions on hands - occasional contamination with blood. AIDS 1988.
A7. Aoun (89)	USA	M House Officer	Lacerated finger in 1983 in USA while performing a hematocrit when capillary tube containing HIV+ve blood shattered. AIDS 1986.
A8. Rotheram (94)	USA	M Surgeon	HIV+ve at insurance medical 1989, died AIDS 1993. Rewired sternum of patient in USA with acute transfusion acquired HIV in 1985, seroconversion like illness 3 weeks later.

The Centers for Disease Control and Prevention's (CDC's) surveillance for occupational HIV infection relies primarily on the voluntary reporting of individual cases in the US. Regarding possible occupational HIV infection, the total reported to CDC are the 136 cases given in the main part of Table 4. Case reports in the literature are included in Table 4 Appendix, some of which may also be among the 136 cases in CDC's surveillance system.

Table 5

**REPORTED OCCUPATIONALLY ACQUIRED HIV INFECTIONS IN HEALTH CARE WORKERS  
AND AIDS CASES, BY COUNTRY**

REGION	Estimated current HIV/AIDS Prevalence*	Definite OAI	Possible OAI	Total
<b>EUROPE</b>				
France	110,000	13	29	42
Spain	120,000	5	-	5
Italy	90,000	5	-	5
Germany	35,000	3	26	29
United Kingdom	25,000	5	8	13
Belgium	7,500	2	1	3
Switzerland	12,000	2	1	3
Netherlands	14,000	-	2	2
Denmark	3,100	-	1	1
<b>Sub Total</b>		35	68	103
<b>REST OF WORLD</b>				
Australia	11,000	5	-	5
Canada	44,000	1	2	3
South Africa	2,900,000	4	1	5
Argentina	120,000	1	-	1
Zambia	770,000	1	-	1
Mexico	180,000	-	9	9
Israel	not available	-	1	1
<b>Sub Total</b>		12	13	25
<b>USA</b>	820,000	55	136	191
<b>TOTAL</b>		102	217	319

\* UNAIDS/WHO Report on the global HIV/AIDS epidemic June 1998

Table 6

**OCCUPATIONALLY ACQUIRED HIV INFECTION:  
ALL REPORTS, BY OCCUPATION**

OCCUPATION	Documented OAI	Possible OAI	Total
Nurse/midwife <sup>1</sup>	55	64	119
Doctor/medical students	14	23	37
Surgeon	1	14	15
Dentist/dental worker	-	9	9
Clinical lab worker	18	21	39
Ambulanceman/paramedic	-	13	13
Non-clinical lab worker	3	3	6
Embalmer/morgue technician	-	3	3
Surgical technician/ODA	2	3	5
Dialysis technician	1	3	4
Respiratory therapist	1	2	3
Health aide/attendant/nurse aid	1	18	19
Housekeeper/porter/maintenance	2	13	15
Other/unspecified HCW	4	28	32
<b>Total</b>	102	217	319

<sup>1</sup> = In the US, phlebotomists are classified as clinical laboratory workers, and in France Italy and Spain nurses are usually responsible for phlebotomy.  
Prepared by PHLS Communicable Disease Surveillance Centre, London. December 1999.

**Periods in which HIV-1 seroconversion occurred following occupational exposure (15 percutaneous and 3 mucocutaneous) in 18 of the reported cases who were given AZT**

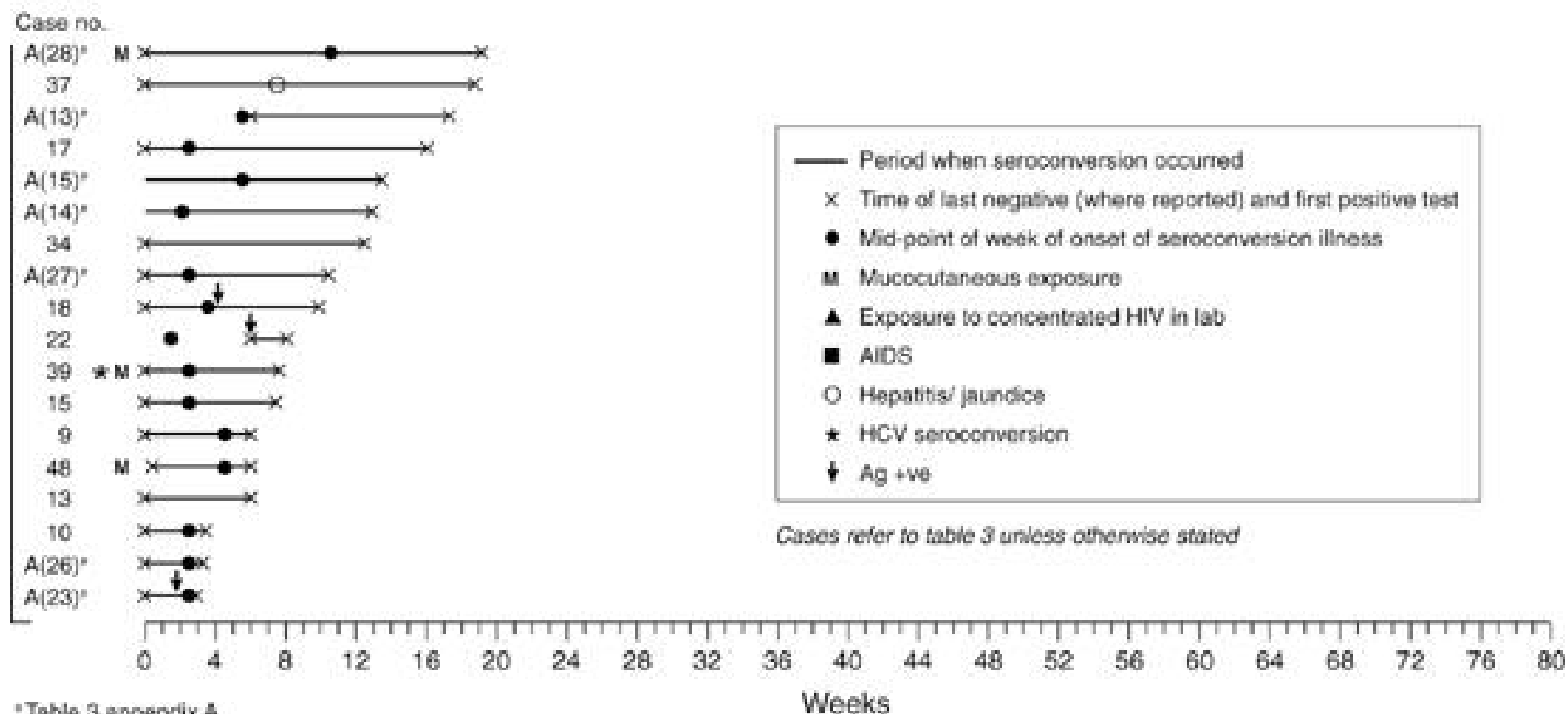
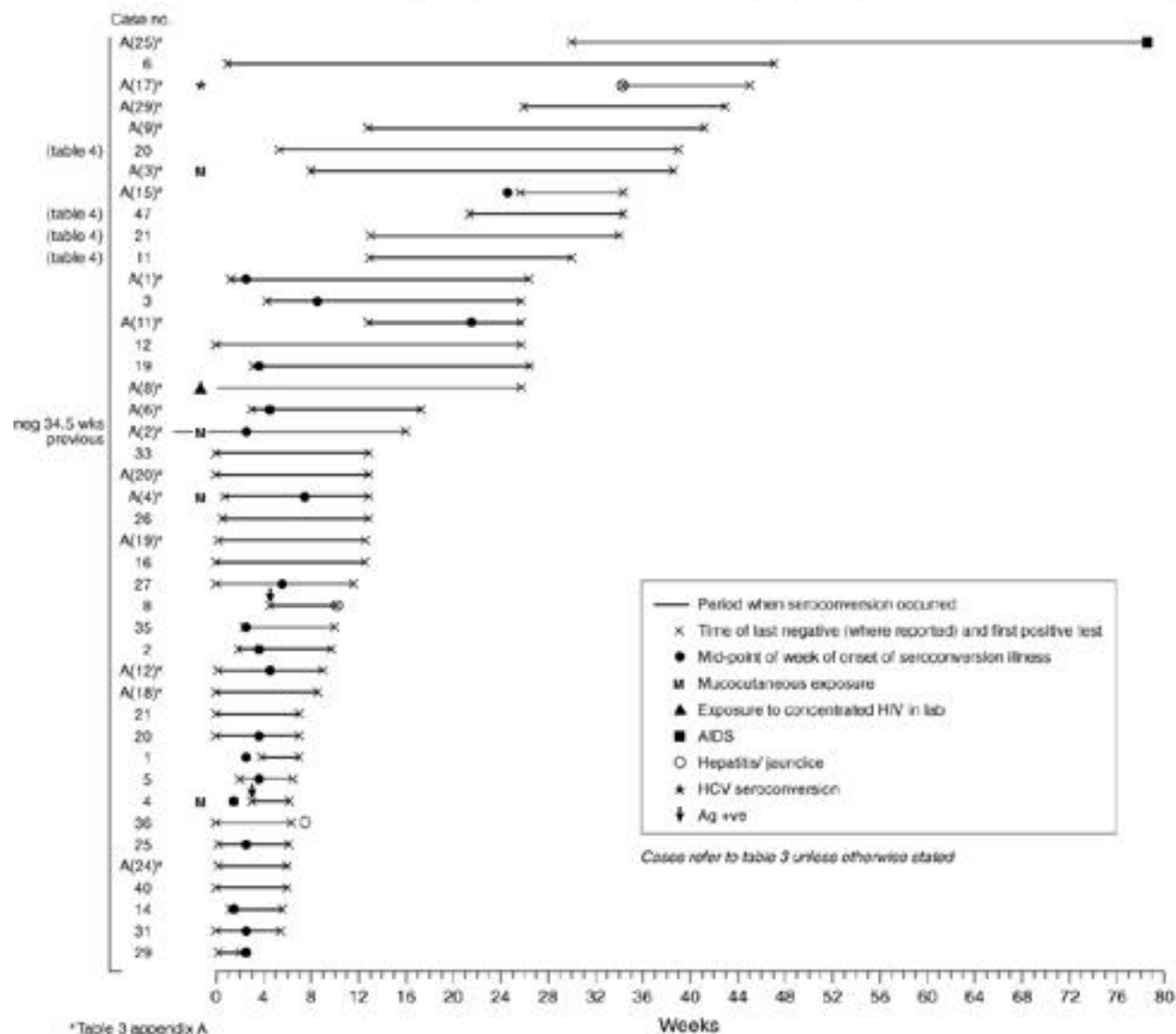


Table 7a

Periods in which HIV-1 seroconversion occurred following occupational exposure (38 percutaneous, 4 mucocutaneous and 1 exposure to concentrated HIV in lab) in 43 of the reported cases who were not given AZT



**Table 8 REPORTED FAILURES OF POST-EXPOSURE PROPHYLAXIS**

Report	See also	Year	Exposure	Time to 1st dose	Dosage schedule		HIV antibody test results		Onset of retroviral illness	Source on Zidovudine
					mg/day	days	last neg (days after exposure)	first pos (days after exposure)		
<b>HEALTH CARE WORKERS</b>										
1	T3*(91)	1990	phlebotomy needle	6 hrs	1000	54	0	42	week 5	yes
2	T3(10)	1990	lancet	6-12 hrs	1200	21	0	24	week 3	no
3	T3(13)	1992	IV cannula	30 mins	1200	42	0	42	none	no
4	T3(15)	1990	phlebotomy needle	90 mins	1000	28	0	52	day 16	yes
5	T3(22)	1992	18-20G IV cannula	1 hr	1000	42	0, 42	56 (Ag+ve 42)	week 2	yes
6	T3(App A13)	1992	21G syringe needle	2 hrs	1000	17	0, 6 wk	121	day 38	no
7	T3(App A14)	1991	22G phlebotomy needle	45 mins	800	10	NR	90+	day 14	yes
8	T3(App A15)	1990	16G IV cannula	3-7 hrs	1000	8	NR	94	day 36	yes
9	T3(34)	1994	phlebotomy needle	1 hr	1000	14	0	87	none	yes
10	T3(37)	1991	winged steel needle	2 hrs	500	55	0	131	jaundice day 55	NR
11	T3(39)	NR	mucocutaneous exposure	3 hrs	1000	30	0	53	week 4	NR
12	T3(App A19)	1992	biopsy needle (given ddl also)	30 mins	1000	45	0	23	day 23	yes

\* = Table number    1 = case number    NR = not reported

Continued .....

Table 8 (continued)

Report	See also	Year	Exposure	Time to 1st dose	Dosage schedule		HIV antibody test results		Onset of retroviral illness	Source on Zidovudine
					mg/day	days	last neg (days after exposure)	first pos (days after exposure)		
<b>HEALTH CARE WORKERS (continued)</b>										
13	T3(App A20)	1993	broken glass vacuum tube	90 mins	600	10	0	73	week 3	yes
14	T3(App A28)	1992	mucocutaneous exposure	192 hrs	1200	21	0	134	week 11	NR
152	T3(App A23)	NR	phlebotomy needle	<1 hr	1000	28	0	20	week 3	yes
162	T3(17)	1991	phlebotomy needle	30 mins	600	28	0	112	week 3	yes
172	T3(18)	1992	phlebotomy needle	2 hrs	1000	2	0	69	week 4	no
182	T3(43)	1993	mucocutaneous splash	NR	1500	28	3+	42	week 5	NR
<b>OTHER REPORTED FAILURES</b>										
19	T11(13)	-	IV injection 0.1-0.2ml	45 mins	2000	60	23+	41	NR	no
20	-	-	self-inoculation (2-3 ml)	2 hrs	1000	35	28+	90	lymphadenopathy at 3 months	NR
21	T1 <sup>(footnote)</sup>	-	needle stab	4 hrs	1000	56	0	28	week 3	no
22	T11(14)	-	IV injection 5ml	45 mins	initially 1200	15	0	9	-	yes
23	-	-	blood transfusion	7 days	1200	42	NR	4 mths	NR	NR
24	T9(16)	1995	bite	10 hrs	1200	NR	0	54	week 5	yes

Continued .....

Table 8 (continued)

Report	See also	Year	Exposure	Time to 1st dose	Dosage schedule		HIV antibody test results		Onset of retroviral illness	Source on Zidovudine
					mg/day	days	last neg (days after exposure)	first pos		
<b>HEALTH CARE WORKERS (continued)</b>										
25	T3(44)	1996	deep needlestick while recapping after obtaining arterial sample for blood gases	90 mins	NR	28	0	97	day 45	no
26	T3(45)	1997	deep needlestick with a blood-filled needle (large gauge) incorrectly discarded in waste plastic bag	90 mins	NR	28	4	55	day 40	yes
27	T3(App A31)	1998	21G Butterfly	40 mins	NR	42	0	83		yes
28	T3(46)	1999	needlestick in finger web while clearing up. Needle hidden beneath some swabs	95 mins	NR	25	0	approx 90	day 26	yes

\* = Table number    1 = case number    NR = not reported    2 = partial AZT post exposure prophylaxis.

Table 9

## OTHER REPORTED HIV TRANSMISSIONS OF RELEVANCE TO OCCUPATIONAL RISK

Case number, Author of first report (year of report)	Country	Case	Exposure type*	Description of exposure/possible exposure	HIV DNA sequences matched?
1. Grint(85)	UK	F Housewife	MC	Home nursing care for a terminally ill neighbour. Prolonged and frequent skin contact with body fluids. Small cuts on her hands and exacerbation of chronic eczema. AIDS 1985.	ND
2. CDC(86)	USA	F Mother	MC	Home nursing care for seropositive child. Frequent contact with child's blood and other fluids, without glove wearing. HIV+ve 1985.	ND
3. Wahn(86)	Germany	F Sibling	?P	Bite on forearm from HIV+ve sibling, but exposure not definite (skin not broken, no bleeding).	ND
4. Anon(87)	Unknown	F Sibling	P	Female HCW bitten on leg during fight with HIV+ve sister whose mouth was bleeding.	ND
5. Torre(90)	Italy	M Footballer	MC	Contact with blood from HIV+ve player after collision in which both men sustained cut eyebrows and bled profusely. Acute retroviral syndrome 1 month later. HIV+ 1989.	ND
6. Jones(91)	Australia	M Prison Officer	P	Attacked with syringe by HIV+ve prisoner. Failed ZDV prophylaxis (table 8, case 20).	ND
7. O'Farrell(92)	UK	M Wedding guest	MC	Contact with blood from HIV+ve individual during a fight between two men during which both sustained facial injuries and bled profusely. Acute retroviral syndrome 10 days later (1991).	ND
8. Ippolito(94)	Italy	M Sibling	MC	Contact with blood from HIV+ve brother during a fight, required sutures, acute retroviral syndrome day 30, seroconversion day 43 (1992).	Yes
9. Inagaki(94)	Japan	Mother	?P	Infected 1985 (? by needlestick injury). Homecare for HIV+ve child with haemophilia.	NR
10. CDC(92)	USA	M Sibling (child)	?P/MC	One of two brothers with haemophilia. Mother administered IV treatment to both children; uninfected sibling could have been exposed to discarded needles and syringes.	Yes
11. CDC(93)	USA	M Sibling (adolescent)	P/MC	Two adolescent brothers with haemophilia. Case and source shared a razor; case cut himself with the razor and bled (source HIV+ve 1992).	Yes
12. Fitzgibbon(93)	USA	Child	MC	Perinatally HIV infected child born to mother 1. Child born to HIV+ve mother 2 was not infected at birth but lived with child 1 and acquired virus through unrecognised exposure to child 1.	Yes
13. CDC (94)	USA	Child	MC	HIV+ve mother, who had purulent exudative skin lesions. Child had impetigo, mother picked at child's scabs. Mother had gingival bleeding and shared toothbrushes with child (HIV+ve 1993).	Yes

\* MC = mucocutaneous exposure, P = percutaneous exposure, ND = not developed

Continued .....

Table 9 (continued)

Case number, Author of first report (year of report)	Country	Case	Exposure type*	Description of exposure/possible exposure	HIV DNA sequences matched?
14. CDC (94)	USA	Mother	MC	Provided terminal home care for adult son. Usually wore gloves, but some skin contact with urine and faeces (HIV+ve 1991).	No
15. Anon	USA	Adult	P	Bitten by female sex worker during assault. Subsequently seroconverted.	NR
16. Vidmar (96)	Slovenia	M Neighbour	P	Bitten by terminally ill AIDS patient during grand mal fit. Small crack in finger, shallow wound, no visible bleeding. AZT failure (table 8, case 24).	NR
17. CDSC/Gilbart(98)	UK	M Adult	MC	Fight in car with IDU who had advanced HIV disease. Both men bled profusely. IDU diagnosed with AIDS one month later.	NA
18. CDSC/Gilbart(98)	UK	M Railway worker	MC	Contact with blood and body fluids when removing bodies (suicide victims) from a railway track. Seroconversion illness followed shortly afterwards.	NA
19. CDSC/Gilbart(98)	UK	M Nurse	P	Deliberate self-inoculation with 20mls of HIV+ve blood. Seroconversion illness 5 weeks later.	NA
20. CDSC/Gilbart(98)	UK	F Adult	P	Deliberate self-inoculation with friend's HIV+ve blood.	NA
21. CDSC/Gilbart(98)	UK	M Adult	P	Stabbed with needle whilst attacked by 2 men. Seroconversion illness followed 8 weeks later.	NA
22. Brambilla A (98)	Italy	M Adult	P	Contact with blood following a head-butting with HIV+ve assailant. HIV-ve 3 days after fight. Symptoms consistent with seroconversion 14 days later.	Yes

\* MC = mucocutaneous exposure.


P = percutaneous exposure.

NA = not available

NR = not reported

Table 10

**PUBLISHED REPORTS OF LOOKBACK INVESTIGATIONS OF  
PATIENTS EXPOSED TO HIV INFECTED HEALTH CARE WORKERS**

First author	Country	HEALTH CARE WORKER		Period covered by investigation	PATIENTS				
		Speciality	Disease course		At risk (n) <sup>1</sup>	Tested (n) <sup>1</sup>	Known HIV neg (n)	Known HIV pos (n)	HCW related infection
1. CDC/Ciesielski	USA Florida	general dentistry	HIV+ve 1986, AIDS 1987, died 1990	?1981-89	>1600	_ 1100	_ 1100	9	6
2. Comer	USA Georgia	dentistry (student)	HIV+ve 1990	NR-1990	163	156	143	0	0
3. Sacks	USA Florida	urology	AIDS, died 1983	1978-83	400	-	-	-	-
4. Armstrong	USA	general surgery	AIDS 1983	1982-85	1804	75	75	0	0
5. Mishu	USA Tennessee	general surgery	Herpes zoster 1988, AIDS, died 1989	1982-88	2160	616	615	1	0
6. Hamory	USA Pennsylvania	O+G	HIV+ve 1991	NR-1991	494	482	482	0	0
7. Dickinson	USA Florida	general dentistry	AIDS 1991	1985-91	1142	900	874	6	0
8. Rogers	USA Baltimore	breast surgery	AIDS, died 1990	1984-90	1131	467	412	1	0
9. von Reyn	USA New Hants	orthopaedics	HIV+ve 1991 (CD4 cell count 50/  )	1978-91	2317	1176	1174	0	0
10. Cottone	USA Texas	dental student	HIV+ve 1991	NR-1991	26	26	26	0	0
11. Heuer	USA Chicago	dental student	HIV+ve 1991	4/90-7/91	125	85	25	0	0

Continued.....

Table 10 (continued)

First author	Country	HEALTH CARE WORKER		Period covered by investigation	PATIENTS				
		Speciality	Disease course		At risk (n) <sup>1</sup>	Tested (n) <sup>1</sup>	Known HIV neg (n)	Known HIV pos (n)	HCW related infection
12. Taylor	USA Omaha	dental student	HIV+ve 1991, HBeAg+ve also	NR-10/91	47	37	NR	0	0
13. Danila	USA Minnesota	family physician	HIV+ve 1990, M.marinum hands, CD4 count 30 x 10 <sup>6</sup> /L	5/90-2/91	336	325	325	0	0
14. Perry	USA New Orleans	haematologist	died HIV 1992	NR	NR	NR	NR	NR	NR
15. Siegel-Itchkovitch	Israel Rehovot	surgeon	died AIDS 1994	NR	"hundreds"	100	0	0	0
16. Siegel-Itchkovitch	Israel Hadera	surgeon	HIV+ve 1993	NR	1300	>1000	0	0	0
17. Bek	Australia	resident O&G	HIV+ve 1994 (HIV-ve 1992)	6/92-7/94	149	134	133	1	0
18. Jaffe	USA (Miami)	general dentistry	HIV+ve 1988, AIDS 1991, died 1991	1985-91 (5 years)	6474	1279	1254	24 (44 others)	0
19. York	USA	dentistry: US Navy	All identified by routine screening. Dates not reported.	1 yr preceding first positive HIV test	1339	854	853	1	0
20. York	USA	dentistry: US Navy			603	495	493	2	0
21. York	USA	dentistry: US Navy			945	690	690	0	0
22. Longfield	USA	paed. dentistry: US Navy	HIV+ve 1991 on routine screening. HIV-ve 1988.	7/88-4/91	2573	1631	1631	0	0
23. Arnow	USA (Chicago)	general dentistry	AIDS 1990	31 months	88	41	41	0	0

Continued .....

Table 10 (continued)

First author	Country	HEALTH CARE WORKER		Period covered by investigation	PATIENTS				
		Speciality	Disease course		At risk (n) <sup>1</sup>	Tested (n) <sup>1</sup>	Known HIV neg (n)	Known HIV pos (n)	HCW related infection
24. Babinchak	USA	cardiothoracic surgery	HIV+ve 1991	1984-86	612	189	189	0	0
25&262. CDCP database	USA	dentist dentist	Not reported Not reported	NR NR	NR NR	1034	NR	41	0
27. CDCP database	USA	dentist	Not reported	NR	NR	689	NR	6	0
28. CDCP database	USA	orthopaedic surgeon	Not reported	NR	NR	328	NR	3	0
29. CDCP database	USA	dentist	Not reported	NR	NR	655	NR	2	0
30. CDCP database	USA	resident O+G	Not reported	NR	NR	480	NR	1	0
31. MS&SS*	France	orthopaedic surgeon	HIV+ve 1983 (Table 4, case 25)	1983-95	3004	983	983	1	1
32. Porter	UK	orthopaedics/ urology/general surgery	AIDS, died 1988 (Table 4, case 7)	1987-88	339	76	76	0	0
33. Gray	UK	midwife	HIV+ve 1993	9/91-2/93	7	5	5	0	0
34. Crawshaw	UK	junior doctor O&G	HIV+ve 1990 CD4 400-600 x 10 <sup>6</sup> /L	1988-90	746	340	340	0	0
35. Hochuli	UK	consultant O&G	AIDS 3/93	1983-93	2492	804	803	1	0
36. Christie	UK	junior doctor SHO in O&G and A&E	AIDS 4/93 died 5/93	1983-93	42	13	13	0	0

Continued.....

Table 10 (continued)

First author	Country	HEALTH CARE WORKER		Period covered by investigation	PATIENTS				
		Speciality	Disease course		At risk (n) <sup>1</sup>	Tested (n) <sup>1</sup>	Known HIV neg (n)	Known HIV pos (n)	HCW related infection
37. Monteith	UK	general dentistry	died AIDS 1993	1988-93	743	75	75	0	0
38. CDSC	UK	junior doctor general surgery	HIV+ve 1992	NR	450	400	400	0	0
39. CDSC	UK	consultant ophthalmic surgeon	HIV+ve 1992	NR	180	105	NR	NR	NR
40. CDSC	UK	junior doctor SHO A&E/GP registrar	HIV+ve 1992, died 1993	2 months	12	0	0	0	0
41. CDSC	UK	midwife	Not reported	NR	200	59	59	0	0
42. CDSC	UK	student nurse	died AIDS 1994	NR	39	2	2	0	0
43. CDSC	UK	ENT consultant	HIV+ve 1994	1984-94	677	18	18	0	0
44. CDSC	UK	junior doctor ENT	Not reported	NR	24	NR	NR	NR	NR
45. CDSC	UK	junior doctor A&E/O&G	died AIDS 1997	5/96-1/97	38	7	7	0	0
46. CDSC	UK	junior doctor O&G	HIV+ve 1997, CD4 310x10 <sup>6</sup> /L	1/90-12/96	2015	1141	1141	0	0
47. CDSC	UK	midwife	HIV+ve 1997	1993-97	16	8	8	0	0
48. CDSC	UK	midwife	HIV+ve 1997	1996-97	21	21	21	0	0

† = Not all patients "at risk" would have undergone procedures which would now be categorised as "exposure prone", nor would all patients have been treated after the date on which the HCW acquired HIV. \* = Ministère de la Santé et de la Sécurité Sociale

‡ = Both practised concurrently in a correctional facility and patients could not be distinguished. NR = Not reported

Prepared by PHLS Communicable Disease Surveillance Centre, London. December 1999

Table 11

## IATROGENIC TRANSMISSION OF HIV

Incident number, Author of 1st report (year of report)	Country	Description of exposures
1. Patrascu(90)	Romania	138 children aged newborn-13 yrs thought to have become infected either through blood transfusions or lack of disposable needles.
2. Hersh(93)	Romania	Study found 20 of 100 children aged 0-4 yrs to be HIV+. All had received multiple injections (mean 280) of antibiotics/vaccines/vitamins; often from multidose vials and multi use needles/syringes.
3. Pokrovsky(94)	Russia	265 children under 15 yrs of age and 23 women infected in 13 hospitals in Elista during May 1988 to August 1989 mainly due to inadequate sterilization techniques.
4. Navarro(88)	Spain	Seven men thought to have become infected through donating plasma to a private blood bank in Valencia. Two further cases subsequently reported in 1988 following Lancet letter (see also incident No.18)
5. Banerjee(89)	India	Twelve professional blood donors seroconverted between Nov 87 and July 88; possibly via common source in commercial plasma bank(s).
6. Avila(89)	Mexico	Up to 280 paid plasma donors at one centre may have become infected in 1985-86; IV tubing used to collect plasma from multiple donors.
7. Mudur(95)	India	60 children with thalassaemia who regularly receive blood transfusions have HIV infection. Same report highlights problems of "unaccounted for" HIV infected donations in blood bank in Bombay.
8. Dyer(93)	Argentina	33 renal dialysis patients infected in Cordoba province, 1991 (reused filters, HIV possibly introduced via heparin multidose vial); at least 20 dialysis associated cases in town of La Plata – catheters from clinic machines HIV-contaminated.
9. Hassan(94)	Egypt	Screening of 5000 patients on haemodialysis in Egypt revealed 82 (1.64%) HIV infected patients. Faulty procedures in decontaminating dialysis tubing and accessories potentially responsible.
10. Velandia(95)	Columbia	Transmission within a dialysis centre in which access needles and blood lines were improperly reprocessed.
11. Nduati(94)	Kenya	Pre-term infant possibly acquired HIV from freshly expressed unpasteurised pooled breast milk.
12. Koenig(86)	Dominica	Boy given vitamin injections by mother after same syringe had been used on HIV+ve brother.

Continued .....

**Table 11 (continued)**

Incident number, Author of 1st report (year of report)	Country	Description of exposures
13. Lange(90)	Netherlands	58-yr old male patient inadvertently injected intravenously with an estimated 100-200µl of fresh whole blood from an HIV-infected patient when used syringe was mistaken for another while attempting to administer 1ml of labelled red cells (table 8).
14. Polder(91)	USA	Inadvertent injection of a patient with labelled white blood cells from an HIV+ve patient instead of patient's own labelled cells (table 8, case 22).
15. Polder(91)	USA	Inadvertent reuse of a syringe, used during a diagnostic procedure on an HIV+ve person, on a second patient. HIV status of recipient after follow up not reported.
16. Chant(93)	Australia	Transmission to four of eight patients who underwent minor surgery on the same day as an HIV+ve patient.
17. Blank(94)	USA	Child probably acquired HIV infection via patient-to-patient transmission during inpatient care in a New York hospital.
18. Gilbert/CDSC (98)	UK	See incident number 4. Two UK residents donated plasma in Valencia in 1983/4. Thought to have become infected then. Seroconversion illnesses consistent with this exposure.
19. Smith (97)	Denmark	Child to child transmission in hospital ward, probably through exposure to HIV+ve needles in sharps bin.
20. Katzenstein(99)	Denmark	Patient to patient transmission possibly via use of multidose vials. The precise timing of the transmission could not be identified but could be narrowed down to the period April to September 1995.

**Table 1: References**

**ESTIMATE OF HIV TRANSMISSION RATE AFTER A SINGLE PERCUTANEOUS EXPOSURE: PROSPECTIVE AND CROSS SECTIONAL STUDIES OF HEALTH CARE WORKERS**

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**continued.....**

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**NOTE:**  
The case mentioned by Fribourg-Blanc (*Medecine et Maladies Infectieuses* 1988; 18:216-218) is not included. This was a technician who was "indisputably" seropositive 2 months after a needlestick injury but who subsequently became seronegative.

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**Table 5: SUMMARY OF REPORTED OCCUPATIONALLY ACQUIRED HIV INFECTIONS IN HEALTH CARE WORKERS AND AIDS CASES, BY COUNTRY**

See Table 3 for references (pages 48-57).

**Table 6: SUMMARY OF OCCUPATIONALLY ACQUIRED HIV INFECTION: ALL REPORTS, BY OCCUPATION**

See Tables 3 and 4 for references (pages 48-60).

**Tables 7 and 7a :PERIODS IN WHICH HIV-1 SEROCONVERSION OCCURRED FOLLOWING OCCUPATIONAL EXPOSURE**

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**ALSO OF POSSIBLE INTEREST: SIV/ICL (IDIOPATHIC CD4 T CELL LYMPHOPAENIA): WORK RELATED INFECTIONS**

**Simian immunodeficiency virus**

1. One worker seroconverted after a blood contaminated needlestick injury during venepuncture, serological results suggest that worker did not become persistently infected.  
A second did not report a specific exposure incident but had severe dermatitis of the forearms and hands and had regularly performed serology on clinical specimens from SIV-infected sources while ungloved. Two other workers sustained scalpel cut exposures during necropsies on SIV-infected sources, neither seroconverted during six months follow up.

Centers for Disease Control. Seroconversion to simian immunodeficiency virus in two laboratory workers. *MMWR* 1992; 41:678-81.

One of the two cases is also reported in:

- (A) Khabbaz RF, Rowe T, Murphey-Corb M, et al. Simian immunodeficiency virus needlestick accident in a laboratory worker. *Lancet* 1992; 340:271-3.  
(B) Bignall J. Human infection with SIV. *Lancet* 1994; 343:229.  
(C) Khabbaz RF, Heneine W, George JR, et al. Brief report: infection of a laboratory worker with simian immunodeficiency virus. *New Engl J Med* 1994; 330:1727.

2. Three of 472 (0.6%) samples tested were seropositive for HIV-2/SIV: seropositives may include one or both of cases reported in (1), above. Prospective studies of workers who sustain exposures to SIV infected sources are planned.

Centers for Disease Control. Anonymous survey for simian immunodeficiency virus (SIV) seropositivity in SIV-laboratory researchers - United States, 1992. *MMWR* 1992; 41:814-5.

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**ICL (idiopathic CD4 T cell lymphopaenia)**

3. 37 yr-old male heterosexual doctor with ICL, (CD4 < 120), herpes zoster, papilloma virus infection & molluscum contagiosum. History of needlestick incident.

Laurence J, Siegal FP, Schattner E, et al. Acquired immunodeficiency without evidence of infection with human immunodeficiency virus types 1 and 2. *Lancet* 1992; 340:273-4.

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- (A) Laurence J, Siegal FP, Gelman I, et al. Acquired immunodeficiency syndromes in the absence of HIV-1, 2 infection. Annual MRC Meeting, Glasgow, 1992:SP5.