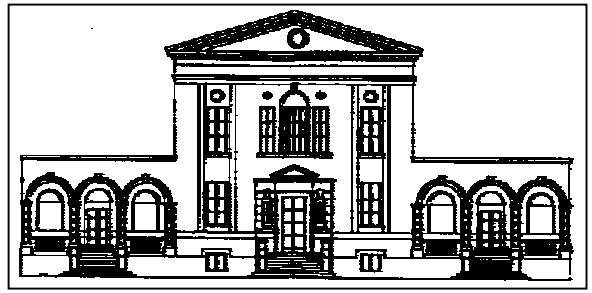
Viral HepatitisPrevention Board



INMI L. Spallanzani Rome, Italy

26th hepatitis B, hepatitis C, and other blood-borne infections in health-care workers

Rome, Italy, March 17-18, 2005.

Definitions: nosocomial infections, exposure-prone procedures, viral load threshold for infectivity

Vincenzo Puro

Nosocomial infection

Infection not present, not incubated at the time of admission/exposure and epidemiologically linked to health-care procedures performed in- as well as out-side the hospital

Health-care associated infection

(including Nosocomial outbreak)

Health-care associated infection

Infection not present, not incubated at the time of admission/exposure and epidemiologically linked to health-care procedures performed in- as well as out-side the hospital

Acute symptomatic infection and/or Documented seroconversion

Newly diagnosed infection

- **PATIENT TO PATIENT**
- **PATIENT TO HEALTHCARE WORKER**
- **HEALTHCARE WORKER TO PATIENT**

Health-care associated infection

Infection not present, not incubated at the time of admission / exposure and epidemiologically linked to health-care procedures performed in- as well as out-side the hospital

Availability of negative "*time zero*"

Nucleic Acid tests

Serology

} ***"window period"***

or at least

Consistent with incubation period

Health-care associated infections

Infection not present, not incubated at the time of admission/exposure and **epidemiologically linked** to health-care procedures

Conventional "classic" epidemiologic investigation

HCV PATIENT TO PATIENT TRANSMISSION

Reference	Setting	Suspected transmission route
Allander 1995	oncology	Percutaneous procedures
Rieske 1998	Pediatric oncology	Multidose vials unclear
Widell 1999	Pediatric oncology	Multidose vials
Schvarcz 1997	Research project	Flushing IV catheters, contaminated gloves
Lesourd 2000	In vitro fertilization	Procedures performed by ancillary staff (not clarified)
Bronowicki 1997	colonscopy	Endoscope, multidose vials
Gabriel 1996	Ozone therapy	Reuse of quartz-glass container
Massari 2001	Gynecology surgery	Multidose vials
Heinsen 2000	surgery	Respiratory circuit
Saginur 2001	Research project	Percutaneous procedures
Desenclose 2001	Unit for diabetic pt	Finger-stick devices for glucose

Health-care associated infections

Infection not present, not incubated at the time of admission/exposure and epidemiologically linked to health-care procedures

Conventional “classic” epidemiologic investigation

Molecular epidemiology

HCV PATIENT TO PATIENT TRANSMISSION

Reference	genotype analysis	sequence analysis	phylogenetic analysis
Allander 1995	+	E2 / HVR	
Widell 1999	+	HVR1	
Schvarcz 1997	+	NS5, core	+
Bronowicki 1997	+	NS3	
Massari 2001	+	E1, E2, HVR1, NS5	+
Heinsen 2000	+	C-E1	+
Saginur 2001	+	E1 / HVR	
Desenclose 2001	+	E2 / HVR; NS5b	+

HIV

All the 4 cases of HCW-to-Pts transmission of HIV reported in the literature,
was confirmed by genotype, sequence and phylogenetic analysis

HCV

In 10 out of 12 cases of HCW-to-Pts transmission of HCV reported in the literature for whom data are available, transmission was confirmed by genotype, sequence and, in 7, also by phylogenetic analysis

OCCUPATIONAL TRANSMISSION OF HIV

Summary of Published Reports

March 2005 Edition
Data to December 2002

Cases of occupationally acquired HIV infection are usually categorised as either "definite" or "possible", but the definitions used vary slightly from country to country

Definite case

1. Documented HIV seroconversion associated in time with a specific occupational exposure to a source of HIV.

2. Subtyping or genotyping of HIV from an infected healthcare worker show the strain to be indistinguishable from that of the putative source

i.e. when HIV infectivity of the source not documented or specific exposure unreported

Possible or probable case

no other identified risk for infection other than occupational exposure.

Exposure prone procedures

MMWR
Morbidity and Mortality Weekly Report
CDC
Julv 12. 1991 / 40(RR08):1-9

Recommendations for Preventing Transmission of Human Immunodeficiency Virus and Hepatitis B Virus to Patients During Exposure-Prone Invasive Procedures

Precautions are prudent to prevent HIV and HBV transmission during procedures that have been

linked to HCW-to-patient HBV transmission

or

that are considered exposure-prone,

i.e. procedures in which the likelihood of exposure of the patient to an HCW's blood is greater.

Exposure-Prone Procedures

…….. in the case of the sharp object causing the HCW injury recontacted the patient's open wound.

Tokars JI. Percutaneous injuries during surgical procedures. JAMA. 1992
Injuries occurred during 6.9% of the 1382 procedures.
In 32% of the injuries in surgeons, the sharp object that caused the injury recontacted the patient

Evidence: Recontact is frequent and at higher rates in certain surgical settings

Deriving Principle: these settings should be considered at high risk

Exposure prone
Surgical specialties linked to HCW-tp Pts HBV transmission

39 surgeons

- 9 cardiothoracic surgeons
- 8 obstetric/gynecologic surgeons
- 8 general surgeons
- 5 oral surgeons
- 4 dentists
- 2 orthopedic surgeons
- 1 (general, cardiot. & gynecologic surg)
- 1 (gynecologic surg, orthopedic surg)
- 1 urology

EP <u>Surgical interventions</u> linked to HCW-tp Pts HBV transmission:

gynecological	Hysterectomy, Ovariectomy Repair of prolapse uterus
obstetric	Caesarean delivery Deliveries with forceps
cardio thoracic	Coronary bypass Valvular replacement Bypass surgery Open heart surgery Heart transplant Repair of congenital defects Thymectomy Open lung biopsy Pneumonactomy
Orthopedic	Total knee arthroplasty Hip hemiarthroplasty “bone-pinning”
G-intestinal	Cholecystectomy, inguinal hernia repair

Surgical interventions linked to HCW-tp Pts HCV or HIV transmission

HCV

7 surgeons

- **3 cardiothoracic surgeons**
  valvular replacement, coronary bypass
- **3 obstetric/gynecologic surgeons**
  cesarean section, Hysterectomy. N.A.
- **1 orthopedic surgeons**
  total hip arthroplasty

HIV

1 orthopedic	Hip prothesis with bone transplant
1 dentist	Unknown
1 gynecologic	Cesarean section

Exposure-Prone Procedures: a descriptive definition

UK Advisory Panel for HCW infected with B-B viruses. 2002

Invasive procedures where there is a risk that injury to the worker may result in the exposure of the patient's open tissues to the blood of the worker.

These include procedures where the worker's gloved hands may be in contact with sharp instruments, needletips or sharp tissues (e.g. spicules of bone or teeth) inside a patient's open body cavity, wound or confined anatomical space where the hands or fingertips may not be completely visible at all times.

Department of Health, Dec 2002 Health Clearance for Serious Communicable Diseases

Report from the Ad hoc Risk Assessment Expert Group Exposure-prone procedures

Summary of exposure-prone procedures according to medical specialty*

Specialty	Expected to perform EPP		Proviso
	Yes	No	
A&E	+		
Anaesthetics		-	No EPP in much of routine elective minor anaesthesia
Audiology Medicine		-	
Blood transfusion		-	
Cardiology		-	If no arterial cut-downs or removal of pacemakers
Chemical pathology		-	
Chest Medicine		-	
Clinical Oncology		-	If no EP skin tunnelling
Clinical neurophysiology		-	
Clinical Physiology		-	
Dentistry	+		
Dermatology		-	
Endocrinology & Diabetes		-	
Gastroenterology		-	
General Internal Medicine		-	
General Practice		-	If no EP minor surgery or infiltration of LA for/suturing of episiotomy nor attachment of sharp scalp electrodes
Genetics		-	
Genitourinary medicine		-	
Geriatric Medicine		-	

Specialty	Expected to perform EPP		Proviso
	Yes	No	
Haematology		-	Except for bone marrow harvesting by pelvic aspiration and insertion of central venous lines in femoral and subclavian veins
Immunology		-	
Infectious Diseases		-	
Intensive Care		-	If no arterial cut-downs or EP skin tunnelling
Microbiology		-	
Morbid Anatomy		-	
Neurology		-	
Neuropathology		-	
Nuclear Medicine		-	
Obstetrics & Gynaecology	+		
Occupational Health		-	
Ophthalmology		-	Except orbital surgery and some acute trauma cases
Orthodontics	+		
Paediatrics		-	
Palliative medicine		-	If no EP skin tunnelling
Paramedics		-	Except for emergency sites/acute trauma
Pathology (including histopathology)		-	
Pharmaceutical medicine		-	
Psychiatry		-	Except learning difficulties (& mental handicap) where biting and scratching predicted to occur frequently or if a patient were to seriously assault a HCW
Public & Community Health		-	
Podiatry		-	Unless podiatric surgery performed

Department of Health, Dec 2002 Health Clearance for Serious Communicable Diseases

Report from the Ad hoc Risk Assessment Expert Group Exposure-prone procedures (EPPs):

Specialty	Expected to perform EPP		Proviso
	Yes	No	
Radiology		-	Except for brachytherapy in clinical oncology and interventional radiology procedures
Rehabilitation Medicine		-	
Renal Medicine		-	Except obtaining vascular access [femoral] site in a distressed patient. All HBsAg HCW excluded from the haemo-dialysis process in renal units
Rheumatology		-	
Spinal injuries		-	
Surgery[#]	+		
Nursing			
General		-	
Psychiatric/learning difficulties	+		If biting and scratching predicted to occur frequently
Theatre	+		
A & E	+		
Midwifery	(+)		If include infiltration of LA/suturing of episiotomy and attachment of sharp scalp electrodes

HCV transmission from cardiothoracic surgeon - 2002

1992-2001 10.000 interventions

3 cases documented, 4 highly probable

August 2001: Cardiothoracic surgeon tested HCV positive

Probably, occupationally acquired infection

North Shore University Hospital Policy:

Double gloves, clamps instead of wires, blunted needles, baseline patient's HCV testing and informed consent

Continue to operate

www.newsday.com April 2002

Exposure-Prone Procedures

Despite adherence to the principles of universal precautions, certain invasive surgical and dental procedures have been implicated in the transmission of HBV from infected HCWs to patients, and should be considered exposure-prone.

Deriving Principle: Some invasive procedures would be regarded as non-exposure prone if conducted in accordance with Standard precautions and other preventive measures.

and

infected HCW who adhere to SP can be allowed to practice

? How to evaluate compliance

Non- Surgical procedures linked to HCW-tp Pts HBV, HCV, HIV transmission

HBV

- **2 physicians**
- **1 nurse**
- **1 inhalation therapist**
- **2 pump perfusion technicians**
- **1 acupuncturist**
- **1 EEG technician**
- **1 not specified**
- **1 dentist**

HCV

3 Anesthetists
(endotracheal intubation i.V. incannulation)

HIV

1 Surgical unit nurse

Case Report Journal of Medical Virology 75:399–401 (2005)

Anesthetist to Patient Transmission of Hepatitis C Virus Associated With Non Exposure-Prone Procedures

J. Mawdsley,[1]* C.G. Teo,[2] M. Kyi,[3] and M. Anderson[4]

A 44-year-old lady was diagnosed with acute hepatitis C virus (HCV) infection 8 weeks after hysterectomy at which the attending anesthetist was known to be hepatitis C seropositive. Comparative nucleotide sequence analysis and phylogenetic comparison proved that transmission had occurred from the anesthetist to the patient. The patient had received general anesthesia with endotracheal intubation and peripheral intravenous cannulation. No exposure-prone anesthetic procedures had been performed. This is the first case described in UK involving transmission from an anesthetist to a patient during anesthesia where no exposure prone procedures were carried out. It is the first example in which the anesthetist was known to be seropositive for hepatitis C prior to the operation. ***J. Med. Virol.***

Lessons from patient notification exercises following the identification of hepatitis B e antigen positive surgeons in an English health region

SE Oliver, J Woodhouse, V Hollyoak

Commun Dis Public Health 1999; **2**: 130-6.

TABLE 5 **Risk classification of exposure prone procedures performed in all incidents**

Commun Dis Public Health 1999; **2**: 130-6.

High risk procedures *(OPCS code to 2 digits)*		Low risk procedures *(OPCS code to 2 digits)*	Not-exposure prone *(OPCS code to 2 digits)*
Gastroduodenal (11 procedures) *(G28, 29, 33, 35, 52)* Partial gastrectomy Open excision of stomach lesion Gastrojejunal anastomosis Peptic ulcer operation	**Thyroid (4 procedures)** *(B08)* Thyroidectomy	**Perianal/anal (49 procedures)** ***(H48, 51, 52, 55, 56, 58, 59, 60)*** Excision of lesion of anus Haemorrhoidectomy or Injection* of piles Laying open of anal fistula Lateral spincterotomy Perineal drainage Excision etc of pilonidal sinus	**Endoscopic only (10 procedures)** *(G18, 45)* Dilation of Oesophagus using rigid oesophagoscope Fibreoptic examination of upper gastrointestinal tract *(H25, 26, 28)* Examination of lower bowel and biopsy using fibreoptic sigmoidoscope Examination of sigmoid colon
Colorectal (26 procedures) *(H05, 06, 07, 09, 10, 15, 16, 17, 33* hemic… end an… Sigmoi… Draina… Excisio…	**Breast (55 procedures)** *(B27, 28, 32, 33)* Total/other* mastectomy Biopsy Drainage procedure	**Various veins**	
Biliar… (J18, I… Anasto… jejunu…	**Appendicectomy (67 procedures)**		
Renal… (4 pro… *(M02,* Partial cystectomy	*(G69, 72)* Excision of ileum, Other connectio of ileum	**Penile (12 procedures)** *(N27, 30, 32)* Excision of lesion Circumcision Other operations on penis	
Laparotomy (5 procedures) *(T30)*	*(41)* Peranal excision of lesion of rectum		
Hip and knee (20 procedures) *(W37, 42, 46)* Total prosthetic joint replacements*	*(J69)* Splenectomy *(L62)* Open embolectomy of femoral artery	**Lymph node excision biopsy (12 procedures)** *(T87)* Excision or biopsy of lymph node	
Amputations (3 procedures) *(X09, 10, W57)* leg above knee, through metatarsal bones, excision arthroplasty of first MTP joint	*(T41, 69, 85)* Freeing of adhesions of peritoneum Freeing of tendon Block dissection of lymph nodes *(W20)* Open reduction of fracture and extramedullary fixation *(X11)* Amputation of toe	**Miscellaneous (6 procedures)** *(T01, 31, 59)* Excision of lesions of chest wall, of anterior abdominal wall, or ganglion	

There was no association between the risk of procedure and transmission rates based on confirmed and undetermined cases in incidents combined or separately

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY June 2002

TRANSMISSION OF HEPATITIS B VIRUS FROM A SURGEON TO HIS PATIENTS DURING HIGH-RISK AND LOW-RISK SURGICAL PROCEDURES DURING 4 YEARS

Ingrid J. B. Spijkerman, PhD; Leen-Jan van Doorn, PhD; Maria H. W. Janssen; Clementine J. Wijkmans, MD; Marijke A. J. Bilkert-Mooiman; Roel A. Coutinho, PhD; Gezina Weers-Pothoff, PhD

ABSTRACT

OBJECTIVE: We investigated cases of acute hepatitis B in The Netherlands that were linked to the same general surgeon who was infected with hepatitis B virus (HBV).

DESIGN: A retrospective cohort study was conducted of 1,564 patients operated on by the surgeon. Patients were tested for serologic HBV markers. A case–control study was performed to identify risk factors.

RESULTS: The surgeon tested positive for hepatitis B surface antigen (HBsAg) and hepatitis B e antigen (HBeAg) with a high viral load. He was a known nonresponder after HBV vaccination and had apparently been infected for more than 10 years. Forty-nine patients (3.1%) were positive for HBV markers. Transmission of HBV from the surgeon was confirmed in 8 patients, probable in 2, and possible in 18. In the remaining 21 patients, the surgeon was not implicated. Two patients had a chronic HBV infection. One case of secondary transmission from a patient to his wife was identified. HBV DNA sequences from the surgeon were completely identical to sequences from 7 of the 28 patients and from the case of secondary transmission. The duration of the operation and the occurrence of complications during or after surgery were identified as independent risk factors. Although the risk of HBV infection during high-risk procedures was 7 times higher than that during low-risk procedures, at least 8 (28.6%) of the 28 patients were infected during low-risk procedures.

CONCLUSIONS: Transmission of HBV from surgeons to patients at a low rate can remain unnoticed for a long period of time. Prevention requires a more stringent strategy for vaccination and testing of surgeons and optimization of infectious disease surveillance. Policies allowing HBV-infected surgeons to perform presumably low-risk procedures should be reconsidered (*Infect Control Hosp Epidemiol* 2002;23:306-312).

TABLE
RISK CLASSIFICATION OF OPERATIONS PERFORMED BY THE INFECTED SURGEON IN CASES AND CONTROLS

High-Risk Procedures	Medium-Risk Procedures	Low-Risk Procedures
Intestinal		
Rectum excision 1/2	Pylorotomy 0/1	Laparoscopic cholecystectomy 2/5
Sigmoid resection 3(1)/0	Mucosectomy of rectum 1/0	or rectopexy 1/0
Ileocecal resection 2(1)/1	Appendectomy 1/8	Lateral sphincterotomy 1/3
Hemicolectomy 0/2	Hemostasis anal bleeding 0/1	Inspection of anal lesions 3/0
Creation or removal of intestinal	Small bowel operation 0/1	Laying open of anal fistula 2/0
Uterus/adnexa extirpation 1(1)/0		Excision of ganglion 2(1)/3, scar tissue 1/2
		Superficial tumor 0/9, pilonidal sinus 0/2
		Biopsy 0/3
Vascular		
Aorta bifurcation prosthesis 2(1)/0	Repair of venous patch leakage 0/2	Ligation/stripping of varicose veins 3(1)/5
		Insertion of subclavian catheter 1/0
Others		
	Drainage of abdominal abscess 0/1	Drainage of superficial abscess 0/6
	Flush abdomen 1/0	Change genta beads 0/1
	Relaparotomy 1/1	Laparoscopy 0/1
	Inguinal hernia repair 3(2)/6	Laparoscopic hernia repair 0/6
	Umbilical hernia repair 1/0	Freeing of tendon 0/6

Numbers indicate the number of such procedures performed in the 28 confirmed, probable, and possible cases (in the 8 confirmed cases if applicable)/the 84 controls.

Although the risk during high risk procedures was 7 time higher……at least 28% of patients were infected during low risk procedures

EXPOSURE-PRONE PROCEDURES

Risk	Procedure
High-risk or "exposure prone" procedures	•Any submucosal invasion with sharp, hand-held instruments or procedures dealing with sharp pathology/bone spicules, usually in poorly visualised or confined spaces (e.g. orthopaedic surgery, trauma, internal cavity surgery)
Variable-risk procedures	•Minor dental procedures (excluding examination), routine dental extractions •Internal/instrument examination/biopsy (e.g. endoscopy, vaginal examination, laparoscopy) •Minor skin surgery
Low-risk procedures	•Interview consultation, dental examination •Noninvasive examinations or procedures (aural testing, electrocardiograph, abdominal ultrasound) •Intact skin palpation (gloves not required) •Injections/venipuncture (gloves required)

Demediuk N 2002 www.ashm.org.a

EXPOSURE-PRONE PROCEDURES

Risk	Procedure
High-risk or "exposure prone" procedures	***those with potential for direct contact between the skin (usually finger or thumb) of the healthcare worker and sharp surgical instruments, needles, or sharp tissues (spicules of bone or teeth) in body cavities or in poorly visualised or confined body sites"."***
high transmitter risk	***• include surgeons, operating room nurses, intensive care staff, interventional radiologists and their assistants, and emergency department staff.***
Low-risk procedures	**• all the others**

Medical Journal Australia 2003; 179 (3): 153-157

EXPOSURE PRONE PROCEDURES

- ✓ **CATEGORY 1**
- ✓ **CATEGORY 2**
- ✓ **CATEGORY 3**

UKAP

EXPOSURE PRONE PROCEDURES

CATEGORY 1

THE HANDS AND FINGERTIPS OF THE WORKER ARE USUALLY VISIBLE AND OUTSIDE THE BODY MOST OF THE TIME.

THE POSSIBILITY OF INJURY IS <u>SLIGHT</u>.

THE RISK OF THE HEALTH CARE WORKER BLEEDING INTO A PATIENT'S OPEN TISSUES SHOULD BE <u>REMOTE</u>.

EXAMPLES:
LOCAL ANAESTHETIC INJECTIONS IN DENTISTRY, REMOVAL OF HAEMORRHOIDS, INTRAVENOUS CANNULATION AND ENDOTRACHEAL INTUBATION

EXPOSURE PRONE PROCEDURES

CATEGORY 2

THE FINGERTIPS MAY NOT BE VISIBLE AT ALL TIMES BUT INJURY TO THE WORKER'S GLOVED HANDS FROM SHARP INSTRUMENTS AND/OR TISSUES IS UNLIKELY.

IF INJURY OCCURS IT IS LIKELY TO BE NOTICED AND ACTED UPON QUICKLY TO AVOID THE HEALTH CARE WORKER'S BLOOD CONTAMINATING A PATIENTS OPEN TISSUES.

EXAMPLES:
ROUTINE TOOTH EXTRACTIONS, APPENDICECTOMY.

EXPOSURE PRONE PROCEDURES

CATEGORY 3

THE FINGERTIPS ARE OUT OF SIGHT FOR A SIGNIFICANT PART OF THE PROCEDURE, OR DURING CERTAIN CRITICAL STAGES.

THERE IS A DISTINCT RISK OF INJURY TO THE WORKERS GLOVED HANDS FROM SHARP INSTRUMENTS AND/OR TISSUES.

IT IS POSSIBLE THAT EXPOSURE OF THE PATIENT'S OPEN TISSUES TO THE HEALTH CARE WORKERS BLOOD MAY GO UNNOTICED OR WOULD NOT BE NOTICED IMMEDIATELY.

EXAMPLES:
HYSTERECTOMIES, CAESAREAN SECTIONS, OPEN CARDIAC SURGICAL PROCEDURES.

Threshold of Infectivity

Level of viremia below which transmission does not occur or it is unlikely

Level of viremia below which the HCW can continue to work (to perform EPP)

HBV

Cases of HCW-to-pts HBV transmission

Ref. (year)	*Surgery*	*HBV DNA g Eq/ml*
Harpaz et al 1996	Thoracic	1×10^9
Incident Investigation Team 1997	General Gyn	1×10^7 2.5×10^5 4.4×10^6 5.5×10^6
Molyneaux et al 2000	N.A.	1×10^6
Spijkerman et al 2002	N.A.	5×10^9

Buster et al Antiviral research 2003; 60: 79-85

HBV DNA levels and transmission of HBV by HBeAg neg HCWs

Corden et al. J Clin Virol 2003; 27:52-58.

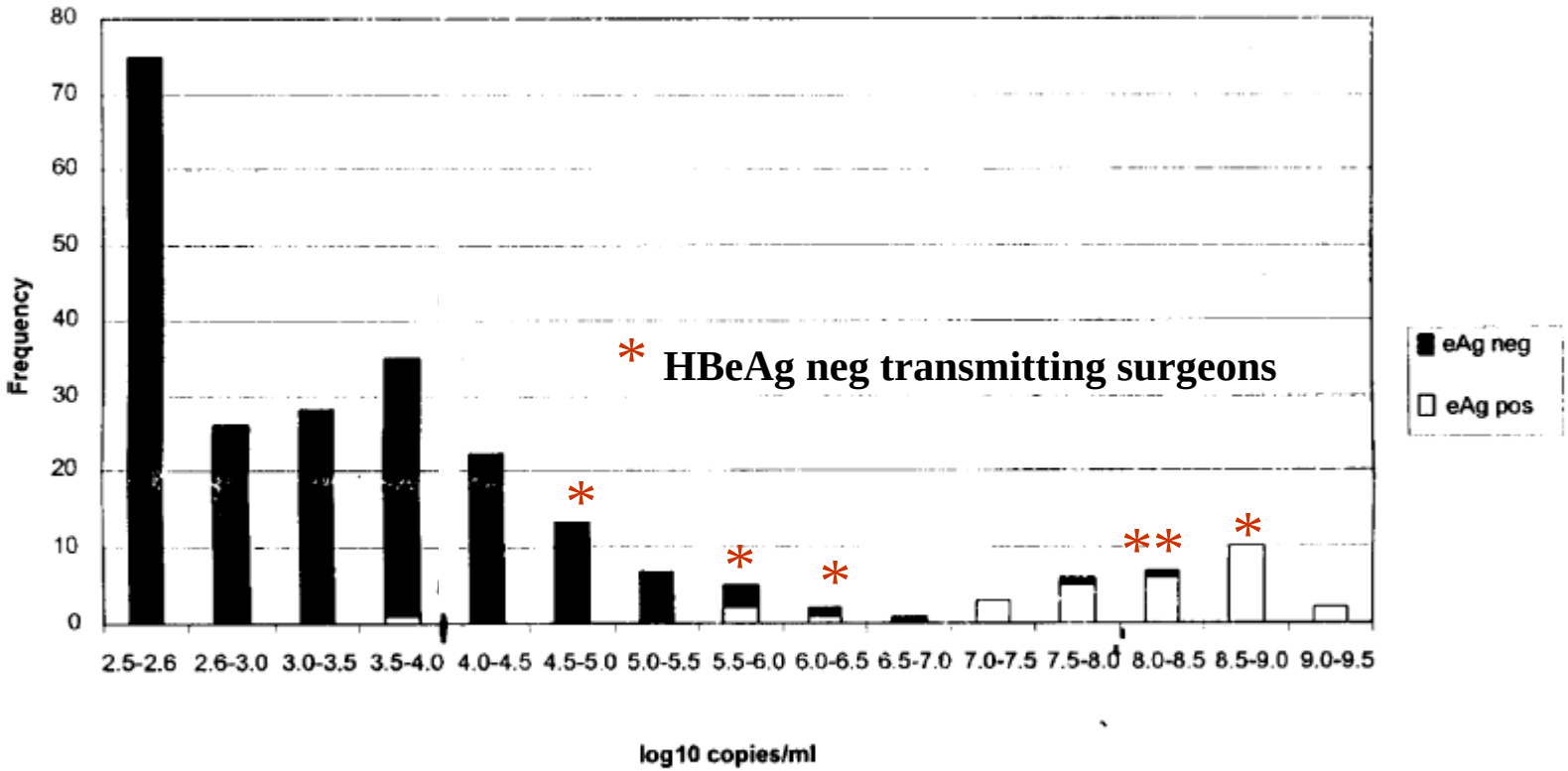


Fig. 2. Distribution of HBV DNA levels, expressed as copies/ml, in 31 carriers whose serum contained HBeAg and 211 carriers whose serum did not. Vertical axis displays numbers of carriers, horizontal axis displays HBV DNA levels (Figure reproduced from Corden et al.).

Of the transmission incidents associated with e-antigen negative health care workers which have been reported in the UK, only one health care worker had an HBV DNA level below 10^5 genome equivalents/ml (3 months after the exp)

anti-Hbe carrier state is a dynamic host parasite relationship with natural, short lived, fluctuations of viral load, which, in rare cases, lead to an 3 log increase in viral load (mean 0.89 log).
i.e. from $10^2/10^3$ to $10^4/10^5$ copies/ml)

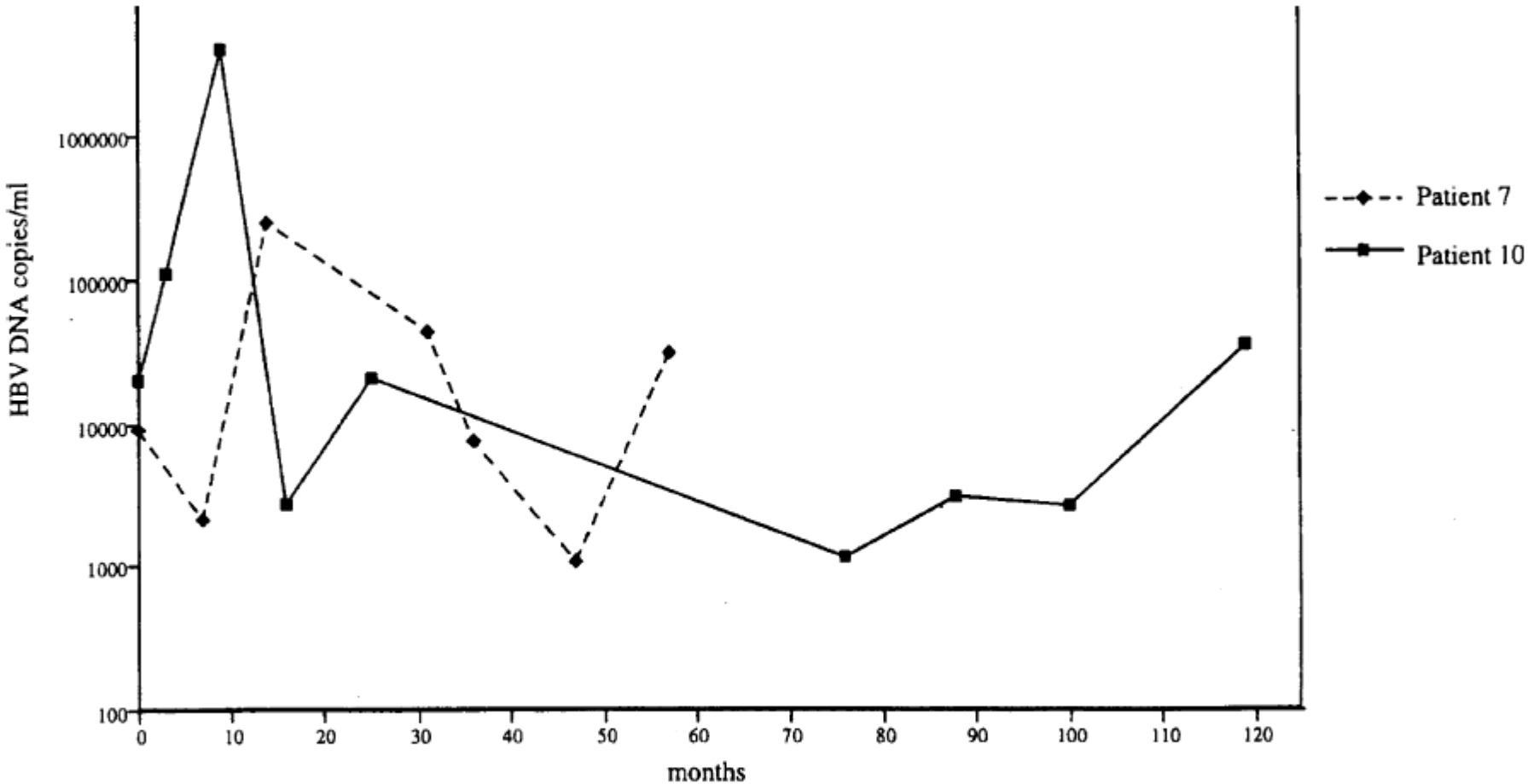


Fig. 3. Changes of HBV DNA levels over time in two anti-HBe patients closely sampled over 60 and 120 months (Figure reproduced from Tedder et al.).

HBV-DNA threshold limit

below which the HCW can continue to perform EPP

US., Canada, Italy: no level is specified

Australia: ***"high"***

UK/Eire, France	**10^3 g Eq/ml**
The Netherlands, Germany	**10^5 g Eq /ml**
The European Consensus Group	**10^4 g Eq /ml**

In the UK a cut off of 10^3 copies/ml has lead to the restriction of 58% HBV infected HCWs

In the Netherlands a cut off of 10^3 copies/ml would result in the restriction of 94% infected HCWs.

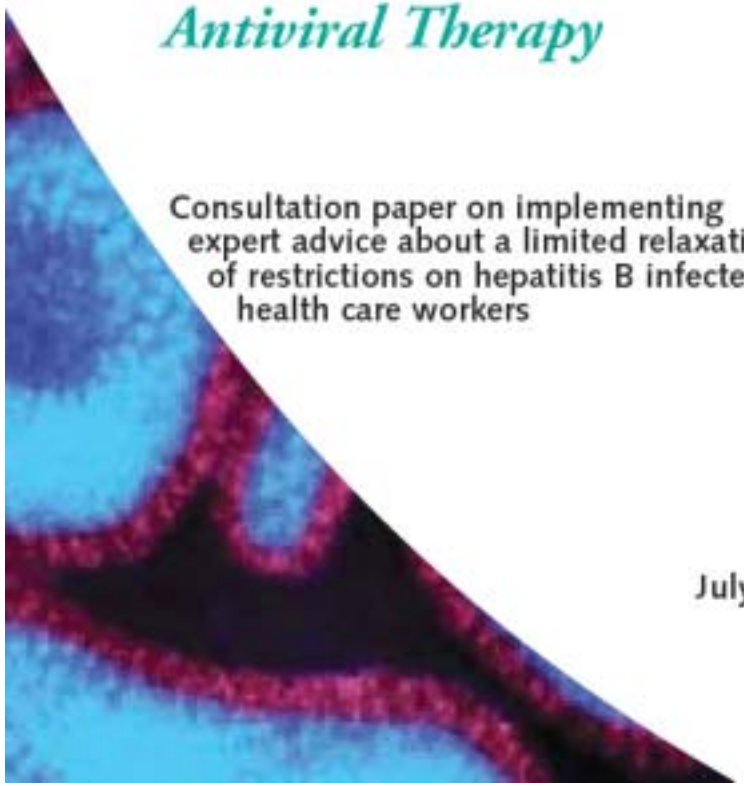
Table 4
HBV DNA levels

HBV DNA level (copies/ml)	Number of HCW with a HBV DNA	
(a) In HBV carriers in HCW in the Netherlands		
$\leq 10^3$	1	
$> 10^3 - 10^4$	2	
$> 10^4 - 10^5$	6	6%
$> 10^5 - 10^6$	3	
$> 10^6$	5	
Total	17	
(b) In HBe negative HCW in the UK		
$\leq 10^3$	184	
$> 10^3 - 10^4$	96	58%
$> 10^4 - 10^5$	110	
$> 10^5 - 10^6$	45	
$> 10^6$	1	
Total	436	

Gunson et al J Clin Virol 2003

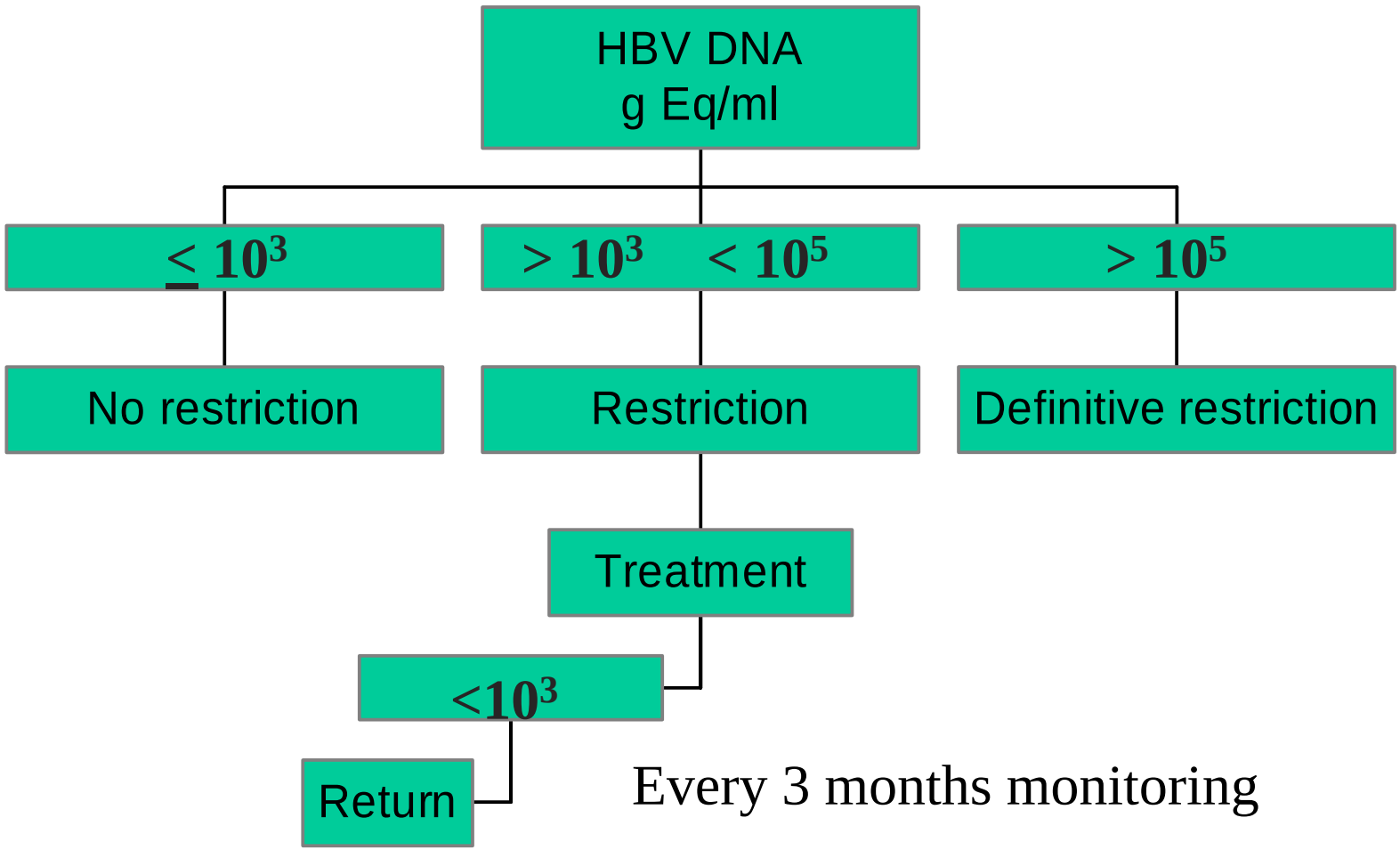
DH Department of Health

Hepatitis B Infected Health Care Workers and Oral Antiviral Therapy



Consultation paper on implementing expert advice about a limited relaxation of restrictions on hepatitis B infected health care workers

July 2004


HBV DNA
g Eq/ml
≤ 10³
> 10³ < 10⁵
> 10⁵
No restriction
Restriction
Definitive restriction
Treatment
<10³
Return
Every 3 months monitoring

HCV

HCV viral load in anti-HCV-reactive donors and infectivity for their recipients
Transfusion-Transmitted Viruses Study. Transfusion. 2003;43:1433-41.

To determine the minimum level of HCV nucleic acid in donors associated with infection of recipients.

A total of 156 recipients of components from 180 anti-HCV-reactive donors were identified; 94 (88%) became infected.

Eighty-five recipients had donors whose HCV RNA level was quantifiable by RT-PCR (**range, 182 - 3,310,000 copies/mL**).

Eighty-three (98%) seroconverted.

High rates of transmission were seen at all levels of viremia, and one donor transmitted with undetectable levels in the TMA assay.

CONCISE COMMUNICATION

Prospective Reevaluation of Risk Factors in Mother-to-Child Transmission of Hepatitis C Virus: High Virus Load, Vaginal Delivery, and Negative Anti-NS4 Antibody

Manabu Okamoto,[1] Ikuo Nagata,[1] Jun Murakami,[1] Shunsaku Kaji,[1] Toshiyuki Iitsuka,[1] Tadataka Hoshika,[3] Ryu Matsuda,[4] Yusaku Tazawa,[1] Kazuo Shiraki[1] and Shigeo Hino[2]

Departments of [1]Pediatrics and [2]Virology, Faculty of Medi Tottori University, Yonago, and [3]Tottori Prefectural Central Hosp and [4]Matsuda Pediatric Clinic, Kurayoshi, Tottori, Ja

Of 21,791 pregnant women screened in Tottori Prefecture, Japan, 127 (0.58%) were positive for anti–hepatitis C virus (HCV) antibody and 84 (0.39%) were positive for HCV RNA. Of 84 children followed up for at least 6 months, 7 (8%) were infected. All of them were born to 26 mothers with a high virus load (HVL; $\geq 2.5 \times 10^6$ RNA copies/mL [27%]), compared with 0 of 58 children born to non-HVL mothers ($P < .001$). Because all the infected children were vaginally delivered, the infection rate among 16 vaginally delivered children born to the HVL mothers was as high as 44%. The prevalence of anti-NS4 antibody in the mothers with an infectious HVL was significantly lower than that in the mothers with a noninfectious HVL ($P = .048$). Analysis of our results suggests that maternal HVL, vaginal delivery, and negative anti-NS4 antibody are significant risk factors for the mother-to-child transmission of HCV.

Increased Risk of Mother-to-Infant Transmission of Hepatitis C Virus by Intrapartum Infantile Exposure to Maternal Blood

Steininger et al The Journal of Infectious Diseases 2003;187:345-351

Table 1. Estimated risk of mother-to-infant transmission of hepatitis C virus (HCV) in relation to virological and clinical risk factors of the mother.

Maternal risk factor	No. of mother-child pairs	Mother-to-infant transmission of HCV		Estimated RR (95% CI)[a]	*P*
		Yes	No		
Virological parameters					
HCV RNA positive, no. (%)	73	9 (100)	51 (80)	NC	.787
HCV load for all deliveries, geometric mean copies/mL (SF)	65	7.3×10^5 (2.3×10^0)	2.5×10^4 (1.0×10^2)	4.1 (0.78–21.52)[b]	.97
HCV load for vaginal deliveries, geometric mean copies/mL (SF)	36	8.1×10^5 (2.1×10^0)	1.4×10^4 (1.3×10^2)	9.9 (0.94–103.35)[b]	.056

The mothers of infected children had a higher mean HCV load than did mothers of uninfected children (7.3×10^5 vs. 2.5×10^4 copies/mL), and this difference in HCV load was even more pronounced among mothers who underwent vaginal delivery (8.1×10^5 vs. 1.4×10^4 copies/mL). However, no statistically significant association could be found between maternal HCV RNA level and the risk of mother-to-infant transmission of HCV, although a trend toward a higher risk of transmission with increasing levels of maternal viremia was noted

Risk factors for HCV transmission after occupational exposure in HCWs: a European case-control study

	Cases	Controls	Unadjusted OR	p- value
HCV RNA +	37/37	42/61	RR 1.45 (1.23-1.72)	0.0001
$\leq 4 \log_{10}$ cp/ml	1/12	11	1.0	
>4 < 6	5	10	5.5 (0.6-55.5)	0.15
>6 log	**6**	**6**	**11.0 (1.1-114.1)**	**0.04**

Yazdanpanah et al submitted

HCWs to PATIENT TRANSMISSION OF HEPATITIS C

Speciality	Country	Date	Infected patients	RNA level
Cardiothoracic surgeon	E	1988-93	5	2.2×10^6 gEq/ml
Cardiothoracic surgeon	UK	1994	1	1×10^6 gEq/ml
Gynaecologic surgeon	UK	1997	1+7*	N.A.
Gynaecologic surgeon	D	1999	1	2.6×10^5 IU/ml
Orthopedic surgeon	D	2000	1	1.3×10^6 IU/ml
Anesthetist	D	1998	5	1×10^6 cp/ml
Anesthetist	USA	1996	1	3.7×10^6 gEq/ml
Anesthetist	UK	2001	1	3.7×10^6 cp/ml
Unknown	UK	1994-99	3	N.A.
Unknown	UK	n.d.	1	N.A.
Cardiothoracic surgeon	USA	1993-2002	3+4*	N.A.

* In course

Health Service Circular (HSC) 2002/010
Hepatitis C Infected Health Care Workers

HCV health care workers who have responded successfully to treatment with antiviral therapy should be allowed to resume exposure prone procedures.

Successful response to treatment is defined as remaining hepatitis C virus RNA negative 6 months after cessation of treatment.

Successfully treated health care workers will be allowed to return to performing exposure prone procedures at that time. As a further check, they should be shown still to be hepatitis C virus RNA negative 6 months later.

HIV

In the case reported in France, the HIV infected nurse had a viral load of 83.000 cp/ml, and 95 CD4 cells

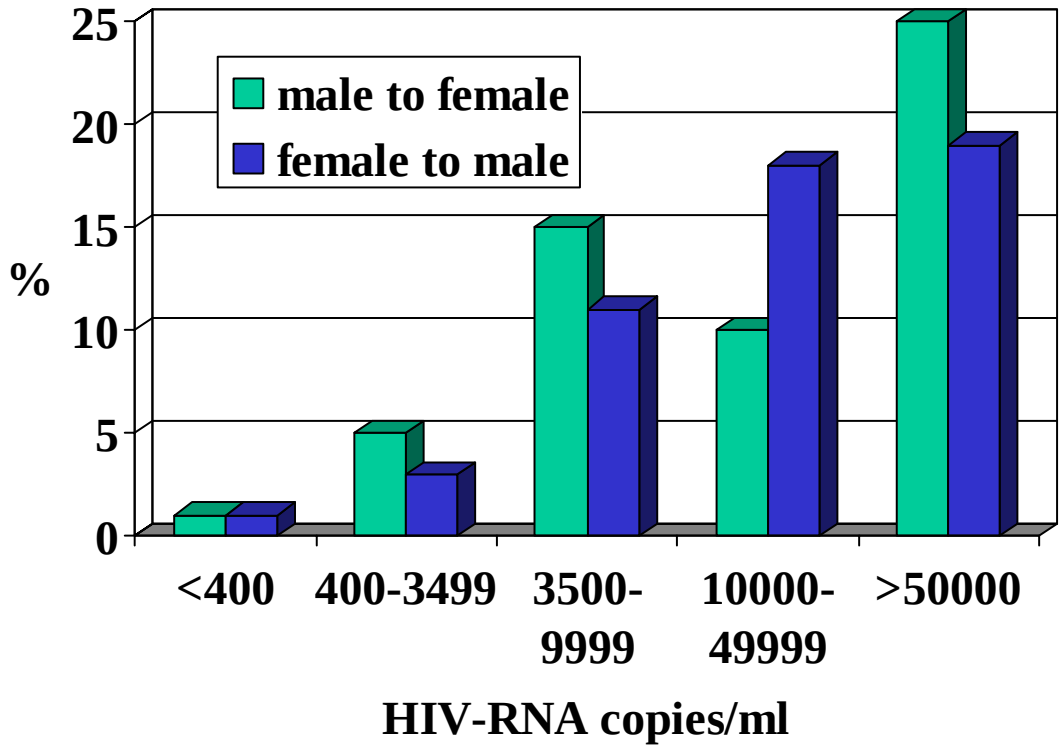
First Case of HIV Transmission by an RNA-Screened Blood Donation

- A case of HIV transmission by red blood cell unit that tested negative by MP-NAT (RT-PCR; 24-unit pool) as well as anti-HIV Ab and p24 Ag negative.

- The viral load in the implicated donation plasma was 150 gEq/mL.

Delwart et al. Vox Sang. 2004 Apr;86(3):171-7

Rate of heterosexual transmission among 415 couples per 100 person-years



Vernazza et al. AIDS 1999; 13; 15

Adjusted Rate Ratios of the Risk of Sexual Transmission and Acquisition of HIV-1

Serum HIV-1 RNA level in HIV-1+ partners	Risk of Transmission among HIV-1+ Partners	Risk of Acquisition among HIV-1- Partners
< 3500 copies/ml	1.0	1.0
3500-9999 copies/ml	5.80 (2.26-17.80)	5.81 (2.52-17.91)
10000-49000 copies/ml	6.91 (2.96-20.15)	6.84 (2.93-19.97)
>= 50000 copies/ml	11.87 (5.02-34.88)	12.55 (5.28-36.99)
Level (per log increment)	2.45 (1.85-3.26)	2.45 (1.86-3.26)

Quinn et al. NEJM 2000; 342: 921

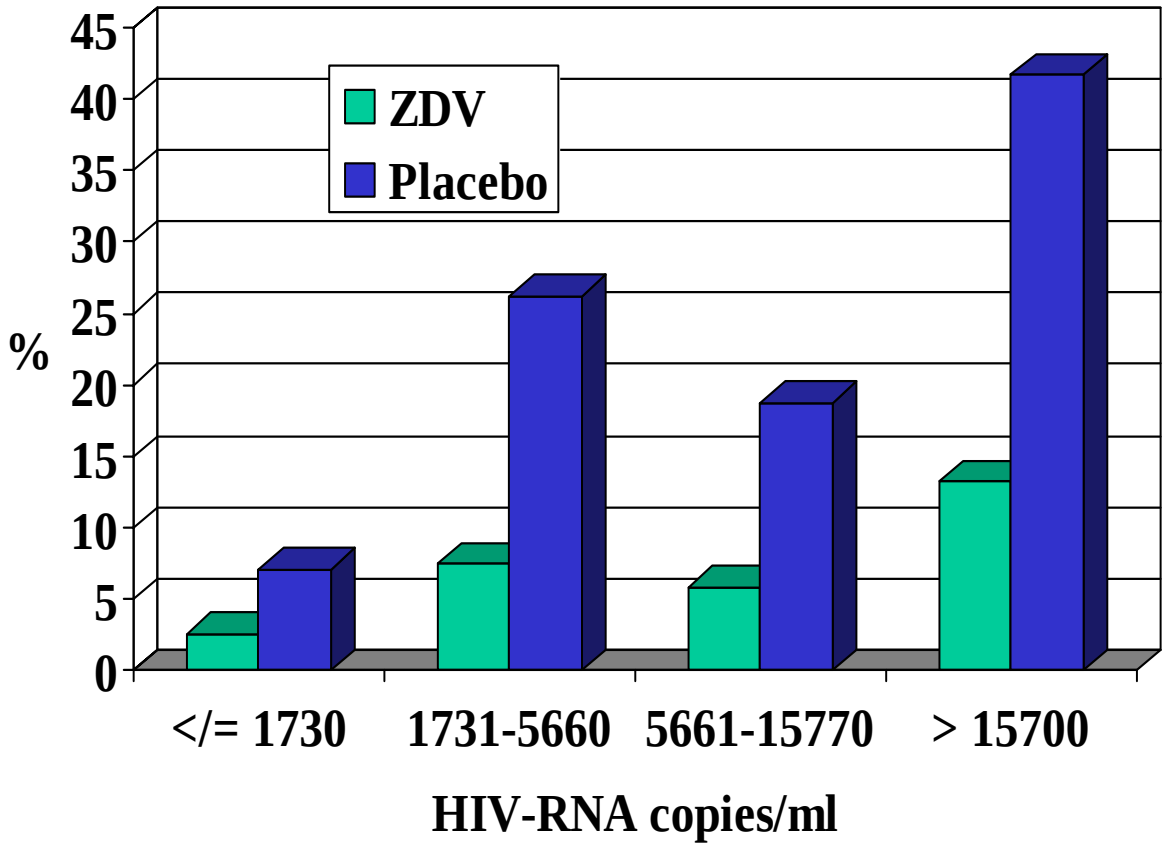
Ioannidis JPA, et al.
Perinatal transmission of human immunodeficiency virus type 1 by pregnant women with RNA virus loads < 1000 copies/mL.

Meta-analysis from 7 EU/US studies

Treatment		% Rate	95% CI
Yes	8/834	1.0	0.4 – 1.9
No	36/368	9.8	7.0 – 13.4

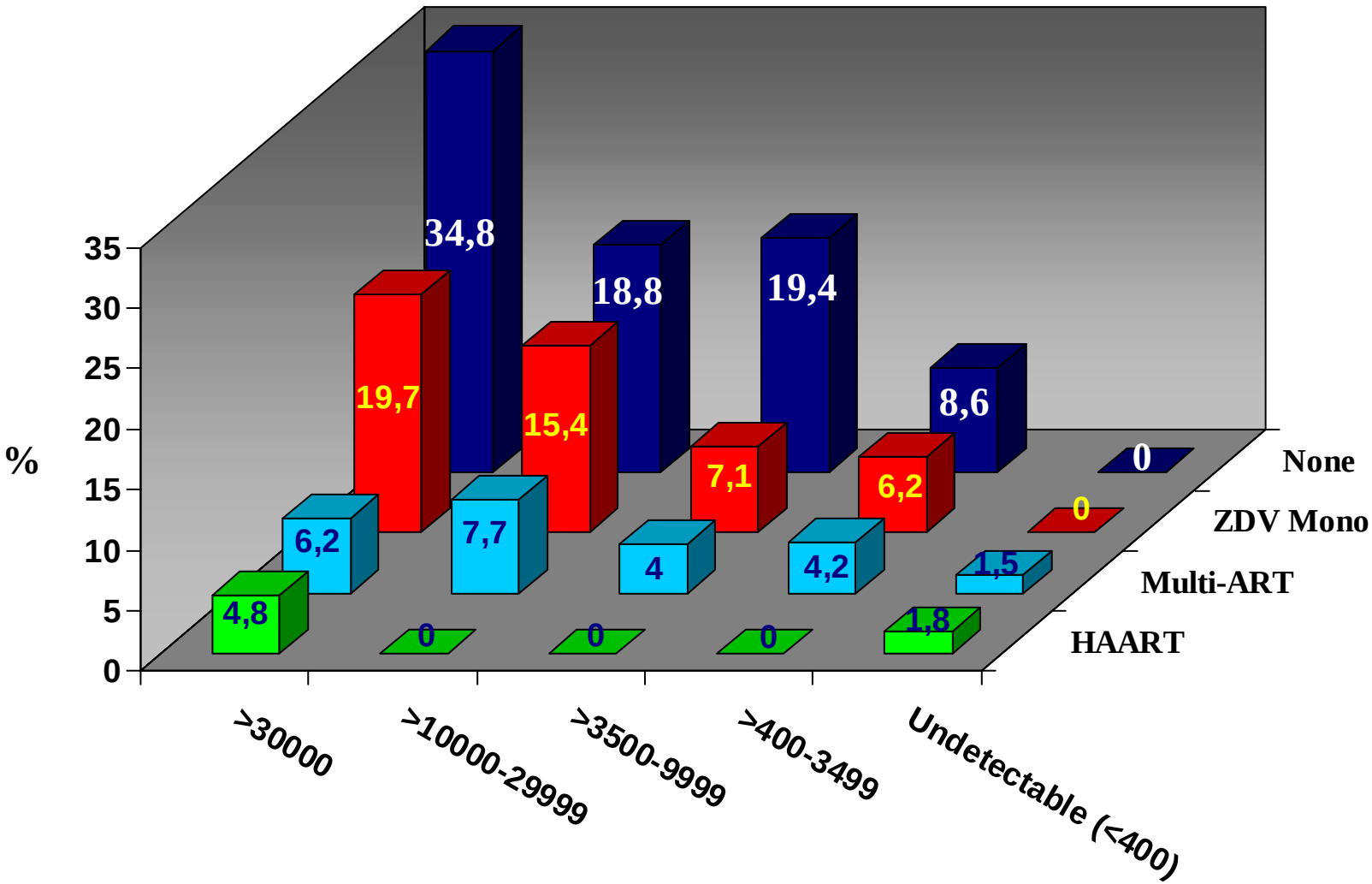
J Infect Dis 2001; 183:539-45.

ACTG 076: HIV vertical transmission by plasma HIV RNA at entry



N Engl J Med 1996; 335:1621-29.

Women and Infants Transmission Study Group



Cooper ER et al. JAIDS 2002; 29: 484-494.

Cases of HIV transmission despite PEP by source viral load

		HIV RNA cp/ml	
Perdue et al 1998	occupational	1.540	
Lot et al 1999	occupational	< 200 820	 2 wks later
Lot et al 1999		25.000	
Hawkins et al J infect 2001	occupational	60.000	
Beltrami et al ICHE 2002	occupational	750.000	
Cordes et al AIDS 2004	sex exp	20.000	