Sector Summary Report:

Hepatitis A, B and C

This sector summary report brings together in one document information on the three main causes of hepatitis, their prevalence, symptoms, treatment and prevention. In so doing it aims to help reduce confusion about these different types of liver disease.

Hepatitis means 'inflammation of the liver'. It can be a complication of other medical conditions, excessive alcohol consumption, medication side effects and some auto-immune disorders. However, this sector summary report covers the three main forms of *infectious* or *viral hepatitis* (A, B and C).[1]

The liver stores and filters blood, removing unwanted substances, processing and storing nutrients, making bile (which helps to digest fat) and releasing energy into the bloodstream. Although each type of hepatitis attacks the liver and may cause similar symptoms, the viruses are not related and previous infection or vaccination against one provides no protection against the others.

Hepatitis A

What are the effects of hepatitis A?

Hepatitis A, caused by the virus HAV, is widely seen as the least harmful of the three types of viral hepatitis due to its relatively benign and self-limiting course. There are no 'carriers' (people with long term, infectious disease). The infection can occasionally be fatal in the elderly and those with other liver conditions (including hepatitis-induced liver disease and co-infection with hepatitis C).[2]

How common is hepatitis A?

In the UK previous exposure to HAV is not uncommon.[3] It increases with age, recreational (including intravenous) drug use and larger number of sexual partners, the latter accounting for high levels of exposure among gay and bisexual men. In developing countries the vast majority of people are exposed to HAV in childhood (and so develop immunity), but in the UK the majority of adults are still at risk of being infected. Outbreaks occur sporadically, often linked to an HAV-infected food handler, or among gay and bisexual men or intravenous drug users.

What are the symptoms of hepatitis A?

Symptoms can appear 15-50 days after infection. Symptoms may be dismissed as a flu-like infection or there may be no symptoms (especially in children). Many people remain unaware that they have had hepatitis A until a blood test detects antibodies to HAV.

The classic symptoms of hepatitis A are:

- flu-like illness
- extreme tiredness
- diarrhoea
- fever
- weight loss
- lack of appetite
- vomiting and nausea (especially with alcohol, fatty food or tobacco smoke)
- pain in the abdomen (upper right side)
- itchy skin
- jaundice (skin and whites of the eyes turn yellow, urine becomes dark and faeces turn pale).

Most recover quickly, although some need weeks or months of convalescence. Around one in ten of those infected may suffer a relapse of symptoms during the first six months of illness before then recovering completely.

How is hepatitis A passed on?

HAV (present usually in faeces) needs to enter the mouth; only minute quantities are needed for transmission. An infected person is most infectious before symptoms show, with high levels of HAV in faeces from two weeks before symptoms appear until two weeks after. The following activities risk transmission if they allow contaminated faeces to enter the body:

Sexual

Minute quantities of faeces can be swallowed during or after:

- unprotected anal sex
- rimming
- fingering
- fisting
- handling used condoms or sex toys.

Virus can be present in saliva, semen and urine but not in high enough levels to make transmission likely.

Non-sexual

- drinking contaminated water, including ice (especially in the developing world)
- eating seafood (especially shellfish)
- eating salads (rinsed in infected water) or food prepared by an infected person
- transmission through blood products is possible but uncommon.

Hepatitis A, B and C at a glance

	A	B	C
How serious?	Full recovery for nearly all. None become 'carriers'	5-10% become long term 'carriers'. About 1% of those infected die	Most of the infected fail to clear virus. About 20% eventually suffer serious liver damage
Virus can be transmitted in	Tiny amounts of faeces	Body fluids (blood, semen, possibly saliva)	Blood
Mostly transmitted through	Contaminated food or water. Sexual contact with faeces	Sharing injecting equipment. Sexual contact	Sharing injecting equipment. Rarely through sex (higher risk with anal sex and fisting)
Symptoms	Often none. Fatigue, jaundice, flu-like symptoms	Often none. Fatigue, jaundice, flu-like symptoms	Usually none for years, but may include depression, mental confusion, nausea and fatigue
Vaccine	Yes	Yes	No
Treatment	None needed	Usually none needed. *Interferon* for 'carriers'	*Pegylated interferon* together with riba*virin* (successful for half of those infected). Transplant if liver fails

"Hepatitis A... is widely seen as the least harmful of the three types of viral hepatits due to its relativley benign and self-limiting course."

"In total, for about 1% of all those contracting hepatitis B the infection will cause death through liver disease."

"Of those infected with hepatitis C about 20% clear the infection without treatment; about 80% develop chronic (ongoing) hepatitis C."

How is hepatitis A prevented?

Vaccination is the most effective method. The UK Department of Health guidelines[4] recommend free vaccination for:

- haemophiliacs and those receiving regular blood transfusions or blood products
- anyone with chronic liver disease (including hepatitis B or C)
- gay and bisexual men
- intravenous drug users
- travellers to countries were HAV is endemic
- certain occupations (including sewerage workers and workers in residential centres for people with learning disabilities).

Vaccination involves two doses, usually six months apart. The vast majority of people will be protected within one month of the first dose, with total protection achieved after the second. Vaccination is not recommended for pregnant women unless there is a definite risk of hepatitis A transmission. It is especially advised for people with HIV.

Government guidelines recommend a booster after ten years, although some believe immunity may last much longer. A combined vaccine for adults against hepatitis A and B is available.

People who have already been infected have life long immunity, so vaccination would be pointless. Blood tests can detect antibodies to HAV in those previously infected. Because of the cost, testing for antibodies before vaccination is usually restricted to populations with high levels of natural immunity.

To make HAV transmission less likely in people who are not vaccinated, condoms should be used and contact with minute amounts of faecal matter avoided during sex. Transmission is reduced by using latex gloves for fingering and fisting and, for rimming, by using a dental dam, a condom cut open to form a square or non-microwavable cling film. Hands should be washed after going to the toilet, sex or handling used condoms or sex toys. In areas where HAV is endemic raw or unpeeled food should be avoided.

Immunoglobulin

Immunoglobulin (a preparation of concentrated antibodies recovered from human blood) is given in certain situations when immediate protection is required following contact with an infectious person. As protection is only temporary (a few months) immunoglobulin is usually given together with the vaccine. Once routinely offered to travellers, use of immunoglobulin has now greatly declined in favour of vaccination.

Post-exposure prophylaxis[5] for hepatitis A infection

To prevent infection in someone recently exposed to HAV, vaccine and/or immunoglobulin can be given. In general a doctor will seek specialist guidance.

How can hepatitis A be treated?

Other than rest, no special treatment is usually needed. While recovering an individual may be intolerant to smoking and fatty foods. Alcohol (and recreational drugs) may need to be avoided for up to a year.

HAV and HIV

Vaccination is recommended for people with HIV, especially with lower CD4 counts. As they respond less well to it, further doses may be needed. People with HIV may have hepatitis A for longer and with a higher HAV viral load. During the time someone has HAV-induced liver inflammation, medication (including HIV drugs) which is metabolised by the liver may need to be used with caution or stopped.

Hepatitis B

What are the effects of hepatitis B?

Hepatitis B, caused by the virus HBV, is for most people a short-lived, self-limiting illness with no lasting complications. For a minority (up to 10% but higher in children) the infection becomes a chronic (long term) condition which sees them become 'carriers', i.e. they are infectious to others. 'Carriers' might suffer no lasting ill effects but some risk liver disease, including cirrhosis (scarring of the liver). Around 15-25% of untreated 'carriers' will eventually die as a result of HBV. In total, for about 1% of all those contracting hepatitis B the infection will cause death through liver disease.[6]

How common is hepatitis B?

HBV is very common in the developing world.[7] The World Health Organisation estimates that about a third of the world's population has been infected.[8] While relatively rare in the UK and Western Europe (at under 1% of the population) evidence of infection with HBV can be found at high levels in certain UK populations such as gay and bisexual men (about 15-30%),[9] around 20% of IV drug users,[10] those with many sexual partners or a history of sexually transmitted infections. The extent of HBV infection is hidden as many have the infection without realising and sexual health clinics see few cases (people with symptoms usually go to GPs).

What are the symptoms of hepatitis B?

Symptoms can take from six weeks to six months to appear (on average three months). At least half of those who contract HBV never show symptoms and minor symptoms are common. Many will only become aware of being exposed after a blood sample tests positive for antibodies to HBV.

The classic symptoms of hepatitis B are:

- flu-like illness
- extreme tiredness
- joint and muscle pain
- diarrhoea
- fever
- weight loss
- lack of appetite
- vomiting and nausea (especially with alcohol, fatty food or tobacco smoke)
- pain in the abdomen (upper right side)
- itchy skin
- jaundice (skin and whites of the eyes turn yellow, urine becomes dark and faeces turn pale).

How is hepatitis B passed on?

HBV is extremely infectious, frequently cited as being up to 100 times more infectious than HIV.[11] Only a minute amount of infected blood is needed for transmission. Sexual transmission and contact with blood or blood products (before screening of the blood supply) have historically been the chief routes of transmission, although household contacts of an infected person can contract the virus through close contact with body fluids.

HBV is present in:

- blood (virus can survive at least a week in dried blood)
- semen and pre-cum
- vaginal fluids
- saliva
- and in smaller amounts (but believed to be non-transmissible) in sweat, tears, faeces, breast milk and urine.

The virus gets into the bloodstream through tiny (often invisible) breaks in the skin of the genitals or mouth. The following activities risk transmission if they allow contact with infectious body fluids:

Sexual

- fellatio
- cunnilingus
- unprotected vaginal intercourse
- unprotected anal intercourse
- rimming
- fisting
- kissing (believed uncommon)
- 'watersports', i.e. sex involving urine (believed uncommon).

Non-sexual

- sharing injecting equipment (syringes, spoons, needles, 'works')
- tattooing, piercing, acupuncture or other medical procedures if contaminated or insufficiently sterilised needles and equipment are used
- sharing razors or toothbrushes
- receiving contaminated blood or blood products in countries with inadequate screening (the UK blood supply has been tested for HBV since 1986)
- pregnancy and childbirth (especially in the developing world)
- there is no evidence that breast feeding or insect bites transmit HBV

How is hepatitis B prevented?

Vaccination, usually involving three doses (sometimes two or four) over six to twelve months, protects from infection. Full protection is reached after the final dose and the vaccine works for 90-95% of individuals. Antibody levels should be checked every five years with a booster given if needed. No boosters are needed for those with immunity due to previous infection. Being older (over 40) or HIV positive is linked to the vaccine being less effective. If the first course does not provide protection it can be repeated.

Previous infection with HBV gives life long immunity. Antibody testing can be used to screen out those not needing immunisation, especially in populations with high levels of previous HBV infection.

The UK Department of Health recommends free vaccination for:

- IV drug users and their sex partners/close contacts
- those with many sex partners (e.g. gay or bisexual men or sex workers)
- those in close contact with infected people (partners, family and household members)
- people with chronic renal failure or liver disease (including hepatitis C)
- travellers to countries where hepatitis B is endemic
- individuals needing repeated blood transfusions or blood products, (e.g. haemophiliacs)
- prison inmates
- people living or working in residential centres for people with learning disabilities
- health care workers

Vaccination is also available to certain professions at risk of contact with body fluids such as police and prison staff. Vaccination is especially advised for people with HIV.

Pregnant women can be safely immunised. Babies born to infected mothers should receive post-exposure prophylaxis at birth (see below), reducing the risk of becoming a 'carrier' by around 90%. A combined vaccine against hepatitis A and B is available.

In the unvaccinated, transmission can be reduced by using condoms for penetrative sex and dental dams for rimming or cunnilingus (or a condom cut into a square or non-microwavable cling film). Injecting equipment (needles, 'works' etc) should not be shared. During acupuncture, piercing or tattooing, needles and other equipment should be sterile and/or disposable and/or come from a sterile packet.

Immunoglobulin

Immunoglobulin (a preparation of concentrated antibodies recovered from human blood) is given in certain situations when immediate protection is required following contact with an infectious person. As protection is only temporary (a few months) immunoglobulin is usually given together with the vaccine. Use of immunoglobulin has now greatly declined in favour of vaccination.

Post-exposure prophylaxis for hepatitis B infection

After exposure to HBV, infection can be prevented by giving, within seven days, immunoglobulin and/or a superaccelerated version[12] of the vaccine. In general a doctor will seek specialist guidance. After sexual assault PEP for HBV would usually only be given if the attacker was known to have hepatitis B infection.

How can hepatitis B be treated?

Treatment is not usually needed beyond rest (possibly for many weeks or months), a low fat diet and avoidance of alcohol and recreational drugs (for up to a year).

Up to one in ten of infected adults (but much higher among infants) do not clear the virus from their body and develop chronic (long term) infection, becoming 'carriers' (i.e. remaining infectious to others). 'Carriers' are at risk of developing liver disease such as liver cancer or cirrhosis.

If blood tests identify the presence of HBV antibodies alone then the person has cleared the infection. A blood test six months after infection also showing the presence of HBV antigens (fragments of virus) means the individual has developed the chronic infection and is now a 'carrier'. In such cases drugs[13] can be prescribed to reduce levels of (and sometimes eliminate) HBV in the body, lessening liver damage and making the person less infectious. Regular monitoring of the liver, a low fat diet and abstinence from alcohol may be advised. Some 'carriers' will eventually clear the virus from their body.

For severe liver damage transplants are possible (including for those with HIV) but a transplant may fail; even if successful the new liver may become infected with HBV still present in the body.

HBV and HIV

Many people with HIV have also been co-infected with HBV. Having HBV does not mean a worse prognosis regarding HIV disease. However, hepatitis B is a significant cause of illness and death (through cirrhosis and liver cancer) for those with HIV[14] and if infected with HBV they are more likely to become 'carriers'.

For this reason vaccination is especially advisable for people with HIV. Response to the vaccine may be poorer, requiring additional doses. As vaccination can cause a short term rise in HIV viral load, HIV positive people should tell their doctors if being vaccinated. Drug regimens to treat chronic hepatitis B infection have a lower success rate with HIV positive patients.

One side-effect of beginning treatment for HIV can be a 'flare up' of an established HBV infection as the immune system is strengthened and is more able to react against the presence of HBV. This is why an HIV treatment regime including a drug effective against HBV is recommended for those with both infections. Having HBV is also a risk factor in developing liver problems in those starting anti-HIV treatment.

During the time someone has HBV-induced liver inflammation, medication (including HIV drugs) which is metabolised by the liver may need to be used with caution or stopped.

Hepatitis C

What are the effects of hepatitis C?

Only formally identified in 1989,[15] the hepatitis C virus (HCV) causes the most harmful type of hepatitis. Only a minority of those infected clear the infection and a high proportion of those who fail to do so go on to develop liver disease such as cirrhosis or liver cancer (possibly leading to complete liver failure). Many people have the infection for years before it is diagnosed by which time it may have caused liver damage.

Of those infected with HCV:

- about 20% clear the infection without treatment
- about 80% develop chronic (ongoing) hepatitis C.

Of those with chronic infection:

- the majority will live a normal lifespan
- about 20% will get cirrhosis (scarring of the liver)
- a small percentage (1-4%) will go on to get liver failure or cancer many years later.

How common is hepatitis C?

Estimates of the number of people in England with chronic hepatitis C range from 200,000[16] to half a million,[17] with about 0.5% of the population estimated to have been exposed.[18] The vast majority of those with HCV are unaware of their infection.

The virus is widespread among those who received blood or blood products before screening was introduced (sterilisation of blood products since 1986, testing of blood donations since September 1991). Past and current injecting drug users make up a large proportion of cases; a figure of 46% for England was recorded in 2005.[19] It is not uncommon for someone who injected drugs a small number of times three or more decades ago to discover that they picked up HCV but are only now becoming ill. Gay and bisexual men, especially those with HIV, are also more likely to have HCV (see section 'HCV and HIV').[20]

What are the symptoms of hepatitis C?

Some people with hepatitis C remain well throughout their life. For most who become infected there are no immediately noticeable symptoms. Only a minority experience symptoms most commonly associated with acute hepatitis infection (see sections on hepatitis A and B). Symptoms such as nausea and fatigue often take years to appear, as do water retention in abdomen and legs, bruising, depression or mental confusion (symptoms associated with hepatitis C but not with A or B). It can be 30 to 40 years between infection and liver damage such as cirrhosis.

How is hepatitis C passed on?

HCV, usually in tiny or invisible amounts of blood, can enter the bloodstream through minute breaches in the skin during the following activities:

- sharing injecting equipment (needles, spoons, filters, water, 'works' etc.)
- possibly sharing rolled up banknotes or snorting straws when using cocaine and other drugs (virus might enter through breaks in nasal blood vessels). Research is not conclusive.
- receiving blood or blood products (UK screening began in 1991; it is not in place in all countries)
- acupuncture, tattooing or piercing (mostly unregulated), if contaminated or insufficiently sterilised needles, inks and other equipment are used
- sharing razors, toothbrushes, nail scissors, etc. (the virus survives in dried blood for at least four days; there is no risk from sharing cutlery, etc.)
- sex, especially unprotected anal intercourse
- pregnancy and childbirth (risk of around 5%)
- medical procedures and blood donations abroad where hygiene levels are low and infection control measures poor.

The virus is in infectious quantities in blood. It can be found in other body fluids (vaginal fluid and semen) but at levels too low to be considered likely to transmit infection, although this cannot be ruled out. HCV was assumed to be chiefly transmitted by blood contact, with little sexual transmission. Recent studies are changing opinion on this.[21]

- Transmission within heterosexual couples appears rare.[22]
- Having HIV makes transmission of HCV more likely.
- Growing numbers of gay and bisexual men are picking up HCV sexually, especially those with HIV and/or who engage in unprotected anal intercourse or fisting.
- The greatest risk seems to come from sex involving trauma or contact with blood, as seen during unprotected anal sex, fisting (also rimming).
- The presence of ulcerative infections such as syphilis also makes the spread of HCV easier.

How is hepatitis C prevented?

Transmission is greatly reduced by the use of condoms for penetrative sex, latex gloves for fisting and, for rimming, dental dams (or condoms cut into squares or non-microwavable cling film). The sharing of injecting equipment, snorting paraphernalia (including banknotes) or razors, toothbrushes, nail cutters, etc. should also be avoided. During acupuncture, piercing or tattooing, needles and other equipment should be sterile and/or disposable and/or come from a sterile packet.

With HIV positive pregnant women Caesarean section reduces mother to baby transmission of HCV. Evidence is inconclusive as to whether breast feeding is a risk.[23] Undiluted bleach will effectively deal with blood spills.

" Estimates of the number of people in England with chronic hepatitis C range from 200,000 to half a million, with about 0.5% of the population estimated to have been exposed. The vast majority of those with HCV are unaware of their infection."

Due to the number of different sub-types of HCV and the high degree of mutation within them, there is no vaccine against hepatitis C. Neither is there post-exposure prophylaxis for those recently exposed. Vaccination against hepatitis A and B is strongly recommended for those with HCV as co-infection can lead to very aggressive hepatitis C-related liver disease.

How can hepatitis C be treated?

HCV infection is confirmed through a blood test (available at sexual health clinics or GP surgeries) for antibodies to the virus which, for nearly all those infected, appear within six months of infection. Viral load tests, as well as monitoring the effectiveness of treatment, can determine if someone with HCV antibodies still has an active infection or if they have cleared it. Other diagnostic tools used are liver function tests and liver biopsies to gauge the level of damage the virus has caused and what treatments are recommended and for how long. Alcohol consumption (and possibly smoking) should be avoided as this significantly increases the risk of liver cancer.

Treatment varies by type of hepatitis C virus[24] but pegylated interferon (injected weekly) together with ribavirin (taken daily by mouth) is the current standard treatment. Side effects include joint pain, flu-like symptoms and depression. Treatment lasts six to twelve months with a success rate of about 50% but this is improving over time. On stopping treatment about half of those people infected relapse and will be offered further treatment. Liver transplantation is possible in cases of liver failure but HCV almost always infects the new liver.

HCV and HIV

HCV and HIV co-infection is often seen among IV drug users, gay and bisexual men and haemophiliacs who received contaminated blood products. Having hepatitis C appears to impair immune system recovery, in particular by depressing CD4 count. Individuals with HIV have the worst prognosis among patients with hepatitis C, with a greater chance of liver disease (now a major cause of illness and death among people with HIV).

Studies show that having HIV appears to make passing on or picking up of hepatitis C more likely.[25] People with HIV often have higher HCV viral loads and HCV is more likely to be detected in semen.[26] Lower CD4 counts are linked to higher levels of HCV in the body.

Anti-HIV drugs can be taken but side effects involving the liver may be more severe, requiring liver function monitoring as HIV drugs are started. People with HCV on HIV treatment have a higher risk of insulin resistance and diabetes.

There are difficulties treating both HIV and hepatitis C together. As HIV usually presents a greater risk to health, treating this infection is normally prioritised over treatment of hepatitis C if CD4 count is low – otherwise HCV treatment is prioritised. HIV positive individuals are strongly recommended to be tested for and vaccinated against hepatitis A and B (if not already immune through earlier infection). Complications from contracting these on top of HCV can be life-threatening.

For further support and information on hepatitis in general:

www.hepinfo.org
www.britishlivertrust.org.uk
www.hivandhepatitis.com
www.aidsmap.com

Hepatitis C

www.hepcuk.info
Helpline: 0870 200 1 200

www.hepc.nhs.uk
Information line: 0800 451 451
(10am-10pm)

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Notes

1 To date seven sub-types of hepatitis have been given names from A to G (F has subsequently been found not to exist). D is only present with infection with B. 'Hepatitis' is commonly abbreviated to 'hep' before the letters A, B, C etc.

2 The fatality rate for hepatitis A is estimated by the United States Centers for Disease Control and Prevention to be 0.4%, rising to 1.75% in the elderly or those with liver disease.

3 One study of under 45s in England and Wales found around one in five were HAV positive. Whilst vaccination accounted for around half of this, it showed that around one in ten of the unvaccinated had contracted hepatitis A. (Morris-Cunnington M et al. A population-based seroprevalence study of hepatitis A virus using oral fluid in England and Wales. *American Journal of Epidemiology*. 2004; 159: 786-794).

Antibodies to HAV were found in around 45% of inner London residents, rising to nearly 70% in those born abroad. (Bernal W et al. A community prevalence study of antibodies to hepatitis A and E in inner-city London. *Journal of Medical Virology*. 1998; 49: 230-234).

The majority of people over 55 in one study in 1996 had antibodies to HAV. (Morris MC et al. The changing epidemiological pattern of hepatitis A in England and Wales. *Epidemiology and Infection*. 2002; 128: 457-463).

A study of gay men found 23% had HAV antibodies. (Increased incidence of hepatitis A in south east England. *Communicable Disease Report*. 1997; 7:373).

4 *Immunisation against infectious disease ("The Green Book").* London: The Stationery Office; 2006. Available from: www.dh.gov.uk

5 Post Exposure Prophylaxis is a term applied to a variety of infections and is not to be confused here with the treatment used to prevent HIV infection.

6 British Medical Association. www.bma.org.uk/ap.nsf/Content/hepB

7 In the US and Western Europe, under 1% are 'carriers' and 4-6% have been exposed to HBV. 8-20% are 'carriers' and 70-90% have been exposed in Sub-Saharan Africa, the Middle East, South East and Central Asia. *Hepatitis B.* World Health Organization (Epidemic and Pandemic Alert and Response unit); 2002. Available from: www.who.int/csr/disease/hepatitis/whocdscsrlyo20022/en

8 World Health Organisation hepatitis B factsheet (two billion out of a global population of over six billion). www.who.int/mediacentre/factsheets/fs204/en/

9 10% prevalence among men who have sex with men under 35, 35% for those over 35. (Presented by Alan McOwan at the 79th Medical Society for the Study of Venereal Disease Spring meeting, Belfast, May 2001). Also, 16.5% prevalence (6.9% under 25, 19.7% over 25) is cited in Hart G et al. Risk behaviour, anti-HIV and anti-hepatitis B core prevalence in clinic and non-clinic samples of gay men in England, 1991-2. *AIDS* 1993; 7:863-869.

10 In England, Wales and Northern Ireland. *Shooting Up: infections among injecting drug users in the United Kingdom 2005: an update October 2006*, London: Health Protection Agency; 2006. Available from: www.hpa.org.uk

11 World Health Organisation hepatitis B factsheet. www.who.int/mediacentre/factsheets/fs204/en/

12 Three doses over three weeks instead of six months.

13 Alpha interferon injected three times weekly for at least four months (20-40% success rate). Also approved for treating both HIV and hepatitis B is 3TC (lamivudine or Epivir), daily in tablet form taken for 1-2 years, possibly for life (20-30% success rate). Adefovir and tenofovir are also used to treat HBV.

14 Those with HIV who become 'carriers' of HBV are eight times more likely to die of liver-related disease than HIV positive people who clear HBV. Thio CL et al. Liver disease mortality in HIV-HBV co-infected persons. 9th Conference on Retroviruses and Opportunistic Infections, Seattle, abstract 656; 2002.

15 Before then the virus was known as 'non-A, non-B hepatitis virus'.

16 *Hepatitis C in England.* London: Health Protection Agency; 2005. Available from: www.hpa.org.uk

17 NICE (National Institute for Health and Clinical Excellence) press release: *Thousands more people with hepatitis C to benefit from latest NICE guidance on drug treatments.* London: 2006. Available from: www.nice.org.uk

18 *Hepatitis C in England*, as previous footnote.

19 *Shooting Up*, as previous footnote.

20 7% of HIV positive gay men screened at Chelsea & Westminster Hospital in 2002 had been exposed to HCV. Nelson M et al. Increasing incidence of acute hepatitis C in HIV positive men secondary to sexual transmission, epidemiology and treatment. 9th European AIDS Conference, Warsaw, abstract F12/3; 2003.

21 Coutinho R et al. *Rise in HCV Incidence in HIV-infected Men Who Have Sex with Men in Amsterdam: Sexual Transmission of Difficult to Treat HCV Genotypes 1 and 4.* Thirteenth Conference on Retroviruses and Opportunistic Infections, Denver, abstract 87, 2006.

Danta M et al. *Evidence for Sexual Transmission of HCV in Recent Epidemic in HIV- infected Men in the UK.* Thirteenth Conference on Retroviruses and Opportunistic Infections, Denver, abstract 86, 2006.

Ghosn J et al. *Increase in HCV Incidence in HIV-1-infected Women and Men Followed in the French PRIMO Cohort.* Thirteenth Conference on Retroviruses and Opportunistic Infections, Denver, abstract 843, 2006.

22 A Spanish study of 171 heterosexual couples showed no sexual transmission of HCV over ten years, (Marincovich B et al. Absence of hepatitis C virus transmission in a prospective cohort of heterosexual serodiscordant couples. *Sexually Transmitted Infections*, 2003; 79:160-162).

However, another study showed sexual contact among factors associated with HCV transmission, (Weisbord JS et al. Prevalence and risk factors for hepatitis C virus infection among STD clinic clientele in Miami, Florida. *Sexually Transmitted Infections*, 2003; 79: E1-E5).

23 Advice does not discourage HCV positive mothers from breastfeeding unless they are HIV positive or with broken skin or nipples, although many see this advice as unnecessarily cautious.

24 Genotype 1 is the most common in Europe but is the hardest to treat.

25 Filippini P et al. Does HIV infection favour the sexual transmission of hepatitis C? *Sexually Transmitted Diseases*, 2001; 28: 725-9.

Risbud AR et al. Hepatitis C virus infection among patients attending sexually transmitted disease clinics with and without HIV-1 infection in Pune, India. 14th International AIDS Conference, Barcelona, abstract WePeB6026; 2002.

Abresica N et al. Sexual transmission of HCV in sexually infected HIV women. 14th International AIDS Conference, Barcelona, abstract C11013; 2002

26 A study has shown that 38% of HIV positive men with HCV had HCV in their semen at some time (compared to 18% of HIV negative men) and that the men with HIV had higher levels of HCV in their blood. Briat et al. Hepatitis C virus in the semen of men coinfected with HIV-1: prevalence and origin. *AIDS* 2005; 19:1827-1853.

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