

HIV testing and risks of sexual transmission

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Watch for out-of-date information

HIV transmission and sexual risk
When to test
PEP, PEPSE and PrEP
What if I am HIV positive?

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Thanks to the community and healthcare professional advisory groups for comments. Contributors are listed online together with references.

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Cover: Untitled, 1984 (c) Keith Haring Foundation. Used with permission.

Disclaimer: Information in this booklet is not intended to replace information from your doctor. Treatment decisions should always be taken in consultation with your doctor.

“I don’t have time to
read books about
science or medicine
... I just want to
know how to stay
safe and protect my
partners...”

HIV in the UK (2011) ^[1]

- 100,000 people in the UK are HIV positive
70,000 are diagnosed : 30,000 undiagnosed.
Over 80% of people diagnosed are on treatment.
No-one who is undiagnosed is on treatment.
- 1.5 million people took an HIV test in the UK in 2010. Half were in a sexual health setting and half as pregnancy screening. More than 99% of all results were negative.
- Of the 7,000 results that were positive (less than 0.5%). Half were heterosexual and half were gay men.
- Half of diagnoses were in people who should already be on treatment. ^[2] They are likely to have been HIV positive for many years.
- Late diagnosis causes half of all HIV-related deaths. These could be prevented with earlier testing.

1. Estimates based on HPA data to December 2010 (www.hpa.org.uk)

2. Based on a CD4 count less than 350 cells/mm³.

Introduction

This booklet is about sexual transmission of HIV and HIV testing.

It includes information on:

- How HIV risk is more than just about condoms.
- How and when different tests can be used.
- What test results mean, especially in relation to the time since your last potential risk.
- The importance of making your own decisions about your sexual health.

Although you can stay negative by abstinence, this guide is written for people who want to have sex.

More complex and technical information about how HIV tests work is available in the online and electronic versions of this guide.

Condoms are excellent protection against HIV. But people still become HIV positive each year for complex reasons. The main reason condoms don't always work is because they are not used every time.

This booklet doesn't talk in great details about safer sex. Instead, we focus on other factors associated with HIV transmission. These are all important to understand your risk from any single exposure.

Realising you may have been at risk of HIV, going for a HIV test and then having to wait for the results can be a stressful and anxious time.

This guide is meant to help separate real risks from imagined risks like worry, anxiety, nervousness and guilt.

Sex can be an important, dynamic, vibrant part of your life.

Worrying about getting HIV or passing it on to a partner does not have to spoil this.

But sex is complicated. We do not always make the best decisions for our own health.

Even when being careful, some people will still become HIV positive.

If this happens, there is little to gain from looking back. Treatment, when used correctly, is very effective.

HIV is still a serious illness. It is better to stay HIV negative. However, the impact HIV has on how long someone is expected to live is now much less dramatic.

If you find out that you are HIV positive, i-Base and other organisations can help.

If you are positive it does not have to stop you leading a full, active and happy life.

HIV basics

Fear of HIV testing

HIV is not an easy virus to catch sexually. Compared to the numbers of people who have sex each year, only a tiny percentage of people will become HIV positive.

The chance of not getting HIV is always much higher than getting HIV. This is the case even when one partner is HIV positive and the other is HIV negative.

However, it also only takes one exposure for an infection to occur. An exposure is any situation where there would be a risk of transmission if one partner was HIV positive.

Many new infections are likely to come from people who do not know their HIV status.

Someone who is very recently infected (within the last month or two) is likely to think they are still HIV negative. They are likely to be less careful with their partners.

They are also at their most infectious because in the first few months the amount of virus is at its highest.

In nearly every country, 25-50% of HIV positive people have not been diagnosed. This percentage will only be reduced when HIV testing becomes a normal, routine part of healthcare.

HIV, sex and risk

This book is about sexual transmission of HIV.

Talking about HIV risks in general terms is different to talking about one specific time.

If one person has unprotected sex it is unlikely they will become HIV positive. But if 10,000 people have unprotected sex it is more likely that some people will become HIV positive. Even if they all have exactly the same type of sexual risk.

A low single risk can end up affecting a lot of people if the group is large. A lot of people have sex and the majority of times this doesn't involve condoms.

Understanding risk is also not always easy. We are not really taught in school how to understand risk.

So we all worry more about things that are never likely to happen.

On the one hand we convince ourselves that things we enjoy (for example, smoking) are low risk ("it will never happen to me").

On the other hand, some very low risk things are so scary that we can worry out of all proportion to the likelihood that it will happen: "I'm sure I am HIV positive".

This is how our brains work. So no wonder HIV is so tricky to get your head around.

Which body fluids are infectious?

The risk of HIV transmission is related to different factors. These include:

- Which body fluids are infectious.
- How infection occurs - often called the 'routes of infection'.
- Other risk factors including viral load, type of sex, genetics etc.

Only some bodily fluids have the potential to be infectious.

These include:

- Sexual fluids (semen and vaginal fluid).
- Mucus from the vagina and anus.
- Blood.
- Breastmilk is infectious to a baby but is unlikely to be infectious to an adult.
- Tears may be infectious but this is more a theoretical caution than a likely route of actual transmission.

Saliva, spit, urine and faeces are **not** infectious for HIV.

There then has to be a route for another person to become infected.

What are the routes of infection?

Common routes include:

- Contact with the mucous membranes of genital or anal tissue. A mucous membrane is a type of tissue that is a less effective barrier than skin. The inner foreskin is also a mucous membrane.
- Ulcers, sores, tears or microabrasions (microscopic cuts) on genital tissue (to the vagina, penis or anal lining).
- Any direct route into the bloodstream including cuts in your mouth. Sharing needles and injecting equipment has one of the highest risks of transmitting HIV. This is because there is a direct blood-to-blood route.

The section on skin, mucous membranes and HIV transmission on pages 42-43 shows the different types of cell structure for skin and mucous membranes.

These drawings show the different biology for penile, vaginal and anal sex. They show why some risks are higher than others and why anal sex has an especially high risk.

They show why an uncircumcised man has a higher risk for some activities compared to a circumcised man.

Ways that HIV is not transmitted

HIV is not transmitted by day-to-day activities or by contact with objects, food or clothes.

The following list includes just a few examples of questions we get from people worried about catching HIV.

Most of these questions come from a combination of fear and ignorance. They come from a lack of confidence in understanding HIV transmission.

You can NOT catch HIV from:

- Eating any food, cooked or uncooked, with blood on it.
- From a sterile needle at a clinic or other health centre.
- From a human bite.
- From an insect bite including a mosquito bite.
- From an animal.
- From living in the same house as someone who is HIV positive.
- From a sewing needle if you stab your finger.
- From blood on a bus seat that went through your underwear.
- Cleaning nail clippers.
- Using a knife/fork/spoon/cup/plate that an HIV positive person may have used.
- Getting sexual fluid on skin
- Getting sexual fluid on a cut that has already healed over. A cut has to be open to be a risk of HIV.

Effective barriers against HIV

There are many effective barriers that prevent infection.

Skin: Skin is an excellent barrier against HIV, unless there is an open cut or open wound. Infectious fluid on skin is not a route for infection.

Mucous membranes in the mouth, throat and stomach: These membranes are good barriers against HIV infection, so long as there are not cuts, ulcers or sores.

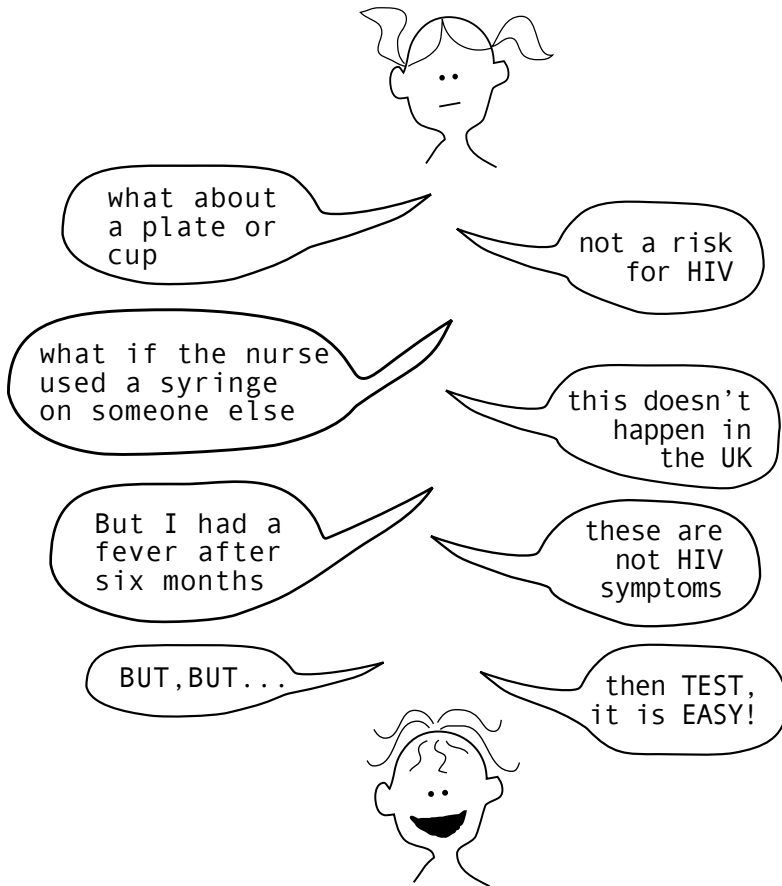
Saliva: Saliva contains proteins and a low salt content that actively reduce its infectiousness. Even when HIV is detected it is unlikely to be in sufficient quantity to cause infection. HIV is not transmitted by kissing including deep kissing. Spit cannot transmit HIV.

Air: HIV is not transmitted by air.

Latex and rubber: Condoms prevent infection from HIV and many other sexually transmitted infections.

Many sexual situations have no risk of transmitting HIV.

These include masturbation (by yourself or with a partner), kissing and deep kissing, receiving oral sex and vaginal or anal sex using a condom correctly.



Risks for transmission

Between 100% safety and 100% risk

Whether HIV transmission takes place is related to many different things. The most important ones are listed on page 11.

This is not just you and your partners' HIV status or what you do with or without a condom. It includes viral load, type of sex, genetics, circumcision etc.

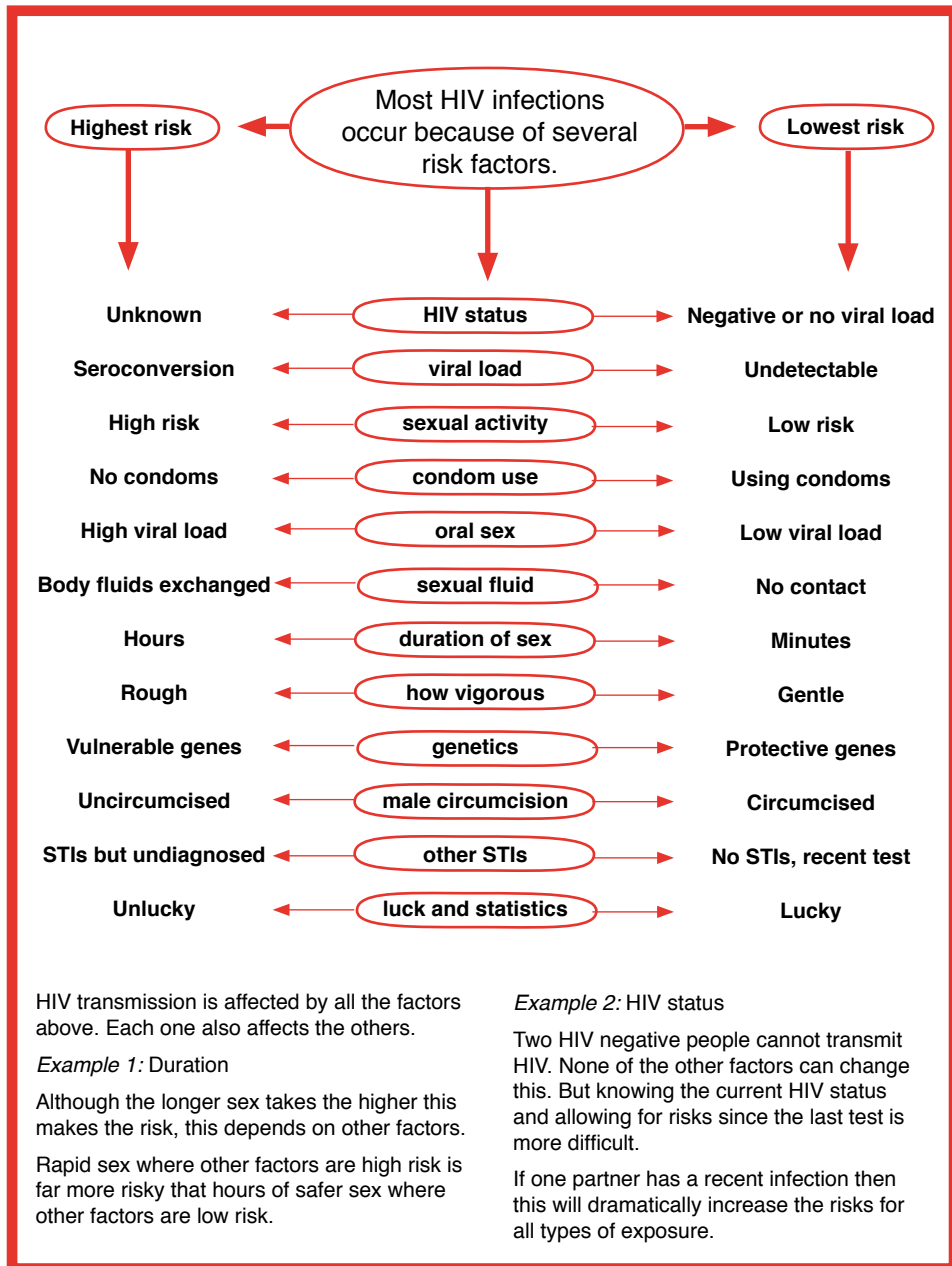
Very few activities have a 100% risk or 100% safety. The risk for each of these factors may be anywhere between high and zero.

These all affect how safe or risky an activity might be.

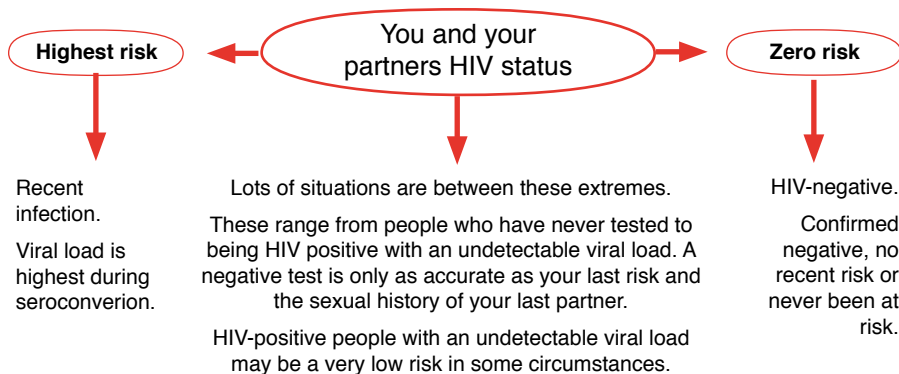
If you are worried because of a risk, the only way to know your HIV status is to take an HIV test.

The next pages discuss each of these risks in more detail.

Figure 1: Common risks for transmission



You and your partners HIV status



When both partners are negative

HIV has to be present for any risk of transmission. If both partners are HIV negative, then transmission cannot occur.

This involves knowing you and your partners current HIV status. This is not the same as knowing their status last year, or the last time either of you tested. Two partners having sex without a condom need to trust that neither partner could catch HIV outside the relationship.

Not all relationships are monogamous all of the time.

When relationships change or breakdown this often involves other sexual partners.

Sometimes it might be easier to continue using condoms than raising these issues of trust.

HIV negative people do not need to use condoms with each other if they:

- are both HIV negative (confirmed test and no risks since).
- have had no risks in the three months before their last HIV test and no risks afterwards.
- are not concerned about pregnancy.
- are not concerned about STIs.

If you don't know you or your partners HIV status

If you don't know your partners status, assume they are positive.

If you don't know your HIV status, assume you are positive (in terms of putting someone at risk).

If you do this - rather than assuming your partners are negative - you will not take risks that you are not happy with.

You will feel in control during sex and you will not feel anxious or worried afterwards.

Your HIV status is only as accurate as your last test result, plus the risks you have taken since.

If one partner is positive and one is negative

If one of you is HIV positive and one of you is HIV negative, you need to be careful to reduce the risk of transmission.

This involves learning about which activities involve a risk and which are most safe. Condoms, if used correctly, protect against HIV, so most sero-different couples become very good at using condoms.

There are lots of couples where HIV status is different. You can have a full and active sex life without the negative partner ever catching HIV.

See the sections in this guide on viral load, on condoms and on PEP.

PEP is when HIV drugs are taken by an HIV negative person after an exposure to reduce the chance of infection.

Treatment dramatically reduces how infectious someone is when viral load becomes undetectable. This is so low that even if a condom breaks, many doctors would not recommend the need for PEP.

HIV treatment makes it easy for couples to have children naturally without the HIV negative partner or the baby catching HIV.

GLOSSARY • **HIV reinfection:** when an HIV-positive person gets reinfected with a different strain of HIV • **Drug resistance:** when HIV changes in a way that stops a drug from working • **Undetectable viral load:** when a person has a level of HIV in their blood that is too low to be detected in routine tests.

“We are both positive and not using condoms is a special part of our relationship. We are both on treatment and have no resistance. We don’t have other partners so there is no risk of STIs but if we do we agree to use condoms then...”

Steve, Manchester

“I am positive and so is my partner. I am happier to continue using condoms. This is because I feel better to be in control of this part of my life. At least I don’t have to worry about my health if he decides to have other partners...”

Paula, London

When both partners are positive: what about reinfection?

Many HIV positive people have sexual partners who are also positive.

If both partners are positive this removes the anxiety of worrying about HIV, even when risks are low.

There are not a great number of benefits from being HIV positive, but for many people, this is one of them.

While this is generally safe in most situations, knowing about reinfection is important. If either partner has drug resistance or a different type of resistance this can be transmitted.

How often reinfection occurs is not know. The risk is probably at least as low as catching HIV the first time. This will be higher if viral load is detectable and dramatically less for someone on effective treatment.

The implications for your health if reinfection occurs will depend on how serious the resistance is.

We mainly know about reinfection because of cases where the new infection has caused treatment to fail.

This means knowing about both you and your partners treatment history.

If neither or you have resistance, or if you both have the same resistance, then there is unlikely to be a problem

Risk of catching HIV when your partner is positive

A study in 1994 looked at the transmission rates in over 250 monogamous heterosexual couples where one partner was HIV positive. When condoms were used every time (for over 15,000 sexual contacts) there were no transmissions.

However, 121 couples did not use condoms every time and half of these couples never used condoms. The infection rate in this group was about 5% per year. Over 18 months the risks in this group ranged from 7% to 50% depending on how ill their partners were (ie their likely viral load).

This early study, from before there was effective treatment, showed how effective condoms can be.

It also showed that HIV is not easily transmitted with higher risk sex even when one partner is HIV positive.

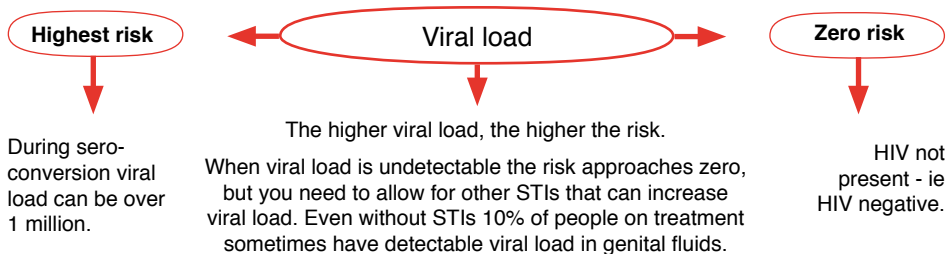
(Ref: deVincenzi V et al. NEJM,1994.)

from not using condoms (other than STIs or pregnancy).

But if one of you has resistance, especially with a detectable viral load, this can be transmitted.

This would loosing the chance to use the resistant drugs in the future.

Viral load



Viral load may be more important than condom use.

Viral load determines how infectious bodily fluids are. Levels are highest in someone who is recently infected (up to 40 million copies in a millilitre of blood). By comparison, someone on treatment with an undetectable viral load has less than 50 copies/mL (see page 17 for Figures 2 and 3).

When viral load is very high, normally low risk activities like giving oral sex become a higher risk.

The risk of heterosexual transmission from vaginal sex without a condom is dramatically reduced when an HIV positive person has an undetectable viral load.

One study reported the risk to drop by 92% [1] and another by 96%. [2].

References

1. Donnell D and others. ART and risk of heterosexual HIV-1 transmission in HIV-1 serodiscordant African couples: a multinational prospective study. 17th CROI 2010. Oral abstract 136.
2. Cohen M and others. Antiretroviral

The single transmission in each study occurred when the positive partner had only just started treatment when their viral load was still high.

An undetectable viral load does not mean that transmission cannot occur, but the risk is dramatically reduced.

When viral load is undetectable in blood, there are less than 50 copies/mL and often less than 5 copies/mL.

About 90% of times that viral load is undetectable in blood it is also undetectable in genital fluids.

This changes how we think of traditional risks and safety. So sex without a condom (with undetectable viral load) might become a lower risk than oral sex (with a man who is been recently infected).

treatment to prevent the sexual transmission of HIV-1: results from the HPTN 052. IAS conference, 2011. Abstract MOAX0102.

3. Quinn TC and others. Viral load and heterosexual transmission of HIV type 1. Rakai Project Study Group. NEJM 2000; 342: 921-929.

GLOSSARY: mL (millilitre) one thousandth of a litre.

Figure 2 - Viral load levels as HIV infection progresses

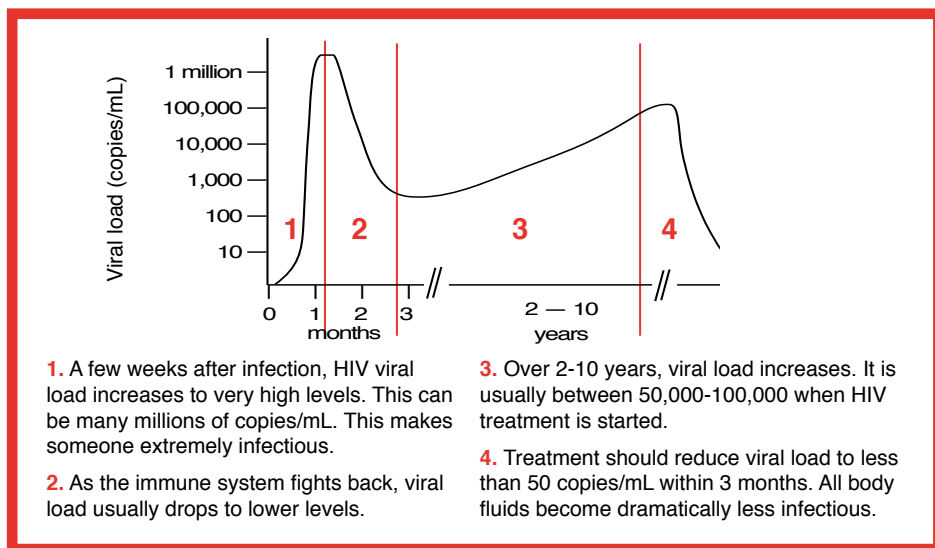
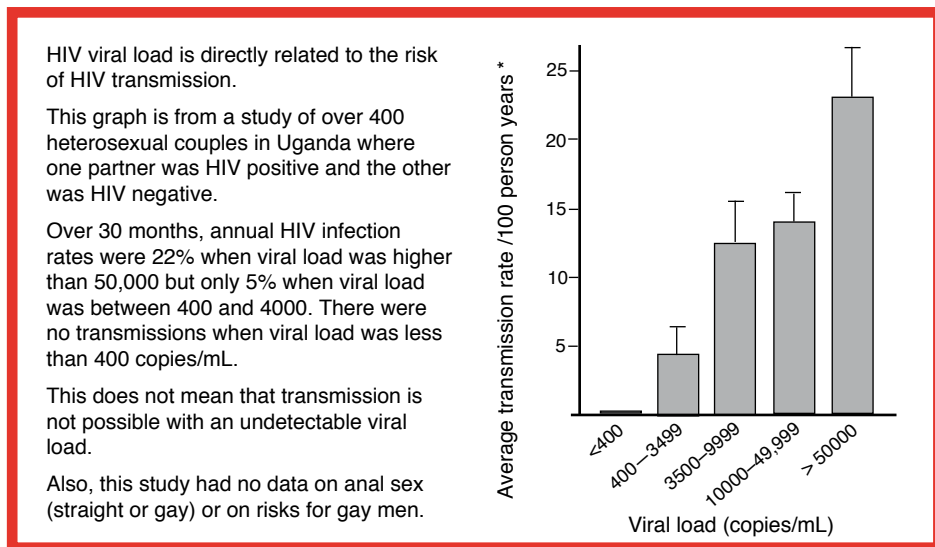
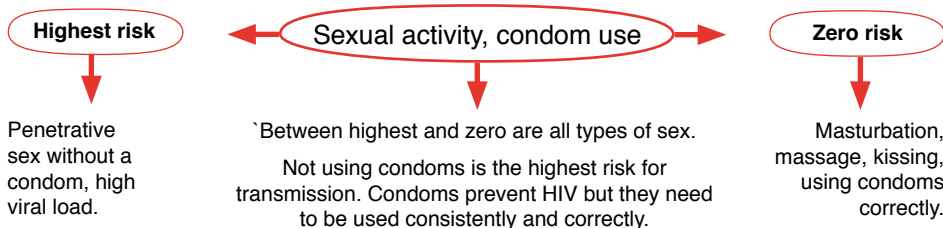


Figure 3 - The relationship between viral load and HIV transmission in Rakai Study [3]



* A 'person year' in research refers to 12 months of time in a study, ie 100 person years could be 200 people all followed for 6 months. This is used when calculating risks.

Sexual activity and condom use



The type of sex you have (anal, oral or vaginal) and whether or not you use a condom are both related to the risk of getting HIV.

Oral sex is generally a lower risk. Penetrative (anal and vaginal sex) without a condom is generally a higher risk. The risk is highest for the receptive partner in vaginal and anal sex than for an insertive man.

Condoms used correctly protect 100% against HIV transmission and some other STIs. This includes applying lubrication where required to avoid tears and checking it is in place (see Figures 4 and 5).

When research reports that condoms are only 85-95% effective, this is because people who use condoms do not use them every time.

Figure 4 - Using a female condom

Follow the same advice for use, lube, care and disposal as for male condoms (Figure 5).

An inner ring at the smaller end of the female condom should sit deep in the vagina or anus.

Although not approved or marketed for anal sex they are often used for this type of sex.

The female condom can be worn on the penis or inserted first into the anus, keeping the large ring outside. The small ring can be removed for anal sex if this is more comfortable.

Inner ring →

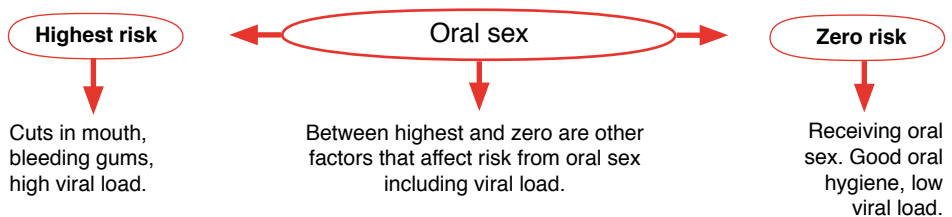
Outer ring →

Figure 5 - How to use a male condom

- A condom used carefully will stop HIV. Check the date, open carefully - not with your teeth.
- Check you have the condom the right way round by seeing which way it unrolls.
- Condoms have a teat to collect the semen (cum). Pinch the top (teat) so that air is not trapped inside.
- If you rushed to get the condom out of the packet the teat sometimes gets pushed the wrong way, so always check before starting to put it on.
- Unroll the condom down the length of the penis.
Put on the condom before you have sex, when your penis is hard.
- Use water-based (not oil-based) lube. Oil breaks down the protection of a latex condom by making the condom porous. This also makes them easier to break.
You can use lube inside as well as outside. But too much lube inside a condom can make it slip off.
- During sex, check the condom is still in place. If sex lasts a long time, also check that it is not broken during sex.
- After cumming, taking the condom off carefully. Hold the condom against your penis as you withdraw. This is to make sure the cum stays inside the condom.
- If you tie the condom in a knot the semen will stay inside.
Wipe your penis so that cum doesn't get anywhere else.
Then bin it, don't flush it. Think of the surfers!
- If you have sex again, use a new condom each time.
- Practice will improve your confidence in using condoms.
Try different sizes, makes and brands of condoms and different lubes to find the ones you and your partner prefer. Practice by yourself or with your partner.
- In the UK condoms are available from chemists, supermarkets, corner stores etc. Condoms are free from GUM clinics and your GP.



Oral sex



Oral sex is generally a low risk activity. It is likely to be zero or close to zero in most circumstances. This will be higher depending on these factors:

- Whether you are receiving or giving oral sex – **receiving oral sex is likely to be zero or near zero risk.** Saliva is not linked to HIV transmissions.
- Whether you are giving oral sex to a man or a woman - **giving a woman oral sex is likely to be zero or close to zero risk.** Cervical/vaginal fluid, even if infectious, is more difficult to get in your mouth compared to semen.
- Whether cum or pre-cum or gets in the mouth. If there is no cum or no pre-cum then the risk is zero, but it can sometimes be difficult to know this.

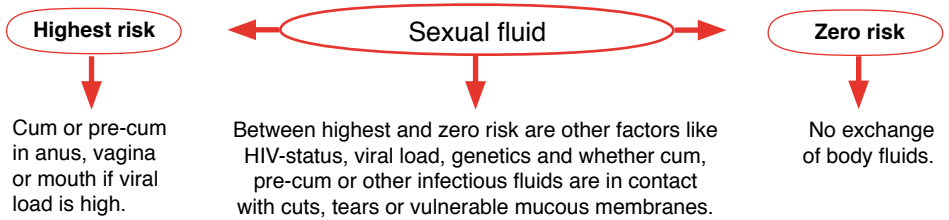
- **Oral hygiene of the person giving the oral sex.** The mouth is generally very resistant to infection, but cuts or sores, bleeding gums, can be a route for infection.
- Most cases reporting oral sex as a risk for HIV report mouth problems. Gum problems are common (perhaps in 10-50% of adults). If your gums bleed when you brush your teeth or floss this will be a route for HIV.

In practice, condoms are very rarely used for oral sex.

If you don't know your partners HIV status, or if they are HIV positive with a detectable viral load, then giving a man oral sex should be considered a risk for transmission. If you have poor oral health this risk may be high.

Up to 5% of HIV infections in gay men may be due to oral sex. These cases are likely to be explained by both cuts in the mouth or other oral problems and high viral load in the positive partner.

Sexual fluid



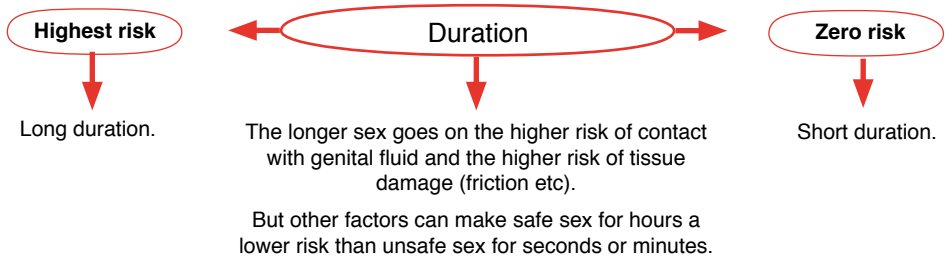
HIV is infectious in semen (cum) and pre-cum, in vaginal fluid and in rectal mucus.

Pre-cum has a lower risk because there is generally less of it. Some men can have more pre-cum than

other men have cum. This risk is clearly related to other factors like viral load.

If there is no exchange of an infectious body fluid, HIV cannot be transmitted.

Duration of unprotected sex



The longer the duration of unprotected sex, the higher the risk of infection.

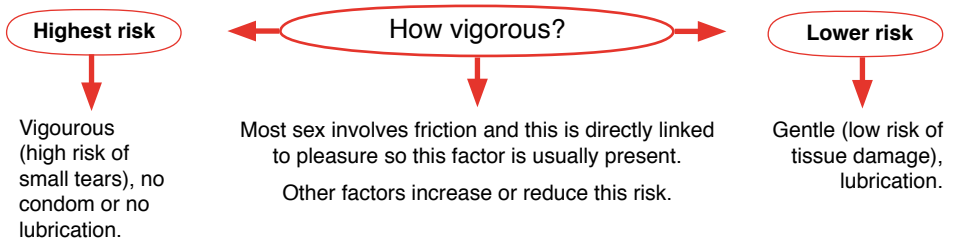
This is easy to understand. The longer mucous membranes are in contact with body fluids that contain HIV, the higher the risk that HIV may get through.

Sex lasting for longer can also increase the chance of tissue damage.

However, other factors are more important.

Quick sex without a condom is a higher risk than long slow sex using a condom!

Vigorousness of sex

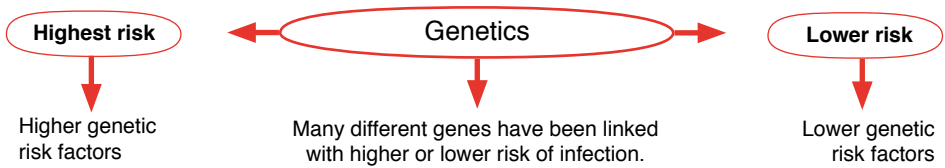


The inner surface of the anus and vagina and the surface of the penis are very sensitive and delicate.

The rougher or more vigorous the sex the more likely that abrasions, tears, cuts and friction can damage the surface.

This damage is unlikely to be visible.
Any cuts or tears can act as entry points for HIV in infected genital fluids.
Lubrication can reduce the risk of this damage.

Genetics



Genetics cannot be measured easily. Tests are expensive and only available in research studies.

However, genetics is related to the risk of catching HIV. Some genes are protective and some genes increase the risk. The same genes affect how fast HIV progresses in an HIV positive person.

For example, a genetic mutation called a CCR5 delta-32 deletion, protects against some types of HIV. Less than 1% of people may have these genes but this is not something that is easy to test.

Up to 10% of new infections are with CXCR4 virus that disables this protection.

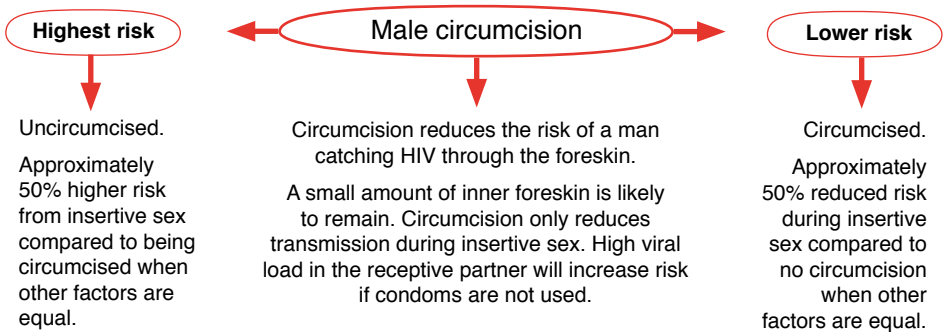
Most people who think they are protected because of their genetics have actually just been lucky.

Just as genetics can protect against infection, genetics can also increase the risk. You or your partner may have genes that make HIV easier to catch or transmit.

Although some viruses can be more infectious, individual immune responses have a bigger impact of HIV transmission.

You cannot change your genes (or your immune system) so this is both an unknown and fixed risk factor.

Medical male circumcision



In heterosexual sex, a circumcised man has a 50% lower chance of becoming infected compared to than a man who is not circumcised.

Male circumcision does not reduce the risk of *transmitting* the virus. It does not protect from other routes of infection.

The inner foreskin of the penis is a membrane that HIV can easily penetrate. It has a thinner protective layer (called keratin) between the surface and the immune cells beneath.

It contains a higher proportion of HIV target cells than other types of tissue.

It is also more delicate and more sensitive to damage. So contact between the inner foreskin and genital fluids (vaginal secretions, semen or rectal mucus) is an easier way to catch HIV.

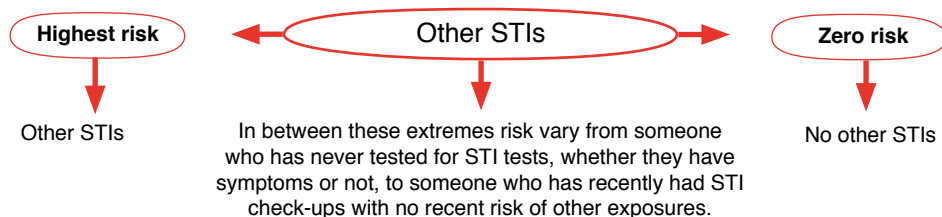
The longer the contact the more time HIV has to overcome this barrier.

The reason similar protection has not been seen in studies of gay men is likely because most gay men enjoy both active and passive sex.

So gay men who are exclusively insertive may have a similar level of protection, but only for insertive sex.

So far studies have not been able to show this.

Other sexually transmitted infections (STIs)



Other STIs in either the HIV negative or HIV positive partner can increase the risk of HIV transmission. STIs include:

- chlamydia
- genital warts (HPV - human papilloma virus)
- gonorrhoea
- syphilis
- herpes
- LGV (lymphogranuloma venereum)
- hepatitis A and B
- hepatitis C (for HIV positive gay men)
- trichomoniasis

STIs can reduce immune protection against other infections in HIV negative people.

An HIV negative person with an STI has an activated immune system. This increases the number of cells that HIV needs to infect. So HIV has a better chance of finding one of these cells. See page 44 (Fig 10 c).

With herpes, for example, HIV target cells stay at much higher levels even weeks after a sore has cleared up.

This is why HIV negative people with herpes, are at higher risk of catching HIV, even when they have no current sores.

Any STI that causes a sore makes an easy way for HIV to enter the body.

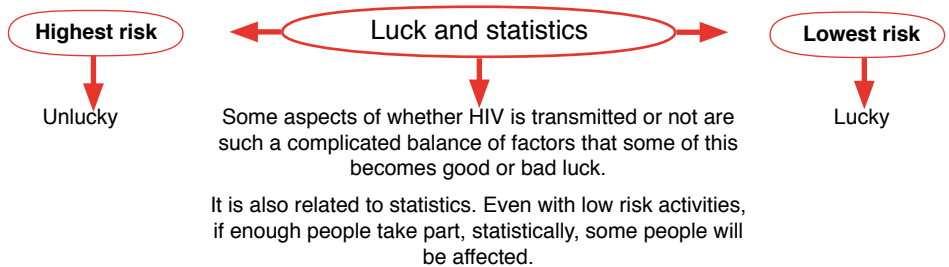
An HIV positive person with an STI may be more infectious for HIV. This may also cause their undetectable viral load in blood to be at higher levels in genital fluid.

HIV positive people may also be at greater risk of catching STIs. For example, hepatitis C (HCV) is sexually transmitted for HIV positive gay men but rarely from heterosexual sex.

The reasons for this are not clear.

HCV is usually transmitted by contact with infected blood.

Luck (and statistics)



Luck and statistics are really important.

One person might become HIV positive after one exposure. Another person might have many exposures over years and still not become HIV positive.

In many circumstances we cannot explain this. Life is not always fair.

It might be that the risks that are difficult to measure are higher when infections occur. When they don't occur, the same difficult-to-measure risk factors may all be lower.

As these can't be measured or changed, this gets put down to good or bad luck.

Some researchers would also point out the role of statistics.

Even when one partner is HIV positive and another is HIV negative, the risk from not using a condom one time, might be 1 in 1000 (0.1%).

This will be a bit higher for anal sex than vaginal sex, and a bit lower for insertive compared to receptive sex (but remember circumcision). In general these are low single risks.

But new infections occur because on the other hand it only takes one exposure to transmit HIV.

So if 1000 people have sex without a condom and one person is likely to become infected. If 1 million people do the same thing, then 1000 people would be expected to become HIV positive.

Luck, or chance, or unmeasurable factors are related to time and the number of exposures.

Statistically, most people will be lucky once, but the chance of being lucky 10, or 100 or 500 times gets increasingly slim.

For some who takes 50 risks, the previous example with odds of 0.1% increase to 1 in 20 (5%).

HIV testing: feelings of fear, anxiety and guilt

Taking an HIV test is very stressful. It focuses your mind on the real risk, however small, that you might be HIV positive.

Even though 99% of tests in a sexual health clinic in the UK are negative, the worry is still real.

It is also stressful because if the risk was recent it will take time to know if you caught HIV. A test at four weeks gives you a pretty good answer until you get the final test after 12 weeks.

This stress is usually still manageable. But, for a few people, HIV can become an unhealthy obsession that is out of all proportion to their level of risk.

This is often made worse by feelings of guilt related to the circumstances of the risk.

For example:

- If you usually use a condom but didn't on one occasion, or the condom broke.
- If these are your first sexual experiences, whatever your age.
- If you have tried new experiences. For example if you are usually a straight man and had sex with another man.
- If you are in a relationship, gay or

straight, and have had sex outside your main relationship.

- If you paid for sex or were paid for sex.
- If you were sexually assaulted.

An obsessive focus on HIV can lead to psychological problems unconnected with the real risk.

There is also a concern for current sexual partners. If the risk was from a sexual experience outside your main relationship, this may involve changes to your sex life at home to protect your partner until you have your test results.

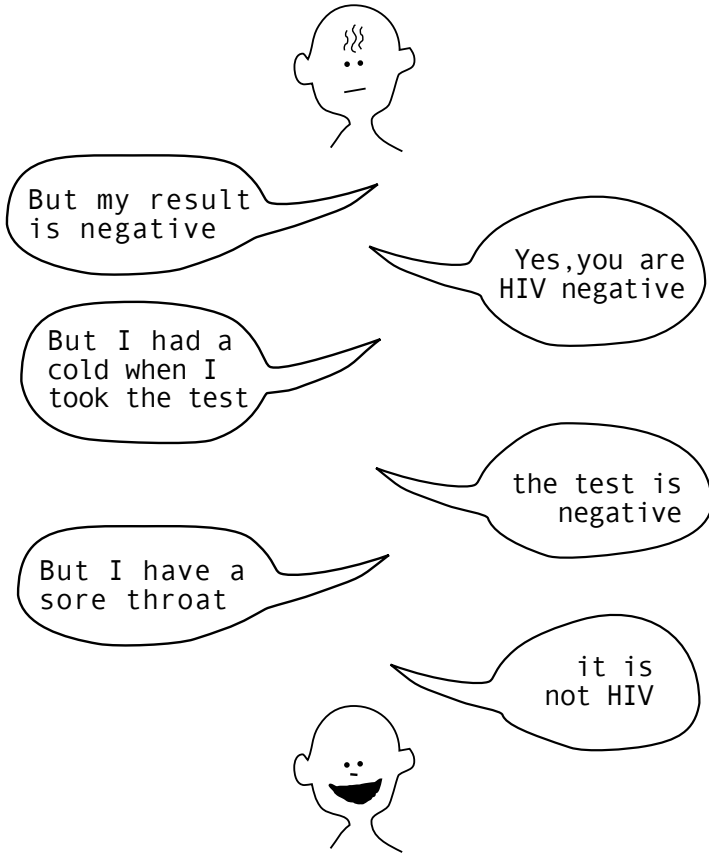
Worry and stress can cause symptoms that people then assume is HIV, especially if the worry has stopped you sleeping.

A health advisor can talk you through this. You also have to fight the urge to believe that the worst outcome is going to happen.

Life is complicated and it is common over a lifetime to do things that you are not always happy with afterwards.

However, if your test result is positive there is a lot you can do. A tiny virus will complicate your life but most people still have the health and the life they had before.

Life expectancy for people who have access to treatment is now close to that of an HIV negative person.



Frequently Asked Questions

We are often asked similar questions regarding HIV transmission.

Here are a few of the answers.

Q: Do I have HIV?

A: The only way for you to know this is for you to take an HIV test.

We can provide information about risk, but unless your risk is zero, which is sometimes the case, you need to test to find out.

Testing is easy and free or cheap.

If you are worried that you have been at risk, like millions of other people, just take a test.

Q: What is my risk of HIV?

A: We get many questions about different risks and the likelihood of having caught HIV.

General risks are not very helpful for individual circumstances for two reasons.

- 1) If you have had any risk that is, for example, 1 in 500, you still need to test to know your result. This remains true whether the risk was much higher (1 in 10) or much lower (1 in 20,000).
- 2) Because a general risk of 1 in 500 (sometimes quoted for unprotected insertive sex) is meaningless without considering other factors.

You need to know the chance that your partner is HIV positive, whether they are on treatment, if so, what is their viral load? Some things you won't be able to test for, like genetics.

Even these few factors could change the same risk of 1 in 500 to as high as 1 in 10 or as low as 1 in 20,000.

Q: Do I need an HIV test?

A: The only way you can know your HIV status is by taking an HIV test.

If you are sexually active, then it is better for you and your partner(s) to know your HIV status.

HIV testing should be a routine part of looking after your sexual health. As is repeating the test every 6-12 months – or as appropriate – depending on your level of sexual activity and risk. This is important in case you are exposed to HIV in the future.

In the UK and many other countries, at least one-third of people living with HIV are not yet diagnosed.

Q: Can I ask my partner to test to know my risk?

A: No. If you want to know your HIV status you need to take your own test.

You cannot interpret your HIV status based on another persons' results.

You also have no right to ask another person to take an HIV test.

This is about **your** sexual health. It is **your** responsibility to test. You cannot impose your worries about your health on another person.

If you test positive, then it makes sense to notify your partners so they can also test.

Q: What is seroconversion?

A: Seroconversion is the period when immune responses to HIV start to develop throughout the body.

This is usually 2-4 weeks after infection.

During this time up to 80% of people have symptoms. These symptoms can last for a few days or a few weeks.

Q: What are symptoms of seroconversion?

A: Seroconversion symptoms are often described as like a heavy flu.

They can also be similar to symptoms of other sexually transmitted diseases. Stress and anxiety can also produce symptoms even when there is no HIV.

The most common symptoms of seroconversion include:

- Fatigue (tiredness)
- Fever
- Sore throat
- Rash
- Headache
- Loss of appetite
- Aching muscles and joints, and
- Swollen lymph glands.

Having only one or two symptoms is very unlikely to be HIV.

Symptoms are not a reliable way of diagnosing HIV infection.

Firstly, 20% of people who become infected with HIV have no symptoms.

Secondly, none of these symptoms are, on their own, an indication that you have HIV. However, if you get several of these symptoms at the same time AND you have had a recent risk of exposure to HIV, then this MAY be related to HIV.

The only way to know is to test.

This involves waiting four weeks for a valid result. It also involves taking a second test after 3 months (see page 37).

If you are worried about HIV, contact a doctor or sexual health clinic.

If you think you may have been exposed to HIV, you can talk about whether testing is appropriate.

The clinic will be able to go through your risk in the detail that is needed.

The 'Health services near you' section of the NHS website includes a sexual health menu to search for clinics by town or postcode.

<http://www.nhs.gov>

Q: Does washing after sex reduce the risk?

A: No. If you are in contact with sexual fluid it is better to wipe this off with a dry cloth. One study reported that infection rates were **higher** in people who washed after sex.

Douching can spread the virus further and soap and water may make a vulnerable membrane an easier barrier to get through.

Lemon or lime juice, even diluted, **increase** the risk of transmission as they damage tissue.

Q: How can my partner test positive and I test negative?

A: It is quite common for one partner to test positive and the other negative, even if they have been having sex without condoms.

Mostly this is explained by luck and the role of other risk factors. Over time, most people will catch HIV if they continue to be at risk.

Even though you have been exposed and not infected, you can still catch HIV in the future.

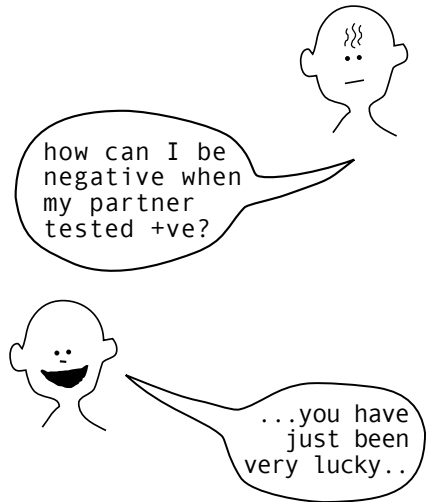
Now you know your partners HIV status you can still stay together and have sex safely. You can prevent infection by using condoms when having sex and not sharing needles or blood products with your partner.

The risk of transmission also drops dramatically if and when your partner uses HIV treatment for their own health.

This is an exciting new area of research.

The link between viral load and the risk of transmission has been known for at least ten years.

More recent studies have strengthened the link between an undetectable viral load and a reduced risk of transmission.



These are mostly heterosexual studies. There is little or no data on the impact of risk from anal sex (gay or straight). Much of the follow up in these studies is also from people who still use condoms.

An undetectable viral load does not mean zero risk but it does dramatically reduce the risk.

There has been at least one case of HIV transmission reported from anal sex with an HIV positive insertive partner who had an undetectable viral load and no STIs.

Q: Are some people protected from infection?

A: Some people have multiple exposures to HIV, from either one person or several partners, and still do not get HIV.

Sometimes this is related to genetic factors (see page 23) only some of which are understood. Most of the time it is just related to luck.

Although immune responses to HIV can develop in some people after frequent exposure, this is not well understood. Using condoms as protection against infection is still recommended.

Even people with a high level of genetic protection can still become infected.

Q: Are risks different for men and women?

A: In heterosexual vaginal or anal sex, if other factors are equal, a woman has a biologically higher risk of infection compared to a man.

- The surface area of the vagina or anus is far greater than the surface area of the penis.

- The risks of tears to the vagina or anus during sex is greater as the these inner linings are more delicate than the skin on the penis.
- The length of time of exposure of the vagina or anus to semen is greater than the time the penis is exposed to the vaginal fluid or rectal mucosa.

Q: Are risks similar for insertive or receptive anal sex?

A: The risk for anal sex, if other factors are equal, is greater for a receptive partner compared to an insertive partner.

- The surface area inside of the anus, is larger than the surface area of the penis
- The risks of tears to the anus during sex is greater as the membrane on the inside of the anus is more delicate than the skin on the penis
- Pre-cum and cum will stay in the receptive partner for longer than the insertive partner is in contact with rectal tissue and mucosa.

PEP, PEPSE and PrEP

What is PEP?

PEP stands for Post Exposure Prophylaxis.

This is the term for using HIV drugs **after** a potential exposure to reduce the risk of HIV infection.

The term PEPSE is sometimes used in the UK to refer to **PEP** after **Sexual Exposure**.

PEP usually involves taking a combination of three drugs for 28 days. Very early use of HIV drugs may stop HIV establishing infection.

PEP needs to be taken as soon after exposure as possible. This is preferably within hours rather than days. Most guidelines have a cut off for PEP of 48 hours after exposure.

Even though in the UK you can get PEP for up to 72 hours it is much less likely to be effective when it is used this late.

The longer the delay the less the chance that PEP will work.

Before getting PEP you will need to talk about your risk. This involves talking about the type of sex and whether you know the HIV status of your partner.

You also need to have a rapid HIV test which gives the result within 30 minutes. **This test only tells you whether you were HIV positive three months ago.** It tells you nothing about the recent risk.

PEP: Using HIV drugs after exposure to reduce the chance of infection

PrEP: Using HIV drugs before exposure to reduce the chance of getting HIV.

You need an HIV test because if you are HIV positive without knowing it, a short-course of treatment could cause drug resistance.

You can get PEP at any accident and emergency (A&E) department of a hospital 24 hours a day. You can also access PEP from a GUM clinic during working hours.

After a course of PEP you need to wait 28 days before testing for HIV. This is because PEP can delay infection.

Do PEP drugs have side effects?

The drugs for PEP are the same meds that HIV positive people use for treatment.

Side effects are common for the first few weeks, although not everyone gets these.

Side effects are nearly always short-term and manageable.

Can I use my partner's meds as PEP?

Using someone else's meds is not recommended. Some HIV drugs should never be used as PEP.

However, two HIV drugs have been studied for preventing HIV. These are tenofovir and FTC (in one pill called Truvada). A single dose of Truvada would provide more rapid cover while you get to a clinic and wait to be seen.

Several studies have shown that daily Truvada can reduce the chance of HIV transmission when taken by HIV negative gay men. These studies also showed Truvada to be safe.

This would only be recommended as a single dose while you are waiting to get to HIV clinic for PEP.

However, if the HIV positive person is already on treatment and has an undetectable viral load, they will also be much less infectious. In these circumstances some guidelines think the risk is so low as to not recommend PEP.

HIV meds that must NEVER be used as PEP include:

- Any type of NNRTI (nevirapine, efavirenz, etravirine or rilpivirine).
- Atripla or Eviplera (which both contain an NNRTI)
- Abacavir (or Kivexa or Trizivir that contain abacavir).

What is PrEP?

PrEP stands for Pre Exposure Prophylaxis.

PrEP uses two HIV drugs (tenofovir and FTC) in one pill (called Truvada) **before** (and after) exposure to reduce infection.

Studies have already reported that PrEP can sometimes reduce (but not eliminate) the risk of HIV transmission. This research has been based on taking one Truvada tablet every day.

One important study in young gay men at high risk of HIV reported that daily PrEP reduced the risk of catching HIV by 44%. In a sub-study of people who actually were taking Truvada (many people did not take it) the protection rate increased to over 90%. [1]

Other studies are looking at different doses and formulation and in different groups of people. This is exciting research but Truvada is not widely available for this use.

Some people may be able to have Truvada prescribed if their doctor believes they are at high risk of catching HIV.

See this link for more information.

www.i-Base.info/home/PEP-and-PrEP

Reference

1. Grant R. iPrEX study, NEJM Dec 2010.

HIV testing

How soon can I take a test?

This question usually refers to how soon after exposure can someone test for HIV.

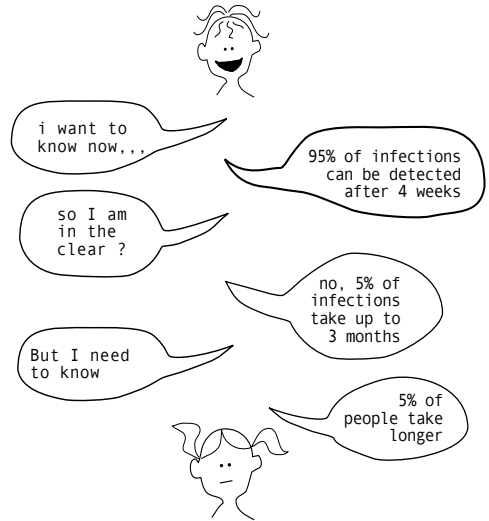
This usually requires waiting four weeks before taking an antibody-based test (see Figure 6).

UK guidelines state that 4th generation HIV tests (antigen/antibody) will detect 95% of infections four weeks after exposure.

A negative test after four weeks then needs to be confirmed with a second test three months after the risk. This is in case you take longer than four weeks to generate an antibody response.

In high risk exposures, especially if symptoms occur, viral load testing is sometimes used after one week.

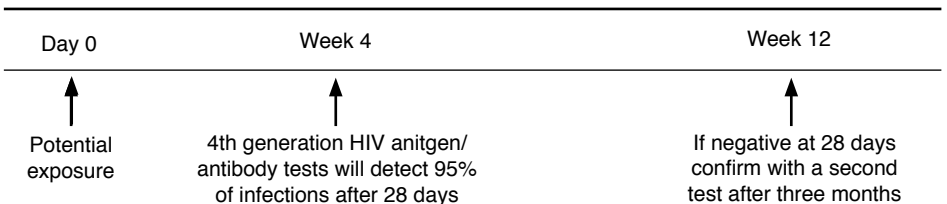
This includes after a sexual assault or after a needlestick injury to a health care worker.



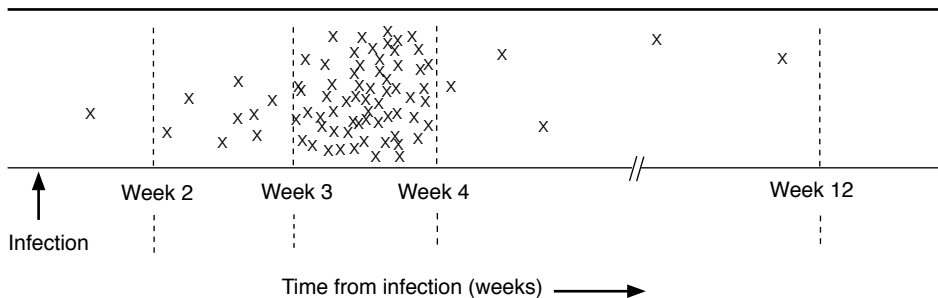
In these cases a viral load test can exclude an infection when there are symptoms.

Viral load tests are not approved to diagnose HIV. A negative result still needs to be confirmed by an antibody test three months after the risk.

Figure 6: Recommended time from exposure to HIV test



A negative HIV test four weeks after an exposure is good news, but you still need to confirm this three months after the exposure.

Figure 7: Time to develop antibodies: 95% by week 4 and more than 99.9% by week 12

Each 'x' represents the time when a different person develops HIV antibodies. Testing is only useful when the majority of infections would be detected. Even though a few people can be detected earlier, testing after only 2 or 3 weeks is not very useful.

What is the window period?

The window period is time between potential exposure to HIV infection and the point when the test will give an accurate result.

During the window period a person can be infected with HIV and infectious but have a HIV negative test result.

The window period for a 4th generation antigen/antibody test is four weeks. At this time it will detect 95% of infections (see Figure 7). There is a three month window period after exposure, for the confirmatory result (to detect more than 99.9% of infections).

Where can I test in the UK?

In the UK you can test anonymously at any GUM (genito-urinary medicine) clinic or sexual health clinic. You can test at your GP.

The 'Health services near you' section of the NHS website includes a sexual health menu to search for clinics by town or postcode.

<http://www.nhs.gov>

Sexual health or GUM clinics often offer more information on HIV and other sexually transmitted infections (STIs).

The Terrence Higgins Trust (THT) also have testing centres around the UK. (www.tht.org.uk)

Private clinics sometimes offer HIV tests that are not recommended in testing guidelines.

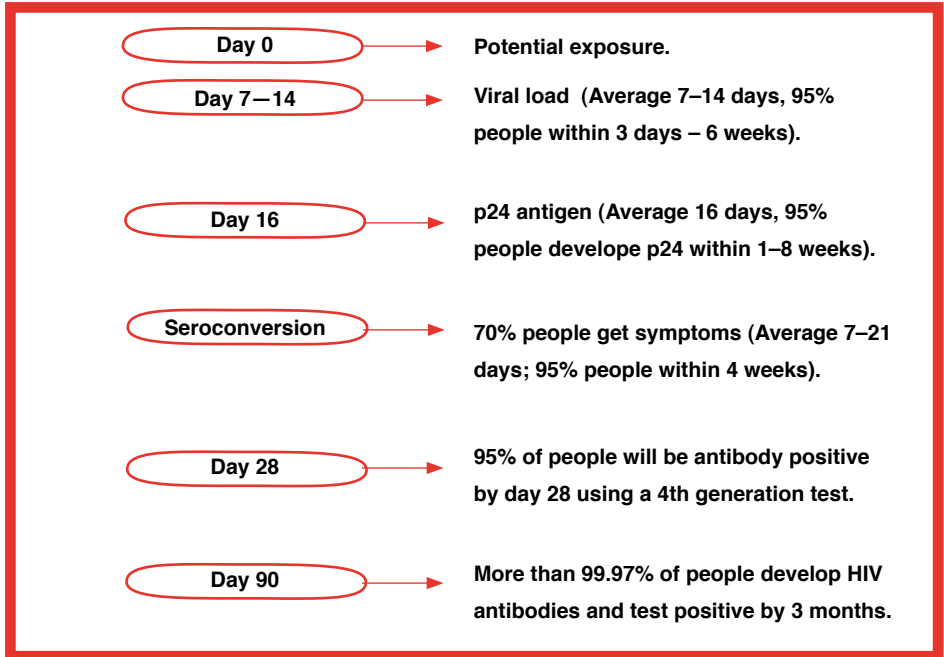
Figure 8: Timeline for HIV infection, immune responses and window period for tests

Figure 8 shows the range of times that people can take to respond to HIV infection.

The earliest marker is HIV viral load. This is in the first weeks after infection (usually from 1 to 6 weeks after exposure). A high viral load is related to seroconversion symptoms.

The first HIV protein (antigen) that can be measured is p24 (from 2 to 8 weeks after exposure).

Viral load and p24 tests are not accurate for diagnosing early HIV if the results are negative.

An HIV antibody response can be detected as early as two weeks in a few people and in more than 99.9% of people by 12 weeks. An antibody test at 4 weeks will detect 95% of infections.

Antibody testing at 4 weeks can give you a good indication of your HIV status, but you need a test at 12 weeks after the exposure to be considered HIV negative.

Why do some UK clinics ask people to wait 3 months?

No UK clinic should ask you to wait for three months before testing.

UK guidelines say you can be tested four weeks after an exposure (see box on BASHH statement).

Ask if the clinic uses 4th generation tests. If so, you can test after four weeks, and confirm this with a second test after three months.

If your clinic doesn't use 4th generation tests ask why not, and where you can get this test.

Please call i-Base if you want us to help.

What happens when I test?

Before taking an HIV test someone at the clinic should explain what is involved. This should include information about the type of test and test accuracy.

It should include information about what happens if the results are positive. It is important that you know about what happens if the results are positive.

Blood samples can be from a pinprick or having blood taken into a test tube.

Oral tests involve rubbing a swab on your gums to collect samples of cells.

You cannot catch HIV by taking an HIV test.

BASHH Statement on the window period

HIV testing using the latest (4th generation) tests are recommended in the BHIVA/BASHH/BIS UK guidelines for HIV testing (2008).

These assays test for HIV antibodies and p24 antigen simultaneously. They will detect the great majority of individuals who have been infected with HIV at one month (4 weeks) after specific exposure.

Patients attending for HIV testing who identify a specific risk occurring more than 4 weeks previously, should not be made to wait 3 months (12 weeks) before HIV testing.

They should be offered a 4th generation laboratory HIV test and advised that a negative result at 4 weeks post exposure is very reassuring/highly likely to exclude HIV infection.

An additional HIV test should be offered to all persons at 3 months (12 weeks) to definitively exclude HIV infection. Patients at lower risk may opt to wait until 3 months to avoid the need for HIV testing twice.

Ref: British Association on Sexual Health and HIV (BASHH), March 2010.

How long do results take?

Rapid HIV tests can give results in 15–60 minutes, or on the same day.

‘Rapid’ refers for the time taken for the results and not the time since exposure that a test can be used.

If samples are being sent to another lab, results can take a few days or a few weeks.

Rapid blood tests put a pin-prick of blood on a testing strip. This test takes about 15-20 minutes so you can get the results whilst you wait.

Some rapid tests also work on oral samples rather than blood. Although they are sometimes called saliva tests this is not accurate. Oral samples collect cells from the surface of the gums and not saliva. These cells contain HIV antibodies.

When samples are sent to a lab you can either collect your results in person or they will be posted out to you. It is your responsibility to get the results. A few clinics may give results over the phone.

A positive result from a rapid test always needs to be confirmed by a different laboratory test.

How are results reported?

Your test centre should clearly explain the results of your test.


If you have questions that were not explained, or that still worry you, ask the test centre first.


Rapid blood tests show two lines if positive or one line if negative, in a similar way as a pregnancy test (see Figure 8).


Results from laboratory tests are given as negative, positive or indeterminate.

- Negative or non-reactive means you are HIV negative. You do not have HIV (based on the window period and no recent risks).
- Positive or reactive means the test shows you are HIV positive and you have HIV infection.
- Indeterminate means the test result was unclear and needs to be repeated.

Figure 8: Example results from a rapid test

C  Non-reactive result (HIV negative)
T Only control area shows a line
 No line in the test area

C  Reactive result (HIV positive)
T Line in both control and test area
 (may be different strengths)

C  Invalid result (repeat the test)
T No control line showing

What does a number on my negative HIV test result mean?

Some tests (not usually in the UK) include a number (ie 0.31 or 0.64).

- If the number is less than 1.0 the result is negative.
- If the result is above 1.0 the result is positive
- If the result is very close to 1.0 (higher than 0.90) the doctor may repeat the test.

A higher number below 1.0 does NOT indicate a higher chance of having HIV.

Are HIV tests accurate?

Yes. Modern HIV tests are very accurate.

This accuracy has to be considered with the window period.

For example, 4th generation tests will pick up 95% of infections at 28 days after exposure.

A confirmatory test three months after the exposure is always recommended. This is because 5% of people take this long to show a positive result.

A positive test result is routinely confirmed using a different type of test called western blot. The western blot test looks for immune responses to specific HIV proteins and is 100% accurate.

Can anything affect the result of my HIV test?

HIV antibody tests are not affected by other circumstances.

This includes infections, medications, vaccinations, putting on weight, eating or drinking anything before the test, use of alcohol or recreational drugs, mouthwash or time of day.

Your test result is accurate even if you had flu or a cold or are using any medication.

You do not need to fast before your test. Food and drink do not affect the results.

Do I need to take another test?

This will depend on how recent your last exposure was.

As part of good practice, if the exposure was less than three months ago then testing at three months after exposure is usually recommended.

Can it take longer than three months for a test to work?

This is so unlikely that UK guidelines consider a negative result three months after an exposure as being HIV negative.

Is a negative test 100% accurate?

HIV tests after the 3 month window are more than 99.97% accurate. They work for all types and subtypes of HIV.

Very few medical tests have 100% accuracy. There will still be rare cases where someone is HIV positive and not picked up.

However, HIV tests are one of the most accurate tests for any medical infection. Tests showing a negative result are interpreted as negative.

This assumes you have had no further risks.

At this point you can stop worrying. This is the purpose of testing. Learn from the experience you have gone through in taking a test.

Learn about how to protect yourself in the future so you don't have to go through this stress again. This will enable you to make informed decisions and to look after your sexual health.

If the result is negative four weeks after the exposure, this tells you that you are likely to be HIV negative. The test after three months is needed to confirm this.

What is a 'false negative' test result?

A false negative test result occurs when the test shows negative and the person is really HIV positive.

This is very rare and usually occurs during the window period when people are newly infected but the test can't quite pick up the infection.

As with other types of tests, there is always be a small margin of error. With antibody-only tests (3rd generation) only 0.3% of tests (3 tests in every 1000) will be a false negative after 3 months.

With 4th generation tests this is even lower. In practice, a negative result after three months means you do not have HIV.

You do not need to test again unless you expose yourself further in the future.

What is a 'false positive' test result?

A false positive test is when the test result shows positive but the person is really negative. This can happen with antibody tests when the test picks up antibodies for other infectious agents.

Approximately 1.5% (15 out of every 1000) antibody tests are a false positive. The fourth generation tests have a much lower chance of a false positive.

This means that a small percentage of people who test positive on a rapid test (where the results are given within an hour) may turn out to be HIV negative.

A second blood sample will be tested in a lab to look for this.

If your blood test was originally performed in a laboratory, a positive result would have been run before giving you this result.

All positive laboratory tests in the UK are routinely confirmed using a second type of test called western blot.

What happens after my test?

If you have had your test results and the results were positive, these will need to be confirmed.

If confirmed you will be referred to an HIV clinic where a doctor and health advisor will be responsible for your future care. Page 45 includes information about what to do if your result is positive.

If the results were negative, then you may be told to have a confirmatory test in a few months time.

It is rare for the confirmatory test to be positive, but this is important to rule out late seroconversion.

What if I still think I have HIV?

A few people test many times after one exposure. Even when the results are all negative they refuse to believe the results.

Sometimes the anxiety causes symptoms that someone mistakenly thinks are related to HIV.

In these cases psychological help or counselling from NHS doctors or nurses is more appropriate than further tests.

If you have had more than one test and all results are negative, without any additional exposures, then you do not have HIV.

What happens if I am HIV positive?

If your test results are positive with a rapid test then you first need a lab test to confirm the result.

If your positive result came from a lab test, then the confirmatory test will already have been done.

If you are HIV positive then your test centre will arrange for you to speak with a doctor. It is important that you then have a few other tests to see how strong your immune system is.

You will need time to come to terms with this news.

With support and information this will become easier. Good information will help you to make informed decisions about your health.

Learning you are HIV positive is never great news. But HIV is now largely a treatable and manageable infection.

HIV treatment can give you a near normal life expectancy with a good quality of life.

Even before the new treatments, HIV positive people wanted to continue to live life to the full. There are very few things that you can't do now because of this virus.

For further information or support then please contact i-Base via our website (www.i-base.info) or our treatment information phoneline.

What if I am diagnosed in pregnancy?

HIV testing is routinely offered to every woman as part of prenatal care.

The almost universal uptake of HIV testing has reduced the number of babies born with HIV in the UK.

This is because diagnosing HIV during pregnancy allows the mother to receive treatment that also protects the baby. If your HIV is managed correctly, the UK has one of the lowest rates of transmission to the baby (less than 1%).

If you are diagnosed during pregnancy you should get special care and counselling.

For more information, see the testing section of the i-Base guide “HIV, Pregnancy and Women’s Health”.

<http://www.i-Base.info/guides>

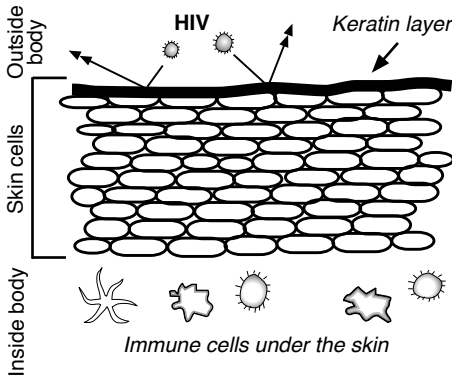
Skin, mucous membranes and HIV transmission

Figure 9 shows the cellular structure of skin compared to mucous membranes.

Figure 10 shows the earliest stages of infection.

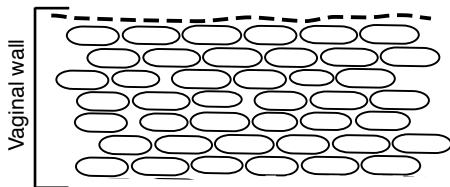
Figure 9: Cell structure of skin and mucous membranes

(a) Skin: tightly packed cells are a barrier to HIV



Most of your skin (on your hands, arms, legs, stomach, back etc) is a thick layer of tightly packed cells that is further protected by a keratin layer. This stops HIV getting to the immune cells that it needs to infect.

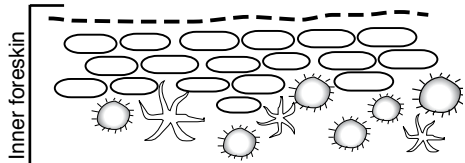
(c) Cells in the vagina wall



Mucosal tissue inside the vagina has many layers but the cells are more loosely packed.

HIV can get through loosely packed cells. This is why vaginal sex without a condom is such a high risk for a woman to catch HIV.

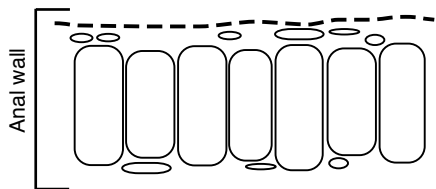
(b) Cells in the inner foreskin of the penis



Tissue on sexual organs can be different from skin. The inner foreskin is a mucous membrane with a thin layer of cells with no keratin layer. The keratin layer in skin helps make it resistant to infection.

The inner foreskin also has a high concentration of HIV target cells. This tissue is much easier for HIV to penetrate.

(d) Cells in the anal wall



The anus is also lined with a mucous membrane. This tissue is made up of a single layer of column shaped cells. This is even less of a barrier against HIV compared to the multiple layers of cells that line the vagina.

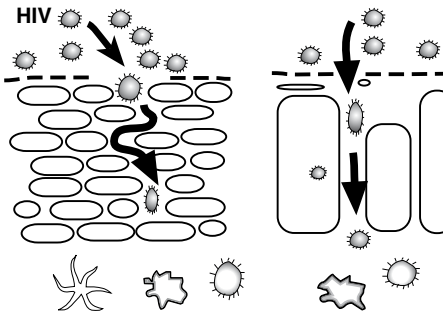
This is why unprotected anal sex is a much higher sexual risk for the receptive partner.

Electron microscope image of cells in anal wall



Figure 10: How HIV crosses skin or mucosal barriers

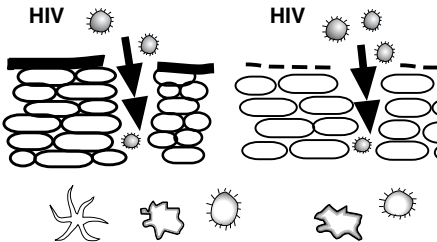
(a) Sexual tissue is an easy target for HIV



Vaginal tissue, rectal tissue and the inner foreskin are all mucous membranes. Cells in mucous membranes are more loosely connected compared to skin.

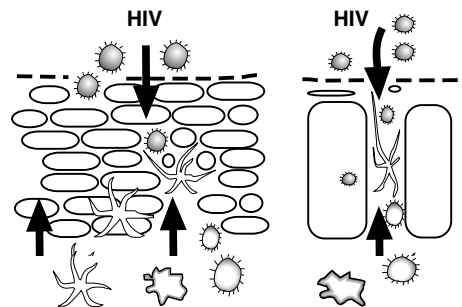
This makes it easier for HIV to penetrate.

(b) Tiny cuts or tears are an easy route for HIV



If you get a cut in your skin or your mucosal membranes have microscopic tears, HIV has an even easier way to reach target cells.

(c) Some STIs increase the risk of infection



Immune cells move up through skin cell layers to get closer to an infection

If you have a sexually transmitted infection (STI) your body sends immune cells to genital tissue. These immune cells move closer to the surface to reach the infection.

For most infections this is a good thing.

But this just makes it easier for HIV to establish an infection. These immune cells are the cells that HIV needs to target and infect.

Because there are more of these cells, and they are easier to find, some STIs increase the risk of acquiring HIV.

Additional reading

Three appendices have been produced with this guide that include more technical details about HIV testing.

Print copies of this booklet do not include these sections which are all available online:

<http://www.i-Base.info>

These additional 14 pages are only available in the online and PDF versions.

Appendix 1: Different types of HIV test

This section explains in detail the difference between the main types of tests used to test for HIV and when they are used.

These are:

- Antigen only (p24 tests). These are rarely used.
- Antibody only tests (Ab). These are rarely used because of more recent availability of joint Ag/Ab tests.
- Combined antibody-antigen tests. These are the most commonly recommended tests in the UK. these test for both antibodies to HIV and p24.
- Viral load tests (RNA PCR test)
Viral load tests are not approved to diagnose HIV but are sometimes used in some circumstances.

Appendix 2: Theoretical risk, population risk & individual risk

This section discuss the differences between individual risk and population risk. Sometimes what is a very small individual risk may still not be acceptable for many people.

It also includes a brief section about how difficult it is to judge risks and how we approach the idea of risk in daily life.

Appendix 3: How HIV tests work

This section describes how HIV tests work in more detail.

Sometimes i-Base is asked technical details and so these might be useful for some people.

This section talks about antigens and antibodies and explains how each of these tests work.

It also explains the differences between Elisa and western blot tests.

It also includes more detailed information and the timing of different stages of early infection and seroconversion.

If you do not have access to the internet please contact i-Base and we can post you a print out of these sections.

Feedback

Your feedback on this guide helps us develop new resources and improve this resource. All comments are really appreciated. Comments can be posted free to:

FREEPOST RSJY-BALK-HGYT, i-Base, 57 Great Suffolk Street, London SE1 0BB.

Or made directly online at: <http://www.surveymonkey.com/s/Z9BP2FY>

1. How easy was the information in this guide to understand?

Too easy Easy Difficult Too difficult

2. How much of the information did you already know?

None A little Most All

3. Did the information help you feel more confident when speaking to your doctor?

Yes, a lot Yes, a little Maybe No

4. Which information did you find most useful?

5. Do you still have questions after reading this guide? Please give examples.

Please include a contact email address if you would like us to reply.

6. Any other comments?

Contact details (if you would like a reply): Name _____

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If you post this form back, please consider filling in the feedback form on the reverse, answers will remain anonymous.

The treatment guides listed below are written in everyday language.
HTB is written in more technical medical language.

Please send me	No. of copies
HIV testing and sexual transmission (<i>this guide</i>)	_____ <input type="checkbox"/>
Introduction to Combination Therapy	_____ <input type="checkbox"/>
Guide to hepatitis C for people living with HIV	_____ <input type="checkbox"/>
HIV, Pregnancy and Women's Health	_____ <input type="checkbox"/>
Guide to Side Effects and Other Complications	_____ <input type="checkbox"/>
Treatment passport (to record your treatment history)	_____ <input type="checkbox"/>
HIV Treatment Bulletin (HTB)	_____ <input type="checkbox"/>

Name

Address

.....

Postcode **Tel**

Email

Further information

If you would like to talk to someone about **HIV treatment** contact the i-Base information service by phone or email.

0808 800 6013

questions@i-Base.org.uk

If you would like to talk about **HIV testing and the risk of transmission** call your local GUM clinic or the Terrence Higgins Trust on 0808 800 1221.

Selected websites

The following websites include information on HIV, safer sex and sexual transmission of HIV.

- MTV online game about HIV status
<http://posornot.com>
- UK site for gay men and men who have sex with men
<http://www.gmfa.org.uk/>
- UK Health information organisations
<http://www.hivscotland.com/>
<http://www.tht.org.uk/>
- US medical site developed for younger people
<http://www.iwannaknow.org>
- Cartoon and animated HIV stories
<http://www.hivnme.com/>
<https://www.livewithit.com>



WWW...

- Information on health and sexuality
<http://www.avert.org/young-gay-sex.htm>
- Sexual health site from Birmingham
<http://www.sexualhealthbirmingham.nhs.uk/>
- Sexual health site for under 20's.
The site now redirects to an NHS site that has more comprehensive information, but is now more boring and text-heavy. Bring back ruthinking!
<http://www.ruthinking.co.uk>

References

Full references for the medical information are available in the online version of this guide.

<http://www.i-Base.info/guides>

Call us on 0808 800 6013

**i-Base Treatment
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**Monday to Wednesday
12 noon to 4pm**



i-Base can also answer your questions by email or online

questions@i-Base.org.uk
www.i-Base.info/questions

Appendices

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HIV testing and risks of sexual transmission

February 2012



HIV i-Base
ISSN 2049-4076
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Watch for out-of-date information

HIV transmission and sexual risk
The window period and when to test
Types of HIV test
Test accuracy and how tests work

Appendices

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It also includes a brief section about how difficult it is to judge risks and how we approach the idea of risk in daily life.

Appendix 3: How HIV tests work

This section describes in more detail about how HIV test work.

Sometimes i-Base gets asked technical details and so these might be useful for some people.

It talks about antigens and antibodies and explains how each of these tests work.

It also explains the differences between Elisa and western blot tests.

This section also includes more detailed information and the timing of different stages of early infection and seroconversion.

If you do not have access to the internet please contact i-Base and we can post you a print out of these sections.

Appendix 1: Different types of HIV test

Different HIV tests work by looking for different things.

- 1) Proteins on the surface of the virus (antigens/Ag) like protein 24 (called p24).
- 2) An immune response to the virus (antibodies/Ab).
- 3) Genetic material from the virus (HIV RNA or DNA).

In this section we describe the main tests.

These are:

- Antigen only (p24 tests). These are rarely used.
- Antibody only tests (Ab). These are rarely used because of more recent availability of joint Ag/Ab tests.
- Combined antibody-antigen tests. These are the most commonly recommended tests in the UK. these test for p24 plus antibodies.
- Viral load tests (RNA PCR test)

More details about how the tests work and the science behind them is included in Appendix 3.

GLOSSARY: antigen (Ag): a foreign substance that generates an immune response antibody (Ab): a type of immune cell first made when your body recognises an antigen.

Antibody tests

The most common HIV test is an antibody test.

Antibodies are part of your immune system that are produced when you come into contact with an infection. Antibody tests look for this immune response.

These tests can be finger-prick tests or use blood samples sent to a laboratory.

If this result is negative or non-reactive, then you are HIV negative.

If the result is positive this does not mean that you definitely have HIV, although it is likely. A small percentage of people can have a 'false-positive' result.

All positive results need to be confirmed by a second test.

In the UK a more sensitive antibody test called a western blot test is usually used to confirm a positive result. The western blot test takes longer (usually a week). It identifies genuine positive results.

HIV antibody tests do not work as soon as you are infected because it usually takes four weeks for your body to generate antibodies to HIV. The time between infection and when your body makes antibodies is called the 'window period'.

Most people generate an antibody response within 4 weeks, but occasionally it can take longer. This is why people are advised to wait three months to take an HIV test, or to re-test three months after an earlier negative result.

Taking an antibody test less than 4 weeks after exposure will not tell you very much.

Combined antibody/antigen tests

It is now common for antibody tests to also test for antigens. These are called 4th generation tests or combined antibody/antigen (Ag/Ab) tests.

In these tests the antigen being tested is a major HIV protein called p24.

p24 (short for protein 24) is produced 2–3 weeks after infection and before antibodies are produced. p24 levels are only detectable for the next 1–2 months. However, by the time the p24 levels have dropped antibodies will be present.

4th generation (Ag/Ab) tests are recommended four weeks after exposure. They give an earlier result than antibody-only tests that are recommended after six weeks.

4th generation tests detect over 95% of infections at four weeks after exposure.

As with antibody only tests, a small percentage of people (less than 5%) may have a delayed response to HIV. So a negative test at four weeks needs to be confirmed after three months.

Viral load (RNA PCR) test

PCR stands for Polymerase Chain Reaction. This test looks directly for HIV in blood. It has the shortest potential window period and can be used from 3 days to 4 weeks after an exposure.

Viral load tests are not recommended for HIV testing except in specific circumstances. This is because they are less accurate. They are also more expensive and take longer to get a result.

After infection, viral load is usually very high within the first 4 weeks and so this test can be used to confirm a suspected early infection if someone has symptoms.

If symptoms are related to HIV, then the viral load test will be positive. HIV symptoms are related to viral load.

However, some people have undetectable viral load without treatment, so a negative result does not guarantee that you do not have the virus.

In adults, viral load tests are only usually offered when there is both:

- i) A recent high risk exposure (ie condom break with a known HIV positive partner who is not on treatment); and
- ii) Symptoms of HIV infection (fever, extreme tiredness, heavy 'flu-like illness etc).

PCR testing for HIV DNA is mainly used for babies born to HIV positive mothers.

As a baby has the mother's antibodies for the first 18 months, antibody testing is not used until a child is two years old.

Which test is which?

Figure 12 lists commonly used HIV tests and shows what type of test they are.

Your testing centre should tell you this information for the test that they use.

Sometimes testing centres give the tests explained above different names like ‘ELISA’ or ‘Western blot’ without explaining what kind of test they are and what it is they are looking for.

ELI, MEIA, ELFA, ECLIA use similar technology to ELISA tests.

UK guidelines recommend using 4th generation tests but 5% of clinics still use 3rd generation tests.

Ask your clinic for more detailed information about the type of test that they use.

Figure 12 - Different types of HIV test

Type of test	What the test look for?		
	RNA/ DNA *	Anti- gen	Anti- body
PCR/viral load	●		
p24 only test (Ag)		●	
4th generation antigen/antibody (Ag/Ab) tests (p24+ ELISA, ELI, MEIA/ELFA/ECLIA): includes Architect, Duo, Combo/Combi etc		●	●
1st/2nd/3rd generation antigen only tests (ELISA, ELI, MEIA/ELFA/ECLIA): includes TriDot etc			●
Rapid tests: finger prick and oral swab test are antibody only: includes OraQuick.			●
Western blot tests look for antibodies to specific HIV proteins. They confirm a positive HIV antibody test result.			●
* Viral genetic material			

When can each test be used?

Viral load can sometimes be detected within a week, p24 on average by day 16 and antibodies by day 25. However, these are average results a lot of people take longer.

A test that misses half of infections is not very useful.

So a 4th generation antigen/antibody test is recommend four weeks after exposure because it will detect 95% of infections.

Validating the timing of viral load (RNA), p24 and antibodies is difficult. Tests can only be checked against blood samples from the same people before and after infection. These are usually people who regularly donate blood (usually twice a week).

Some of these people catch HIV without knowing it. When this picked up in blood screening, these samples are used for testing new HIV tests.

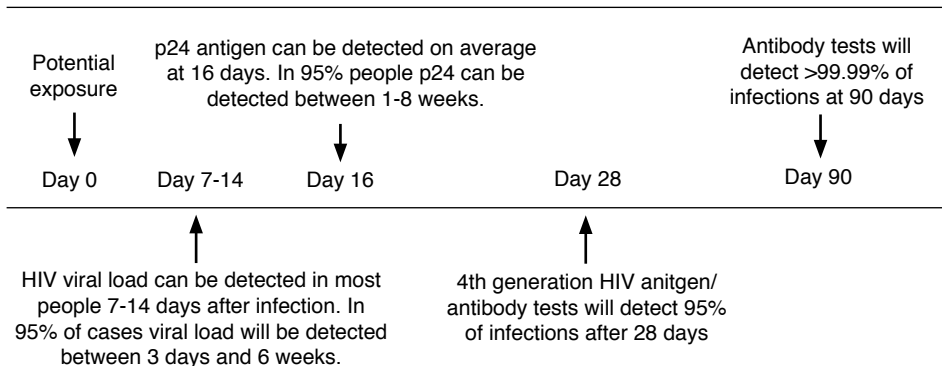
This is why it is impossible to give the percentage chance that a test will be accurate for each day. The tests have been checked on a limited number of samples. These sample reflect the large range of individual responses.

On average, viral load tests (PCR RNA) with a cut-off of 50 copies/mL detect infection about 7 days before a p24 antigen test and 12 days before an antibody test.

These relative times are only used when comparing new tests. They are not good at setting an absolute cut off at 14 days or 19 or 41 days etc.

Figure 13 shows the time ranges after an exposure. Very rarely an antibody response may take longer. Even more rarely (less than 1 in a million) an infection may not make antibodies. These people have positive viral RNA and DNA.

Figure 13 – Average time after exposure to detect HIV antigens and antibodies



Appendix 2: Theoretical risk, population risk & individual risk

Theoretical risk

As HIV can be found all over the body there are instances where in theory there could be a risk of infection but in real life this risk is zero.

The examples on page 21 in the section Ways HIV is NOT transmitted are driven more by an over-active imagination than by real-life risks.

Theoretical risks can never be disproved. It is not possible to prove that something can never happen. So some health information refers to some zero risk activities as low risk.

Estimated population risks?

Guidelines often refer to population risks for different activities. For example, giving oral sex to a man with ejaculation is sometimes referred to as a 0.09% risk (9 in 10,000).

Most of the risk statistics come from population studies that use the following equation to find the percentage risk of transmission:

$$\begin{aligned} \text{Risk of transmission} = \\ \text{risk that source is HIV positive} \\ \times \text{risk of exposure} \end{aligned}$$

This equation should consider both the transmission risk factors discussed earlier and the percentage of people in the population who have HIV.

For example, risks will be higher in a country where 25% of people are HIV positive compared to a country where the less than 1% have HIV.

Population risk vs Individual risk

Population risks are based on many cases where both partners are HIV negative and where the risk is zero.

Using the example above, if out of 10,000 people, nine become positive who only reported oral sex then the population risk (in this population) is 0.09% (9 in 10,000).

But the actual risk for each of those six people at the time they caught HIV was much higher than 0.09%.

Factors including their partner's HIV status, viral load, genetics, STIs, circumcision etc may mean that the risk when the infection occurred may have been 10% or 20% (1 in 10 or 1 in 5).

Someone thinking this is only a 0.06% risk would be wrong. If they had been thinking this might be a 20% risk, they may not have become infected.

This is why population estimates should be used cautiously for personal risk.

HIV transmission is often simplified and these important aspects are missed.

Without this detail, prevention advice only tells half the story.

Too often the detail is left out.

Any risk should be put into context of other factors.

This is especially relevant when you may know very little about your partners health.

What is individual risk of HIV transmission?

Individual risk is very difficult to estimate. For some situations the risk could be much higher. For example, if a negative person is giving a positive person oral sex and the following risk factors were included:

- The HIV positive person has a very high viral load of 10 million copies/mL
- The HIV negative person has poor gum health, or recently brushed their teeth, or eaten a packet or crisps that scratched a gum etc
- The positive person receiving oral sex ejaculates in mouth of his partner

The individual risk here could easily be 90% or 50% or 10% or 1%, it is impossible to say which because this level of detail doesn't exist in any of the studies available.

It will definitely be much higher than the risk of 0.09% estimated and referenced in many guidelines on HIV transmission.

Risks in daily life

Finally, there is probably a reason to talk in general about attitudes to risk in daily life.

Some people choose risks in their daily life that others would find impossible. Many jobs have much higher risks than others.

Sometimes people do things after having considered the risks. Often the risk is assumed to be so low that 'it will never happen to me'.

For others, the personal anxiety and worry about all sorts of risks restricts and limits the activities in their lives.

Most people find a balance. Or we like risks in some areas of our lives but not in others.

Flying in a plane or driving a car are all associated with real risks for some people, but the risk is small enough for most people to still travel.

The Canary Islands and San Francisco are popular holiday destinations despite one being an active volcano and the other being on the San Andreas fault line.

Sexual health risks are different in important ways:

- Condoms can reduce your risk to zero.
- HIV usually takes many years to progress.
- HIV treatment dramatically increases life expectancy to one similar to HIV negative people.

Appendix 3: How HIV tests work

What is an antigen?

An antigen is a substance found on a foreign organism such as a virus or bacteria which, when it gets into the body, stimulates an immune response.

What is an antibody?

An antibody is a certain type of immune cell. In adults it is initially made when your body first recognises an antigen.

Antibodies are 'Y' shaped and the two arms of the 'Y' are known as the variable region. This means it is specifically coded to interact with a certain antigen, just as a key is specific for a lock (see Figure 14).

The stick of the 'Y' is the same in all antibodies (the constant region). It is the variable region (the two arms) that interact with and attach to the antigen.

When the antibody sticks to the antigen it neutralises it so that the foreign organism can no longer enter a human cell or cause harm (see Figure 15).

Once an infectious agent is neutralised it dies.

Figure 14: Diagram of a Y-shaped antibody

The variable region - the antigen binding site (in yellow) and the constant region (in light blue)

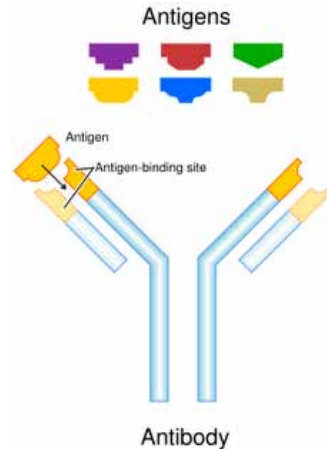
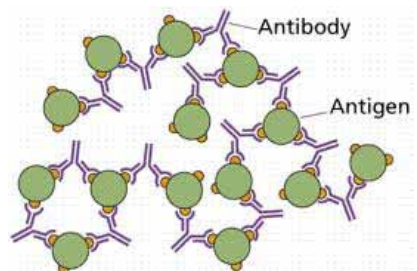


Figure 15: How antibodies and antigens interact

Antibodies neutralising an infectious particle.



How do antibodies and antigens interact?

One way to explain how an antigen and antibody interact is to compare them to a lock and key. The antigen acts like a lock and the antibody like a key. Each key is different for each lock.

As we grow, especially in childhood, we develop a library of millions of different antibodies. This makes up our acquired immune system.

This is a huge reference bank of immune cells that are generally resting or sleeping until they are needed.

Most HIV tests are based around this interaction. On the surface of HIV there are lots of proteins which act as antigens. One of the most common in early infection is called protein 24 (p24).

Antigens for HIV are detectable in most people around 16 days after infection.

Antibodies take longer to produce and are not usually detectable until 4-12 weeks after infection.

How does an ELISA test detect HIV antibodies?

ELISA tests are the standard test for finding out if someone has antibodies to a particular antigen. ELISA stands for enzyme-linked immunosorbent assay.

It is performed in 4 steps as shown in Figure 16.

Rapid tests

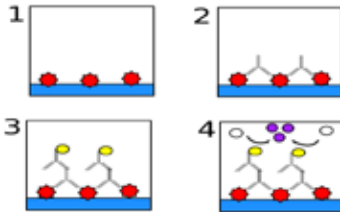
Rapid tests are a simplified version of antibody ELISA tests. They look for HIV antibodies in the blood. The antigens for HIV are fixed on one particular strip along the rapid test stick. Towards the end of the testing stick are control antigens to show that the test worked.

A sample is placed at the end of the testing stick. A chemical, called a buffer, to facilitate the testing process is added.

The chemical causes the antibodies in the blood to flow along the test stick. When they pass over the section with the antigens, if there are any antibodies for HIV present then they will stick to these antigens and change colour.

Once the test is complete, if there is one stripe it means it is a negative result. If there are two stripes then it means it's a positive result. If there are no stripes it means the test did not work properly.

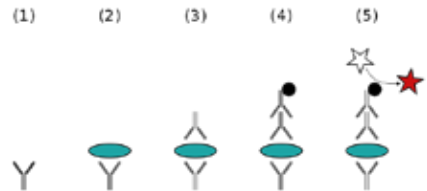
This is illustrated in Figure 9 on page 29.

Figure 16: ELISA antibody detection test

1. HIV p24 antigens are manufactured and attached to the bottom of a plastic testing dish.
2. The dish is then washed with the blood sample. If antibodies (upside-down Y-shapes) for the p24 antigen are present then they attach to the antigens in the dish. This gives an HIV positive result. If antibodies are present the steps 3 and 4 follow. If there are no antibodies, only antigen remains and this is a negative result.
3. Once the antibodies are attached to the p24 antigen, they need to be made visible. To do this the dish is washed with a second 'marker' antibody. The second antibody is specific to all human antibodies. When it comes into contact with a human antibody it will attach itself. This second antibody has an invisible 'marker' attached to the end of it (represented by the black circle)
4. Finally the dish is washed with a dye. Where the second 'marker' antibody is present, the marker (represented by the light circle) will cause the liquid in the dish to change colour (represented by the dark circles). Where there is no 'marker' antibody the liquid will remain clear. This means that any dish that is coloured is a positive result and any dish containing clear liquid is a negative result.

How does an ELISA test detect p24 antigen?

An ELISA to detect antigens is called a sandwich ELISA and works in a similar way (see Figure 17).

Figure 17: ELISA antigen detection test

1. Antibodies for p24 (represented by the Y-shaped picture below the number (1)) are secured to the bottom of a Petri dish.
2. The blood sample is added to the dish and if the sample is HIV positive then the p24 antigen on the surface of HIV (represented by the disc) will attach to the antibodies. If the blood sample is negative then there will be no antigens and the dish remains the same as in number (1)
3. An antibody specific to the p24 antigen is then added to the dish and where the p24 antigen is present it attaches. If there is no p24 antigen present then it washes away
4. Once the antibodies are attached to the p24 antigen, they need to be made visible. To do the dish is washed with a second 'marker' antibody. The second antibody is specific to all human antibodies. When it comes into contact with a human antibody it will attach itself. This second antibody has an invisible 'marker' attached to the end of it (the small dark circle)
5. Finally the dish is washed with a dye. Where the second 'marker' antibody is present, the marker (represented by the black circle) will cause the liquid in the

dish to change colour (represented by the stars). Where there is no 'marker' antibody the liquid will remain clear. This means that any dish that is coloured is a positive result and any dish containing clear liquid is a negative result.

Third generation tests are an ELISA that looks for an antibody alone. Fourth generation tests use both of the above methods to look for both antibodies and antigens.

What does the number after the HIV ELISA test result mean?

Some people are given test results which say something like 'non-reactive (OD: 0.219)'. This number at the end is called the Optical Density (OD) value. This is the measure of how much colour there is in the dish at the end of the ELISA.

As the colour in the dish is an indicator of whether the result is negative or positive these numbers give the result more precisely than just a simple 'positive' or 'negative' answer.

The cut-off values for different tests vary. In general, any numbers below 1.0 mean it's a negative result. Any numbers above 1.0 mean it's a positive result.

The numerical results of HIV tests are not related so if someone has 2 tests and the numbers look like they are increasing it does not mean they are slowly becoming positive. It is just two separate figures.

If someone has an 'inconclusive' test result it is possible that the OD is very close to 1.0 and a confirmatory test will have to be done.

How does a western blot test work?

The western blot, is similar to the ELISA in that it also detects antibodies for HIV. However, it works slightly differently to an ELISA. A western blot works by detecting antibodies to lots of specific proteins (antigens) at the same time.

To do the test, HIV is split into its various component proteins which are all different lengths and thus different weights (measured in kD – kilo Daltons). A blood sample is then mixed with the proteins and any antibodies for HIV in the blood sample attach to the proteins in a similar way to that in the ELISA outlined above. The antibodies present are then tagged using 'marker' antibodies (see ELISA section).

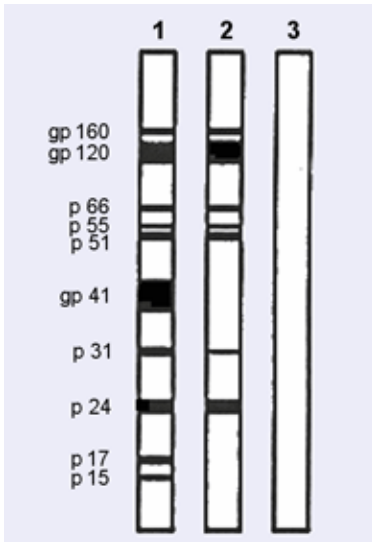
Each sample is then added to a dip made in a special gel. The gel is then plugged into an electric current and the proteins start to move down the gel.

The heavier proteins stop quicker than the lighter ones. The more there are of each protein, the thicker and darker the stripes. The gel is then developed in a similar way to a non-digital photograph to show which proteins are present.

If there are stripes where the HIV proteins should be then the result is positive. If there are no stripes then the result is negative.

The difference between the western blot and the ELISA is that the western blot can identify antibodies for lots of different HIV proteins or antigens at the same time whereas the ELISA will only look for one at a time. As shown in Figure 18 and 19.

Figure 18: A drawing of results of a western blot test



In this case Test 1 is a control as it shows all the proteins tested for are present.

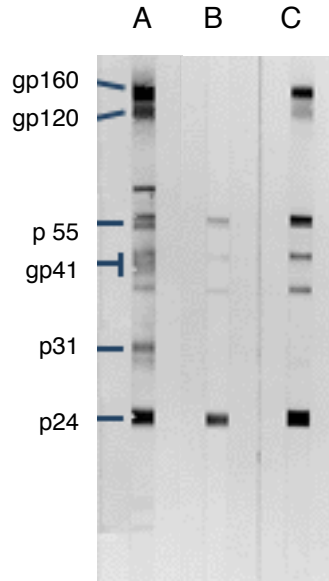
Controls are crucial to make sure that the test is working correctly.

Test 2 is a positive result as it shows there are antibodies for 7 of the HIV proteins.

Test 3 is a negative result.

Figure 19: Western blot test result

In reality a western blot does not look as neat as Figure 18 but looks more like the stripes below.



A - control strip showing antibody responses to key HIV proteins

B - Indeterminate response showing antibodies to p24

C - Positive western blot showing responses to at least three key proteins

PCR tests: DNA and RNA (viral load)

The polymerase chain reaction (PCR) test looks for genetic material from the HIV virus itself.

This genetic material can be RNA (single strand) or DNA (double strand).

RNA and DNA are long chains of chemicals. Different sections of this genetic material are like recipe books for making new virus.

A sample is amplified many times so that there is enough RNA or DNA to be measured.

DNA tests are used for testing babies born to HIV positive mothers and results are positive or negative.

RNA is used for viral load tests for most adult testing, including monitoring HIV positive people before and after treatment.

The PCR test produces a quantifiable result, which means that, as well as a negative/positive result, the amount of virus present in the sample can also be detected.

This result is given as copies per millilitre (copies/mL). The sensitivity of the test is usually 50 copies/mL, below which a result is referred to as undetectable.

How is the accuracy of HIV tests measured?

Accuracy of medical tests are often described in terms of:

Sensitivity - the percentage of the results that will be positive when HIV is present

Specificity - the percentage of the results that will be negative when HIV is not present.

The ideal test would have 100% sensitivity and 100% specificity, but few tests are ever this accurate.

Every diagnostic test has its limitations. On very rare occasions the results can be inconclusive or incorrect.

These are either *false positive* - the test result indicates that HIV is present when it is not or *false negative* - the test result indicates that HIV is absent in an infected person.

A second confirmatory test would eliminate this possibility. False negative and false positive results are discussed earlier in this booklet.

Stages of seroconversion

Stages of seroconversion and primary HIV infection by looking at the time that different HIV tests gave a positive reaction are shown in Figure 20.

Every one has their own immune system and response to infections. This table shows how difficult it is to say exactly when each test is accurate as there is such individual variation.

To help visualise the timeframe for the number of days after infection that each laboratory stage can pick up primary infection see Figure 20.

Figure 20: Stages of seroconversion when different laboratory tests can detect HIV

Stage	Test results +/- (positive/negative)	Timeline duration in days (95% CI *)	
		Individual time	Cumulative time
I	PCR +	5.0 (3.1, 8.1)	5.0 (3.1, 8.1)
II	PCR+ and p24+	5.3 (3.7, 7.7)	10.3 (7.1, 13.5)
III	PCR+, p24+, Ab+ (ELISA)	3.2 (2.1, 4.8)	13.5 (10.0, 17.0)
IV	PCR+, p24+/-, Ab+, WB indeterminate **	5.6 (3.8, 8.1)	19.1 (15.3, 22.9)
V	PCR+, p24+/-, Ab+, WB determined 2 out of 3 of p24, p41, p120; p31-negative	69.5 (39.7, 121.7)	88.6 (47.4, 129.8)
VI	PCR+, p24+/-, Ab+, WB full including p31+	Open-ended	Open-ended

(adapted from Fiebig et al. AIDS 2003).

PCR = viral load; Ab=antibody; Ag=antigen; WB=Western blot.

* CI (Confidence Interval) – this means there is a 95% chance each stage will fall into this timeframe e.g. that stage I will happen between 3.1 and 8.1 days

** Indeterminate means there would be an inconclusive result e.g. there is a strip but it is still too light coloured to be a definite positive (see Western blot section above)

Figure 20: HIV infection, immune responses and window period for different tests

