



# PathWay

THE ROYAL COLLEGE OF PATHOLOGISTS OF AUSTRALASIA



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Issue #019

## In This Issue

- The A, B and C of hepatitis viruses
- You must compare apples with apples when looking at pathology test results
- Drug screening not just the domain of elite athletes
- Antenatal screening tests support women's greatest expectations

## Welcome to the October edition of ePathWay

Life is full of checks and balances and three articles this month are no exception. They include checking the units of measure - and all of the 'other bits' - when researching pathology test results, occupational drug checks that occur in workplaces everywhere, and the checks offered to women during a healthy pregnancy.

The fourth article gives a brief round up of three different hepatitis viruses, known simply as A, B and C, which are still causing grief around the world. One of these viruses has infected two billion people globally and is 50 to 100 times more infectious than Human Immunodeficiency Virus (HIV).

We welcome your feedback about the stories covered in ePathWay, and hope you find it an invaluable way of being kept up to date about pathology in Australasia.

## Interesting Facts

# 600,000

The approximate number of people who die each year due to the consequences of hepatitis B

## The A, B and C of hepatitis viruses

179

The number of countries which vaccinate infants against hepatitis B as part of their vaccination schedules as of July 2011 (compared with just 31 countries in 1992)

350,000

The approximate number of people who die every year from hepatitis C-related liver diseases

Source: World Health Organization



Hepatitis is often lumped together as one disease, yet most infections are caused by three different viruses known simply as hepatitis A (HAV), hepatitis B (HBV) and hepatitis C (HCV). All three have different causes, infection rates and treatment options, two of them have a vaccine and one affects about two billion people globally

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## You must compare apples with apples when looking at pathology test results

When it comes to pathology test results it's important to compare apples with apples. Take cholesterol<sup>[1]</sup>. In Australia and New Zealand it is measured in millimoles per litre (mmol/L), but it is also measured in milligrams per deciliter or 100 ml (mg/dL) in countries such as America. But what if you didn't even notice what unit it was reported in to begin with?



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## Drug screening not just the domain of elite athletes

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The first image that pops into most people's minds when you mention drug screening is elite athletes being tested for illicit performance-enhancing drugs. But more tests to check for performance-destroying drugs take place in workplaces all over Australia and New Zealand every week in the name of workplace safety.



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## Antenatal screening tests support women's greatest expectations

Being pregnant in today's information age has its pros and cons. Information at our fingertips makes research easier but there are also thousands of horror stories on the Internet recording what can go wrong. The real story is that approximately 95 percent of pregnancies progress normally with no complications and there are antenatal screening tests available to monitor the health of both mother and child.



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## Previous Editions



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ISSUE #018

### IN THIS ISSUE

- Experts make their position clear on early detection of diabetes
- Vaccine research coughs up some surprises
- Syphilis is still standing after all these years
- Holy cow! Scientists

## Welcome to the September edition of ePathWay

When it comes to medicine the truth is often stranger than fiction. But it was still a surprise when a cow turned up in New Zealand with an unusual strain of tuberculosis (TB) and an even more unusual source of the infection. A scientist from AgResearch filled us in on this case, and it's an eye opener.

We also take a closer look at syphilis which is springing up again, and report on why research into the current whooping cough

[018 - September 2012](#)

[017 - August 2012](#)

[016 - July 2012](#)

[015 - June 2012](#)

[014 - May 2012](#)

[013 - April 2012](#)

[012 - March 2012](#)

[011 - February 2012](#)

[010 - December 2011/January 2012](#)

[009 - November 2011](#)

[008 - October 2011](#)

[007 - September 2011](#)

[006 - August 2011](#)

[005 - July 2011](#)

[004 - June 2011](#)

[003 - May 2011](#)

[002 - April 2011](#)

[001 - March 2011](#)

[« Back to Home Page](#)

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## The A, B and C of hepatitis viruses



Hepatitis is often lumped together as one disease, yet most infections are caused by three different viruses known simply as hepatitis A (HAV), hepatitis B (HBV) and hepatitis C (HCV). All three have different causes, infection rates and treatment options, two of them have a vaccine and one affects about two billion people globally.

The least troublesome of these viruses is HAV. Dr Gillian Wood, Clinical Microbiologist and Infectious Diseases Physician at Austin Health in Melbourne, says it is normally acquired through ingesting food contaminated with the hepatitis A virus.

“It often causes acute hepatitis which usually resolves itself and the person gets better, but the virus, which is present in a person’s faeces, can be passed on to others if their hands become contaminated after using the toilet.”

Next along in order of impact is HCV which is acquired through direct blood-to-blood contact such as when intravenous needles are shared. This is the most common way it is contracted in Australia and New Zealand.

"It used to be transmitted through blood transfusions and during organ transplantations, but there is now a pathology test for hepatitis C antibodies so this rarely happens anymore," explains Dr Wood.

She says people in poorer countries also contract HCV when vaccination needles and intravenous cannulas are reused, or when surgical instruments are not sterilised properly.

"There are also low levels of the hepatitis C virus in body fluids such as vaginal fluids, semen and saliva. People can become infected during sex, pregnancy and birth, or through living with a hepatitis C carrier, but these risks are very low."

Dr Wood says 20 percent of people infected with HCV clear the virus themselves, while 80 percent go on to have a chronic infection and risk developing chronic active hepatitis, cirrhosis of the liver and hepatocellular carcinoma (HCC). But there is a brighter side.

"Treatments for this virus are continually improving due to improved antiviral drugs. At least 60 percent of people are cured of the virus which stops any liver damage and the risk of hepatocellular carcinoma."

Hepatitis B has the worst reputation of all three viruses for good reasons. It is present in most body fluids in infected people, especially vaginal secretions and semen, and is transmitted to others in the same ways as HCV, but it can also carry a high risk of being passed from mother to baby during pregnancy and birth (known as vertical transmission).

"If a baby contracts hepatitis B from their mother they have a 90 percent chance of becoming chronically infected with no symptoms of acute infections," explains Dr Wood. "This is the way most people become infected in Asia and in the poorer parts of Europe."

If a person acquires HBV as an adult, then Dr Wood says they have a five percent chance of developing chronic hepatitis B and risk developing chronic active hepatitis, cirrhosis of the liver and HCC. There is no curative treatment for this virus either.

"There are antiviral drugs which usually only suppress the virus and minimise the infection and chronic liver damage, but they don't cure it or reduce the risk of developing hepatocellular cancer."

Diagnosis of all three viruses is via a blood test, while two out of the three have a vaccine.

"Hepatitis A and B have a stable outer protein coat which covers the virus," explains Dr Wood. "We inoculate people with parts of this outer coat which creates good antibodies to prevent infection."

To prevent vertical transmission of HBV in Australia and New Zealand, babies are vaccinated at birth against hepatitis B, and then again later in childhood. In cases where the mother is a known carrier of the virus, the baby is also given hepatitis B immunoglobulin to reduce the risk of infection.

Dr Wood says HCV does not have a vaccine because the virus is constantly changing its outer coat making it difficult to extract a stable part to use in a vaccination.

The two hepatitis vaccines are important because the stats on these viruses also paint a sobering picture. About two billion people globally are infected with HBV and it is 50 to 100 times more infectious than Human Immunodeficiency Virus (HIV)<sup>[1]</sup>. HAV infects about 1.4 million people each year, while around 150 million people are chronically infected with HCV. That's a huge impact for viruses simply known as A, B and C.

[1] HIV is covered in [ePathWay Issue #005](#)

[« Back to Home Page](#)



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## You must compare apples with apples when looking at pathology test results



When it comes to pathology test results it's important to compare apples with apples. Take cholesterol<sup>[1]</sup>. In Australia and New Zealand it is measured in millimoles per litre (mmol/L), but it is also measured in milligrams per deciliter or 100 ml (mg/dL) in countries such as America. But what if you didn't even notice what unit it was reported in to begin with?

"No number means anything without a unit," explains Professor Michael Legg from the Centre for Health Informatics and eHealth Research at the University of Wollongong. "It is important that numbers on pathology reports are not separated from the units or the reference intervals related to them."

Prof Legg, who is also a Fellow of the Faculty of Science of the Royal College of Pathologists of Australasia (RCPA), says there are many places where consumers can get tripped up if they are searching the Internet for information about test results.

“They need to be aware that they must keep all the important bits that go with the number including the decimal point, multipliers, units and reference intervals.”

The multipliers are an abbreviated way to write large numbers. For example, instead of writing 1,000,000,000,000 red blood cells per litre, it is abbreviated to  $\times 10^{12}/L$ . The system of measurement will determine the appropriate unit to be used such as molar (mmol/L) or mass (mg/dL), while the reference interval helps with describing what might be expected in a similar group of well people. For example, the reference interval for total cholesterol is recommended by the National Heart Foundation of Australia to be less than 4.0 mmol/L.

Now, let's say a person is told their cholesterol level is 12 – with no unit of measure mentioned - and they are in a high risk category for heart disease. And let's say that person went home and looked up cholesterol levels on the Internet and discovered the optimum goal is to have a cholesterol level less than 150! Eureka! “What was my doctor worried about?”

However, the devil is in the detail. Their level was measured in mmol/L while the level on the Internet site was recorded in mg/dL. They didn't notice this difference in units of measure and celebrated with a hamburger and fries and a cheesecake chaser!

So, why doesn't everyone just report their results with the same units of measure?

“There has historically been tension between our British heritage and the medical research generated by America,” explains Prof Legg. “The weight of research activity influences the units used but it's more complicated than that.”

Within our own coastlines, the Royal College of Pathologists of Australasia (RCPA) began the move to the International System of units (SI) in the early 1970's and a College policy for uniform practice was published in 1986.

“However, often for good reason, not all tests have SI units and not all laboratories report in the same units for tests,” explains Prof Legg. “When patients do their own research on search engines that reach all corners of the globe it gets even more complicated and so they need to be extra vigilant.”

Comparing apples with apples is a good start, but Prof Legg says there are other variables that can change the type of information related to a simple number. Results can differ based on things like gender, time of day, medications and whether a person is fasting or not. There are also technical reasons why some tests can be compared and others can't between laboratories, and why apparently similar tests must have different units. The lab a person goes to can make a difference especially when results are put together as in cumulative results.<sup>[2]</sup>

“Interpreting results is complex but it's important to remember that no number means anything without a unit, and if a person is cutting and pasting results they need to make sure they don't leave any important bits behind,” he says.

Those important bits are the number and its decimal point, the multipliers, units and reference intervals and any comment that might go with the result. And if you take these into account you are on the right track to comparing apples with apples, and it's less likely to all go pear-shaped.

[1] This topic is covered in [ePathWay Issue #006](#)

[2] This topic is covered in [ePathWay Issue #001](#) and in [Pathology - The Facts](#)

[« Back to Home Page](#)

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## Drug screening not just the domain of elite athletes



The first image that pops into most people's minds when you mention drug screening is elite athletes being tested for illicit performance-enhancing drugs. But more tests to check for performance-destroying drugs take place in workplaces all over Australia and New Zealand every week in the name of workplace safety.

"Any company can implement occupational drug screening but you mostly see it in industries with safety risks such as mines, railways and airlines," explains Dr Charles Appleton, Chemical Pathologist at Queensland Medical Laboratory (QML Pathology) in Brisbane. "Having said that, a hairdresser once implemented workplace drug testing after one of her employees cut the top of a client's ear off."

Occupational drug screening involves collecting either a urine or saliva (oral fluid) sample from employees to test for cannabis, opiates (e.g. heroin), cocaine, amphetamines (e.g. speed, ice and some legal prescription drugs) and benzodiazepines<sup>[1]</sup> (e.g. tranquillisers and sleeping pills).

Dr Appleton says the results from these screening tests only provide reassurance they are negative, or give an indication of a

'non-negative' result and which drug group it is from, such as an opiate. The sample must be sent to a pathology lab to confirm the specific drug taken.

"It's dangerous to act on unconfirmed screening tests," explains Dr Appleton. "A non-negative result doesn't mean the person has taken an illicit substance. They might have had a benzodiazepine such as Serepax which was legitimately prescribed, but you don't necessarily want them driving a train either!"

According to Dr Appleton, the process of interpreting and acting on results of occupational drug tests can be a minefield.

"Interpreting the result is not an intuitive process. For example, a person who may have legitimately taken codeine for a headache will show up in a screening test as having taken an opiate. The confirmation test will reveal the presence not only of the codeine but also of morphine which is produced from codeine within the body."

Dr Appleton says about half of all screening programs use occupational health physicians who are medical doctors able to accurately interpret the test results, but the other half send the results to human resources-appointed people who may not have any medical training.

"Correctly interpreting the result is critical and people should ring the pathology laboratory and talk to an expert there if they have an issue with a test result," he advises. "I'd rather spend ten minutes on a call with someone discussing results than spend a lot more time preparing for a court case after they have taken inappropriate action based on one of our results."

There are also different timeframes from use to positive result for each sample type. Urine screens detect substances three to four days after the last drug use, while saliva screens can show positive results for six to eight hours after last drug use. But there are exceptions.

"Heavy long term cannabis and benzodiazepine users may show a positive result in a urine test for a couple of weeks after last use because the drug will be present in their body fat."

And how many non-negative results are there? Dr Appleton says his particular laboratory finds less than one percent of all screens are non-negative with saliva tests, while the number from urine tests varies from industry to industry.

"They can range from 14 percent to as high as 50 percent initially, but then the numbers tend to drop back after a while."

So the next time drug allegations in sport make headlines, think of all the drug tests occurring in the background every week in workplaces to ensure workplace safety. And the ramifications of a non-negative test in the workplace can be far greater than losing medals and accolades, and end in more than tears.

[1] Benzodiazepines are only tested in urine samples.

[« Back to Home Page](#)

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## Antenatal screening tests support women's greatest expectations



Being pregnant in today's information age has its pros and cons. Information at our fingertips makes research easier but there are also thousands of horror stories on the Internet recording what can go wrong. The real story is that approximately 95 percent of pregnancies progress normally with no complications and there are antenatal screening tests available to monitor the health of both mother and child.

Dr Len Moaven, Clinical Microbiologist from Moaven Partners in Sydney, says antenatal checks in the first trimester routinely

include a full blood count to look for specific haemoglobin-related diseases (such as thalassaemia) and iron deficiency, as well as a blood group and antibody screen for rhesus disease<sup>[1]</sup>. Women are also offered a Pap smear<sup>[2]</sup>.

“We also test women for a series of infectious diseases at this time including rubella, hepatitis B, human immunodeficiency virus (HIV)<sup>[3]</sup> and syphilis<sup>[4]</sup>,” explains Dr Moaven. “Women may also be tested for varicella (chickenpox), vitamin D<sup>[5]</sup>, thyroid disorders such as hypothyroidism - which is linked to fetal brain development - and vitamin B12.”

Apart from the Pap smear, all of the above tests involve a simple blood test, while a urine sample is usually requested to check for a urinary tract infection. The treating practitioner may also request a urine sample to test for chlamydia<sup>[6]</sup> which is a sexually transmitted disease linked to trachoma and conjunctivitis in the baby.

The most nail-biting tests occur at around 11 or 12 weeks when screening tests for Down Syndrome<sup>[7]</sup> and other congenital abnormalities are offered.

“The tests for these conditions involve a blood test and an ultrasound, and the results of both are combined to give an indication of risk.”

That’s it for screening tests for healthy uncomplicated pregnancies until about 24 to 28 weeks when women are screened for gestational diabetes. This check is important because between three and eight percent of pregnant women develop this condition. While maternal blood glucose levels usually return to normal after the birth of the baby, there is a known increased risk for type 2 diabetes for the mother in the future.

Dr Moaven says the final check offered before the big event happens around 38 weeks with a swab to check for group B streptococcus.

“Because these bacteria from the gut also colonise the vagina, if the mother is infected with group B streptococcus then the baby gets coated with it during the birth. This leads to an increased risk of infection for the baby.”

For a normal, uncomplicated pregnancy, all of these pathology tests represent a series of checks to ensure the safest outcome possible for mother and baby. And while the Internet may be a pregnant woman’s link to information on pregnancy and birth, when it comes to the horror stories of what can and could go wrong, it’s a good idea to let the pathology tests do the talking. After all, they are intended to support women’s greatest expectations.

[1] Rhesus disease is covered in [ePathWay Issue #009](#).

[2] Pap smears are covered in [ePathWay Issue #008](#).

[3] HIV is covered in [ePathWay Issue #005](#).

[4] Syphilis is covered in [ePathWay Issue #018](#).

[5] Vitamin D is covered in [ePathWay Issue #003](#).

[6] Chlamydia is covered in [ePathWay Issue #004](#).

[7] Down syndrome is covered in [ePathWay Issue #011](#).

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