



**Australian Government**  
**Department of Health and Ageing**



Australia and New Zealand Horizon Scanning Network

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AN INITIATIVE OF THE NATIONAL STATE AND  
TERRITORY GOVERNMENTS OF AUSTRALIA  
AND THE GOVERNMENT OF NEW ZEALAND

# **National Horizon Scanning Unit**

## **Horizon scanning prioritising summary**

**Volume 1, Number 7:**

**Caffeine breath test: Quantitative test of  
hepatic function.**

**November 2003**



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# PRIORITISING SUMMARY

**REGISTER ID:** 0000005

**NAME OF TECHNOLOGY:** CAFFEINE BREATH TEST

**PURPOSE AND TARGET GROUP:** QUANTITATIVE TEST OF HEPATIC FUNCTION

## STAGE OF DEVELOPMENT (IN AUSTRALIA):

- |   |   |
|---|---|
| <input type="checkbox"/> Yet to emerge              | <input type="checkbox"/> Established  |
| <input type="checkbox"/> Experimental               | <input type="checkbox"/> Established <i>but</i> changed indication or modification of technique |
| <input checked="" type="checkbox"/> Investigational | <input type="checkbox"/> Should be taken out of use   |
| <input type="checkbox"/> Nearly established         |   |

## AUSTRALIAN THERAPEUTIC GOODS ADMINISTRATION APPROVAL

- |                              |  |
|------------------------------|--|
| <input type="checkbox"/> Yes | ARTG number  |
| <input type="checkbox"/> No  | <input checked="" type="checkbox"/> Not applicable |

## INTERNATIONAL UTILISATION:

COUNTRY	LEVEL OF USE		
	Trials Underway or Completed	Limited Use	Widely Diffused
Australia, Case control study	✓		

## IMPACT SUMMARY:

Breath tests that utilise carbon labelling of a variety of metabolic markers have been used for many years to investigate liver function. Park et al (2003) have validated a  $^{13}\text{C}$ -Caffeine breath test as a non-invasive, quantitative test of liver function in a case-control study in Australia.

The liver has a number of functions ranging from major roles in metabolism, digestion, detoxification and elimination of substances from the body, therefore there is no single test available that can assess liver function. In the breath test that utilise carbon  $^{13}\text{C}$ -labelled caffeine, a common  $^{12}\text{C}$  atom of a functional group is replaced by the radioactive  $^{13}\text{C}$  isotope. Elimination of caffeine from the body relies on hepatic metabolic capacity. Caffeine undergoes complete absorption and is metabolised entirely by the liver, and as such caffeine has many of the characteristics of an ideal liver test substrate. Prior to a caffeine breath test (CBT), subjects abstain from caffeine products for 24 hours and fast overnight. The  $^{13}\text{C}$ -caffeine is consumed (equivalent to 2 cups of coffee) and breath samples are taken at intervals up to 7 hours. Breath samples are analysed using a isotope ratio mass spectrometer, the same machine used for  $^{13}\text{C}$  breath testing for *Helicobacter pylori*. Samples are stable and may be stored for later analysis.

Park et al (2003) report that cirrhotic patients were characterised by significantly reduced CBT values ( $1.15 \pm 0.75 \Delta\% \text{mg}^{-1}$ ) compared to controls ( $2.23 \pm 0.76$ ;  $p=0.001$ ) and hepatic patients ( $1.83 \pm 1.05$ ;  $p=0.04$ ). Smoking is associated with an increase of CBT, however the CBT was able to distinguish between control, hepatic and cirrhotic smokers ( $5.36 \pm 0.82$ ,  $3.63 \pm 1.21$  and  $2.14 \pm 1.14$ , respectively,  $p=0.001$ ).

The current Medicare Benefits Schedule (MBS) describes a liver function test as one to six of several tests (item numbers 66500-66515).

The number of claims processed by the HIC for MBS item numbers 66500-66515 for the period July 2002 – June 2003 was 10,663,303, with 8,651,787 claims for item 66515 alone (6 or more tests). These figures represent a considerable clinical burden on the Australian health system, with a corresponding cost burden and as such a potentially safe, simple, non-invasive, reliable and single liver function test would be appealing. The cost of <sup>13</sup>C-caffeine is US\$40 for the average subject, however, costs may fall with greater uptake. Cost-effectiveness studies would have to be completed.

#### **CONCLUSION:**

Despite the potential of this technology, currently there is only a single Level III-2 (case-control) study available and it is unlikely that this technology will rapidly diffuse into the Australian health system without further trialling.

#### **HEALTHPACT ACTION:**

Therefore it is recommended that this technology be monitored.

#### **SOURCES OF FURTHER INFORMATION:**

Armuzzi, A., Candelli, M. et al (2002). 'Review article: breath testing for human liver function assessment', *Aliment Pharmacol Ther*, 16 (12), 1977-1996.

Fontana, R. J., Turgeon, D. K. et al (1996). 'The caffeine breath test does not identify patients susceptible to tacrine hepatotoxicity', *Hepatology*, 23 (6), 1429-1435.

Horsmans, Y., De Koninck, X. et al (1995). 'Microsomal function in hepatitis B surface antigen healthy carriers: assessment of cytochrome P450 1A2 activity by the <sup>14</sup>C-caffeine breath test', *Pharmacol Toxicol*, 77 (4), 247-249.

Park, G. J., Katelaris, P. H. et al (2003). 'Validity of the <sup>13</sup>C-caffeine breath test as a noninvasive, quantitative test of liver function', *Hepatology*, 38 (5), 1227-1236.

#### **SEARCH CRITERIA TO BE USED:**

Breath Tests/\*methods

Liver Diseases/\*diagnosis/physiopathology

Liver/\*drug effects/\*metabolism

Liver Function Tests/\*methods

Carbon Isotopes

Microsomes, Liver/physiology