National Horizon Scanning Unit
Horizon scanning prioritising summary

Volume 1, Number 7:

Caffeine breath test: Quantitative test of hepatic function.

November 2003
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):

☐ Yet to emerge  ☐ Established
☐ Experimental  ☐ Established but changed indication or modification of technique
☒ Investigational  ☐ Should be taken out of use
☐ Nearly established

AUSTRALIAN THERAPEUTIC GOODS ADMINISTRATION APPROVAL

☐ Yes  ☐ ARTG number
☐ No  ☒ Not applicable

INTERNATIONAL UTILISATION:

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>LEVEL OF USE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trials Underway or Completed</td>
</tr>
<tr>
<td>Australia, Case control study</td>
<td>✓</td>
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</tbody>
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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 $^{13}$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–labelled caffeine, a common $^{12}$C atom of a functional group is replaced by the radioactive $^{13}$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 $^{13}$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 $^{13}$C breath testing for Heliobacter 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 $^{13}$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:**

**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