13C-Methacetin Breath Test

**13C-Methacetin**

| Molecular weight: 166.19 g/mol | Enrichment: 99% |
| Marked C-atoms: 1 | Dosage: 75 mg |

**Metabolism**

Methacetin is metabolized rapidly in normal subjects, being highly extracted by the liver, implying that the metabolism of methacetin is mainly dependent on the hepatic blood flow and the blood flow is generally decreased in cirrhotic patients. Methacetin undergoes dealkylation by hepatic CYP1A2 to acetaminophen, the methoxy group being eliminated as 13CO2.

Published data of previous studies suggested the Methacetin Breath Test to be a rapid and precise quantitative liver function test without any evidence of toxicities related to the small doses used in contrast to other substrates.

**Applications of 13C-Methacetin Breath Test**

The liver status of patients who have been diagnosed with liver disease can be assessed or monitored non-invasively using the 13C-Methacetin Breath Test:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-alcoholic steatohepatitis (NASH) or alcoholic steatohepatitis (ASH), Fibrosis or Cirrhosis</td>
<td>State of evolution (correlation with Child-Pugh Score)</td>
</tr>
<tr>
<td>Fibrosis or Cirrhosis</td>
<td>State of evolution (correlation with Child-Pugh Score)</td>
</tr>
<tr>
<td>Liver tumor</td>
<td>Hepatic reserve</td>
</tr>
<tr>
<td>Hepatitis B or C</td>
<td>Hepatic reserve</td>
</tr>
<tr>
<td>Long-term medication e.g. anticonvulsants</td>
<td>Monitor hepatotoxicity</td>
</tr>
<tr>
<td>Liver transplant</td>
<td>Liver status of both donor and recipient</td>
</tr>
</tbody>
</table>

**Table 1: Liver diseases assessed by 13C-Methacetin Breath Test**

The patient should be fasting 8 hours prior to the test. Smoking should also be avoided at least one hour prior to the test since that might interfere with the results. In addition oxygen supplementation should be avoided because increased oxygen content in exhaled breath can influence 13CO2 measurement by NDIRS.

**Test Performance Procedure (see IRIS® Operating Manual for additional information).**

1. Collect zero (basal) breath sample as described in manual.
2. Patient takes 13C-Methacetin (75 mg) dissolved in water (100 ml).
3. Collect additional breath samples as shown below (Table 2).
4. Analyze all 10 breath samples with IRIS®-3 or IRIS®-Doc.

<table>
<thead>
<tr>
<th>#1 Bag</th>
<th>#2 Bag</th>
<th>#3 Bag</th>
<th>#4 Bag</th>
<th>#5 Bag</th>
<th>#6 Bag</th>
<th>#7 Bag</th>
<th>#8 Bag</th>
<th>#9 Bag</th>
<th>#10 Bag</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 min</td>
<td>10 min</td>
<td>20 min</td>
<td>30 min</td>
<td>40 min</td>
<td>50 min</td>
<td>60 min</td>
<td>80 min</td>
<td>100 min</td>
<td>120 min</td>
</tr>
</tbody>
</table>

**Table 2: 13C-Methacetin Breath Test Sample Collection**

**Results and interpretation**

In healthy subjects a peak in the exhaled Dose/h of marked CO2 is to expect after 10 to 20 minutes (see Figure 1). About 30% of the administered dose is recovered as 13CO2 after 120 minutes (see Figure 2). In general, the more severe the liver disease, the lower the % cum dose after 120 minutes.
The value of the maximum metabolic rate (dose/h) has shown to be a good quantitative predictor of cirrhosis and fibrosis in chronic hepatitis C (Table 3).

Table 3: Comparison of $^{13}$C-Methacetin Breath Test and Fibroindex as predictors of cirrhosis and fibrosis. (Adapted from Dinesen et al. 17)

The % cumulative dose at 120 minutes has been shown to correlate with different stages of liver disease (Table 4).

Table 4: Correlation of $^{13}$C-Methacetin Breath Test (% cum dose) with stage of liver disease 8

**References**