### Metabolism

1,3-distearyl-2-(carboxyl-\(^{13}\)C)octanoylglycerol, the so-called \(^{13}\)C-Mixed Triglyceride passes the stomach and is digested by lipase activity in the duodenum \(^1\). The two distearyl groups have to be hydrolyzed by pancreatic lipase before absorption and metabolism of the \(^{13}\)C-octanoyl monoglyceride \(^2\). Thus, the oxidation to \(^{13}\)CO\(_2\) is dependent on the rate-limiting step of hydrolysis of the fatty acids in positions 1 and 3 \(^3\).

### Applications of \(^{13}\)C-Mixed Triglyceride Breath Test

The \(^{13}\)C-Mixed Triglyceride Breath Test assesses duodenal pancreatic lipase activity. It is therefore useful for the investigation of severe exocrine pancreatic insufficiency \(^4,5\). If applied under strict conditions even mild to moderate forms can be assessed with high sensitivity and specificity \(^6\).

The patient should have fasted for 10 hours prior to the test. The patient must not drink carbonated water or soft drinks 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 \(^{13}\)CO\(_2\) measurement by NDIRS \(^7\).

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

1. Mix 150 mg of \(^{13}\)C-Mixed Triglyceride with 0.25 g of butter per kg body weight and prepare it with 100 g of bread.
2. Collect zero (basal) breath sample as described in manual.
3. Enter patient height and weight into the IRIS®-3 or IRIS®-Doc Software.
4. Allow the patient to eat the prepared bread.
5. Collect breath samples as shown below (Table 1).
6. Analyze all 13 breath samples with IRIS®-3 or IRIS®-Doc.

### Table 1: \(^{13}\)C-Mixed Triglyceride Test Sample Collection

<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>
<th>#11 Bag</th>
<th>#12 Bag</th>
<th>#13 Bag</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 min</td>
<td>30 min</td>
<td>60 min</td>
<td>90 min</td>
<td>120 min</td>
<td>150 min</td>
<td>180 min</td>
<td>210 min</td>
<td>240 min</td>
<td>270 min</td>
<td>300 min</td>
<td>330 min</td>
<td>360 min</td>
</tr>
</tbody>
</table>

### Results and Interpretation

The pancreatic function is assessed by the 6 hour cumulative \(^{13}\)CO\(_2\) excretion. This can be calculated by the IRIS®-Software, if the correct values for height and weight are entered. Vantrappen \textit{et al.} found normal values to be at 35.6 % ± 2.8 % \(^4\). Another study by Swart \textit{et al.} resulted in a normal value of 33.6 % ± 4.6 % \(^1\). For detection of disease-diminished lipase output Vantrappen \textit{et al.} suggested a cut-off value of 22 % cumulative \CO\(_2\) after 6 hours (sensitivity 0.89, specificity 0.81) \(^4\).

The two figures below show examples of curves for a 5-hour test set-up, taken from Löser \textit{et al.} \(^5\).
As the results are dependent on the test set-up and the population, it is strongly recommended that each laboratory establishes its own reference values.

References