**13C-Sodium-Octanoate and 13C-Octanoic Acid Breath Test**

| 13C-Sodium-Octanoate |  
|----------------------|--
| Molecular weight:    | 167.2 g/mol  
| Enrichment:          | 99 %         
| Labeled C-atoms:     | 1            
| Dosage:              | 100 mg       

<table>
<thead>
<tr>
<th>13C-Octanoic Acid</th>
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| Molecular weight:    | 145.21 g/mol  
| Enrichment:          | 99 %         
| Labeled C-atoms:     | 1            
| Dosage:              | 91 mg (100 µl) |

**Metabolism**

13C-Sodium-octanoate or 13C-Octanoic acid is administered together with solid test meals, to assess the gastric emptying. Labeled octanoic acid is most commonly administered in egg yolk, into which it can be injected before baking. After passing the stomach, it is absorbed in the small intestine and catabolized in the liver. Whilst some of the labeled carbon is incorporated into different metabolic pathways, about 50% enters the body’s bicarbonate pool and is exhaled. As the rate-limiting step in this process is the stomach-emptying rate, this test is a reliable application to assess solid gastric emptying. Whether 13C-sodium-octanoate or 13C-octanoic acid is used is a matter of feasibility.

**Applications of 13C-Sodium-Octanoate Breath Test**

The 13C-Sodium-Octanoate Breath Test is very useful for the investigation of functional dyspepsia and autonomic diabetic neuropathy. Gastroparesis has also been shown to be related to irritable bowel syndrome (IBS) and inflammation of the distal gastrointestinal tract. The patient should have fasted for 10 hours prior to the test. The patient should 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 13CO2 measurement by NDIRS.

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

1. Mix an egg with 100 mg of 13C-sodium-octanoate or inject 91 mg of 13C-octanoic acid into an egg yolk, mix it with egg white and bake. Serve it with 60 g of white bread, 5 g of margarine and 150 ml of water (14 g of protein, 26 g of carbohydrate and 9 g of fat, 250 kcal).
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 patient to eat the prepared egg meal.
5. Collect breath samples as shown below (Table 1).
6. Analyze all 13 breath samples with IRIS®-3 or IRIS®-Doc.

<table>
<thead>
<tr>
<th></th>
<th>#1 Bag</th>
<th>#2 Bag</th>
<th>#3 Bag</th>
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<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>
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<tr>
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<td>15 min</td>
<td>30 min</td>
<td>45 min</td>
<td>60 min</td>
<td>75 min</td>
<td>90 min</td>
<td>105 min</td>
<td>120 min</td>
<td>150 min</td>
<td>180 min</td>
<td>210 min</td>
<td>240 min</td>
<td></td>
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</table>

Table 1: 13C-Sodium-Octanoate Test Sample Collection
Results and interpretation

Gastric emptying parameters are assessed by calculation of the half-emptying time \((T_{\text{lagB}})\) and the lag phase \((T_{\text{lagB}})\) and the gastric emptying coefficient (GEC), which have been introduced and validated against scintigraphy by Ghoos et al.\(^{13}\) This method is still the most frequently applied method, although different analytical methods are currently under validation. These parameters are estimated by non-linear regression analysis directly with the IRIS\(^{®}\)-3 or IRIS\(^{®}\)-Doc Software (please refer to the manual).

Fig. 1: Example of \(^{13}\)C-Sodium-Octanoate gastric emptying breath test, Dose/h curve

As the results are dependent on the test set-up – especially the calories of the provided meal - and the population, it is strongly recommended that each laboratory establishes its own reference values. For solid test meals, Delbende et al. found a cut-off value for \(T_{\text{lagB}}\) of 124 minutes compared to scintigraphy for diagnosis of delayed gastric emptying \(^6\). Normal values calculated and corrected with scintigraphy by Ghoos et al. are for \(T_{\text{lagB}} = 72 \pm 22\) minutes and \(T_{\text{lagB}} = 32 \pm 20\) minutes for a test meal of 250 kcal.\(^{13}\) Delbende and Ghoos adjusted to the scintigraphy by subtraction of 67 minutes and 66 minutes, respectively. Recommended cut-off values for the breath test result are 130 minutes for \(T_{\text{lagB}}\) and 200 minutes for \(T_{\text{lagB}}\) \(^{14}\).

References