

## **Stable isotope laboratory (STABIL)**

The CMRC board has discussed the stable isotope laboratory in terms of **A)** efficiency; **B)** purchase of stable isotopes; **C)** continuation for the next decade; **D)** scientific support

### **A) Efficiency of the stable isotope laboratory**

STABIL has 5 mass-spectrometers and 3 supportive peripherals for infusate and plasma concentration measurements (HPLC, GC and Cobas Fara). Currently, the staff exists of 2 technicians (Nina Pluszek, Carsten Nielsen) and an engineer (Flemming Jessen) and scientist (Gerrit van Hall). It is clear that we cannot make optimal use of the machine capacity without additional analytical support for sample preparation from those performing stable isotope studies. Fortunately, many students and/or technicians from the respective groups have entered the laboratory and have made a great effort to learn the trade. However, there is room for improvement mainly related to the following administrative points:

- 1) If stable isotope or concentration analysis have to be performed you have to come to the STABIL planning meeting (once every two weeks (usually Monday 14:00). Thus far, quite a few appointments have not been kept resulting in substantial efficiency loss. From the planning and efficiency point of view it is advisable to try to analyse samples for weeks in a row and not on and off for a few days.  
In case of absence contact Gerrit van Hall for planning of your samples. In case, you will not use the machine(s) according to planning please contact Gerrit van Hall and Nina Pluszek.
- 2) Before the actual measurements can start a detailed protocol of the study has to be handed in.  
Protocol should contain:
  - A) Scheme of the study protocol with sample points in time, intervention in time.
  - B) Tracer and infusion rates used.
  - C) To be expected concentration of the infusates.
  - D) To be expected concentration of the metabolite (important for a study with intralipid, insulin infusion or food intake).
  - E) List of number of samples and the sample ID's.
- 3) In principle everybody is doing his or her own sample pre-work (derivatisation) (except for pilot studies).
- 4) In case of outside collaboration the CMRC collaborator is responsible for the planning and analysis.
- 5) In case of requirements for new analysis. There should always be somebody of the group for which the new analysis has to be set-up be part, next to Gerrit van Hall and Flemming Jessen.

### **B) Purchase of tracers**

Tracer will be ordered via STABIL, Gerrit van Hall, in order to get the best price. Preferably each group should try to estimate how much will be used for a year so we can order relatively large quantities and get the highest discount. STABIL will order a bit more so we have a small reserve for emergencies.

### **C) Continuation of STABIL for the next decade**

The machines present within STABIL are ageing and in need of substantial repair or have to be replaced over the coming years. Such cost are not foreseen in STABIL budget. Thus far the tracer/concentration analysis have been for free at STABIL. However, in order to raise money for repair/replacement a fee per sample will be asked of Dkr 60 per

tracer/concentration analysis (MS, GC and HPLC), Dkr 20 per breath and blood CO<sub>2</sub> enrichment. Dkr 10 (excluding expense for kits) per sample for Cobas Fara\*.

**D) Scientific support related to stable isotope methodology**

Gerrit van Hall will continue to give advice on a daily basis on stable isotope study design and data evaluation. However, the stable isotope interest group meetings will be discontinued. Instead, a thorough introduction into stable isotope methodology will be provided in the form of a 5 days PhD course. We aim that also master students, involved in stable isotope studies, can attend this course. Possibly a 3 days advanced stable isotope PhD course might be established more focussed on the more special stable isotope usage and scientific interpretation with specialist guest speakers.

\*List of analysis in appendix 1

**Stable Isotope Laboratory determinations 2006**

	<b>Enrichment</b>	<b>Simultaneous concentration</b>	<b>Machine</b>	<b>Seperate Concentration</b>
Amino acids (total)	Yes	Yes	LC-MS	HPLC
Leucine	Yes	Yes	GC-MS	
Phenylalanine	Yes	Yes	GC-MS	
Tyrosine	Yes	Yes	GC-MS	
Lysine	Yes	Yes	GC-MS	
Proline	Yes	Yes	GC-MS	
Alanine	Yes	Yes	GC-MS	
Other amino acids can be easily implemented			GC-MS	
L-Arginine	Yes	Yes	LC-MS	HPLC
L-Citrulline	Yes	Yes	LC-MS	HPLC
Keto-isocaproic acid	Yes	Yes	GC-MS	
Glycerol	Yes	No	GC-MS	Cobas Fara
Glucose	Yes	Yes	LC-MS	Cobas Fara
Acetate	Yes	Yes	GC-MS	
$\beta$ -hydroxybutyrate	Yes	Yes	GC-MS	
Palmitate [U- $^{13}\text{C}$ ]	Yes	No	GC-C-IRMS	GC*
Palmitate [2,2- $^2\text{H}_2$ ]	Yes	Yes	GC-MS	
Lactate	Yes	No	GC-MS	Cobas Fara
Pyruvate	Yes	No	GC-MS	Cobas Fara
[ $^{13}\text{C}$ ]Glucose (incorporation)	Yes	No	GC-C-IRMS	
Intracellular muscle lactate	Yes	No	GC-C-IRMS	
Intracellular muscle pyruvate	Yes	No	GC-C-IRMS	
Muscle protein turnover (Leucine/Proline)	Yes	No	GC-C-IRMS	
Muscle TAG synthesis (palmitate)	Yes	No	GC-C-IRMS	GC*
Muscle palmitate	Yes	No	GC-C-IRMS	GC*
Whole body oxidation (breath $^{13}\text{CO}_2$ )	Yes	No	GC-IRMS	
Tissue oxidation (blood $^{13}\text{CO}_2$ )	Yes	No	GC-IRMS	
Total fatty acid	No			Cobas Fara
Total TAG	No			Cobas Fara
Ammonia	No			Cobas Fara
Creatine	No			Cobas Fara
Phosphocreatine	No			Cobas Fara
Citrate	No			Cobas Fara
Glycogen	No			Cobas Fara
Branched Chain Amino Acids	No			Cobas Fara
Hemoglobine	No			Cobas Fara
HAD	No			Cobas Fara
CS	No			Cobas Fara
LDH	No			Cobas Fara
PFK	No			Cobas Fara
CK	No			Cobas Fara

\*Included in the Dkr60 per sample for enrichment analysis since the same sample is run twice (GC-C-IRMS and GC)