

EQUIPEMENTS AND SERVICES

METABOLIC PHENOTYPING

SERVICES

Isolation of pancreatic islets

Pancreatic islets are isolated by digestion of the pancreas following collagenase injection into the pancreatic canal. Islets are purified by density gradient and hand-picked under a microscope.

Insulin secretion on cell lines, isolated pancreatic islets (static or dynamic in perfusion) and in situ pancreas

These techniques are used to measure insulin secretion in pancreatic beta cells in vitro and ex vivo in response to various secretagogues (glucose, fatty acids, incretins) and/or compounds-drugs.

In vivo carbohydrate homeostasis

Glucose tolerance tests

This test is commonly used to establish glucose tolerance, i.e., the capacity for normalizing a hyperglycaemic episode induced by oral, intraperitoneal or intravenous administration of a glucose bolus in rodents.

Insulin tolerance tests

This test is used in rodents to determine insulin sensitivity. The degree of hypoglycaemia induced by intraperitoneal or intravenous administration of an insulin bolus is an index of insulin sensitivity.

Tolerance tests involve a complex metabolic response implicating among other things insulin secretion and/or insulin sensitivity. When a change in glucose tolerance or insulin sensitivity is suspected using these tests, a quantitative analysis of insulin secretion or insulin sensitivity can be performed using a hyperglycaemic clamp and hyperinsulinemic euglycemic clamp respectively.

Assessment of insulin secretion by hyperglycaemic clamp

The hyperglycaemic clamp makes it possible to assess pancreatic beta cell function, i.e., insulin secretion in response to hyperglycaemia. The clamp is performed on unrestrained, awake animals. A glucose solution is infused at various rates by means of an intravenous catheter to maintain hyperglycaemia at 10, 15 or 20 mM (depending on the study) and monitored on blood samples collected via an arterial catheter. During the test, various blood samples are collected to measure plasma level of insulin and C-peptide over time.

Assessment of insulin sensitivity by hyperinsulinemic euglycemic clamp

The hyperinsulinemic euglycemic clamp makes it possible to quantitatively measure insulin sensitivity in conditions during which glycaemia and hyperinsulinemia are set at constant and measurable levels. The clamp is performed on unrestrained, awake animals. A glucose solution is infused simultaneously with insulin intravenously in order to maintain glycaemia at a target value (depending on the study). The amount of infused glucose needed to maintain glycaemia during hyperinsulinemic condition is a direct measure of insulin sensitivity.

In vivo energy metabolism

Metabolic cages

The Comprehensive Lab Animal Monitoring System (CLAMS) system is used for simultaneous and non-invasive measurement in mice of food intake, water consumption, energy expenditure, respiratory quotient and voluntary locomotor activity. In addition, these parameters can be measured during cold exposure.

Blood chemistry

We provide various dosages for metabolites (glucose, fatty acids and triglycerides), hormones (insulin, C-peptide, GLP-1) and cytokines (leptin, IL1, IL6) from plasma or serum samples.

Experimental models

We provide several models of obesity (high fat diet, obese Zucker rat) and/or diabetes (pancreatectomy, streptozotocin injection, Goto-Kakizaki rat, db/db obese mouse). In addition, a model of chronic glucose and/or lipid systemic infusion is also available.

Example of a study performed by the core facility: <http://www.ncbi.nlm.nih.gov/pubmed/25506550>