Small Animal Glycemic Clamp Core:

Glucose Clamps in the Conscious, Unrestrained Rodent

The Gold Standard for Assessment of Insulin Sensitivity

Initially developed to investigate insulin sensitivity in humans, the hyperinsulinemic-euglycemic clamp procedure has been adapted to other species, such as apes, dogs, rats, and mice. This procedure provides a mechanistic interrogation of insulin action in the intact rodent. Thus, we are able to help you uncover existing pathologies and identify novel therapeutic interventions. During the clamp, hyperinsulinemia is achieved by a constant insulin infusion through an indwelling venous catheter. Blood glucose is measured via an indwelling arterial catheter allowing both infusion and sampling to occur in the conscious, unrestrained rodent with minimal stress. Euglycemia is maintained throughout the study via a concomitant glucose infusion at a variable rate (GIR), and provides the primary measure of whole-body insulin action, as animals with enhanced insulin sensitivity require a greater GIR. The hyperinsulinemic-euglycemic clamp can be conducted as described above (cold) or utilizing radiolabeled tracers ([3-3H]-D-glucose and [14C]-2-Deoxy-D-glucose) to assess tissue-specific glucose uptake, endogenous glucose appearance, and other metabolic parameters.

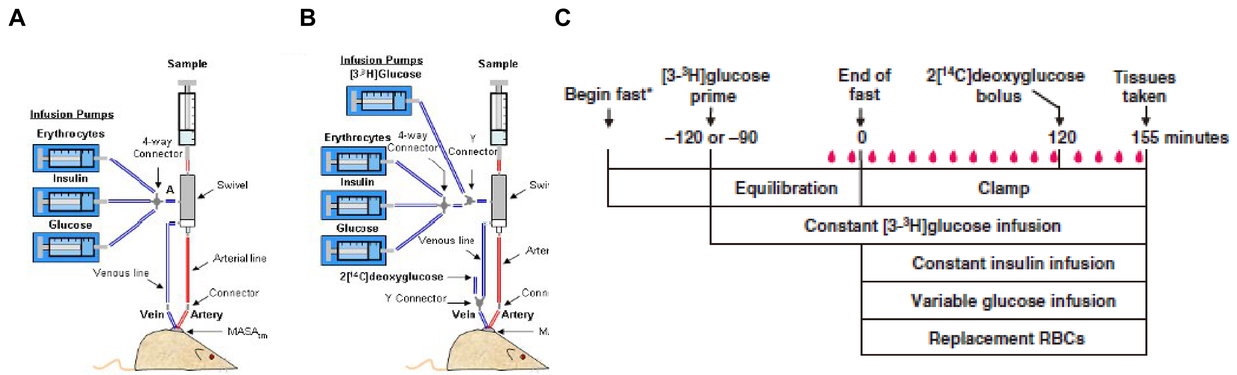

Figure 1. Depiction of the experimental setup for Cold (A) and Tracer-based (B) clamps. Infusion and sampling time-line during a typical glucose clamp experiment.

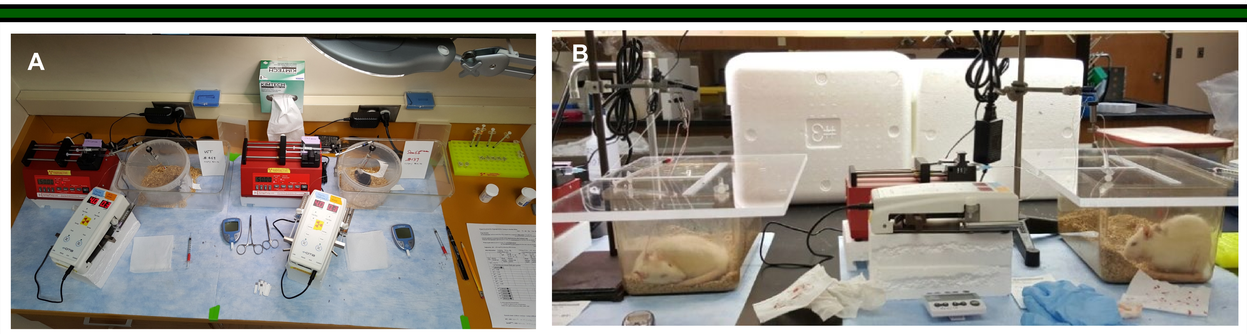

Figure 2. Current experimental setup for glycemic clamping in mice (A) and rats (B).

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Services offered:

- **Indwelling catheter cannulation**
  - Jugular vein (insulin, glucose, tracer infusion)
  - Carotid artery (blood sampling; patent up to 2 weeks)
- **In vivo Glucose-Stimulated Insulin Secretion (GSIS)**
- **Hyperinsulinemic-Euglycemic Clamp / Hypoglycemic Clamp / Hyperglycemic Clamp**
  - Glucose infusion rate (GIR)
  - Glucose disposal rate (Rd)
  - Tissue-specific (2-Deoxy-D-glucose) uptake (Rg)
  - Hepatic glucose production (Endo Ra)
  - Glycolysis and lipid synthesis
  - Tissue-specific Glycogen synthesis
  - Plasma insulin and NEFA (basal vs. clamped)
  - Insulin signaling Western Blot from tissues snap-frozen at clamp termination
- **Primary cell isolation from mouse tissues**
  - Hepatocyte
  - Adipocyte

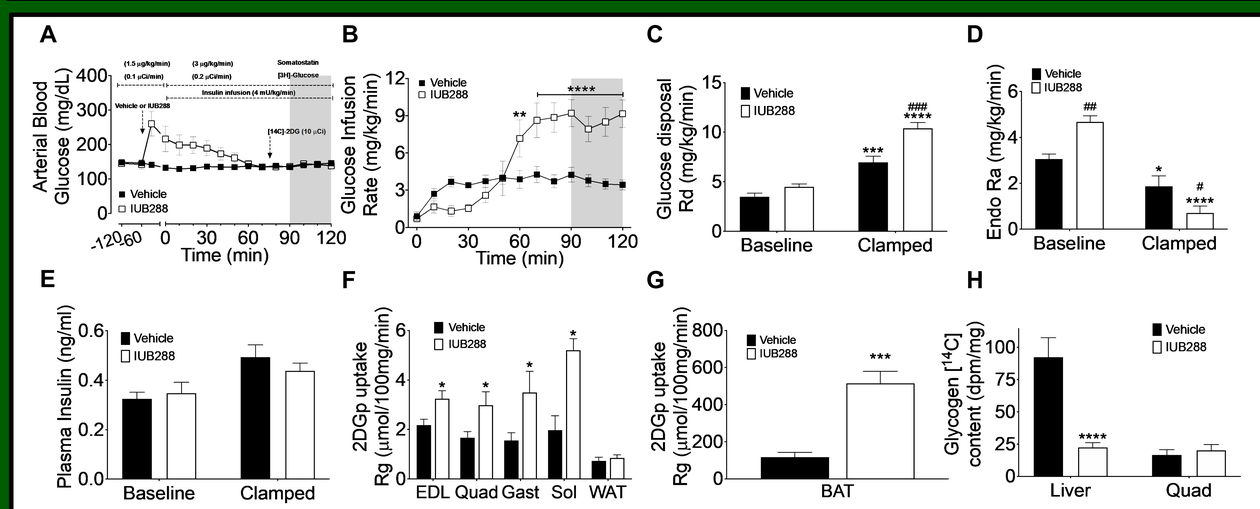

Figure 3. Blood glucose (A), GIR (B), glucose disposal (C), endogenous glucose production (D), plasma insulin (E), glucose uptake (F-G), and glycogen (H). Representative data from tracer-based hyperinsulinemic-euglycemic clamp with somatostatin-blockade of endogenous insulin secretion (Kim et al. *Diabetes* 2018).

References

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