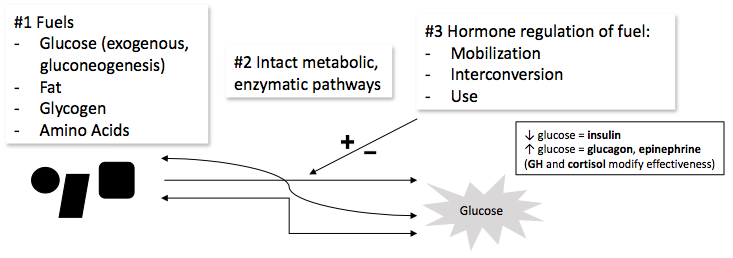
**Pediatric Hypoglycemia**

* **Definition:** Hypoglycemia diagnosis is based on plasma glucose (PG) values and never by point of care (POC) values
  + Common in the newborn period (premature, IUGR, sepsis/asphyxia, high basal needs)
  + Transitional hypoglycemia – 30% healthy infants with PG <50 mg/dL in first 24 hours of life
    - >24 hours of life, PG should be >50 mg/dL
  + Beyond 48 hours of life, normal PG concentrations are the same as older children/adults
    - In general, PG >60-70 mg/dL is normal, <50 mg/dL is hypoglycemia
* **Normal Physiology**:
  + Brain needs continuous supply of glucose (prevents long-term neurologic sequelae, psychomotor retardation, seizures)
  + If glucose unavailable, brain uses ketones (β-hydroxybutyrate, acetoacetate) from fatty acid oxidation as fuel
  + To maintain normal plasma glucose during fasting requires 3 things:



* **Clinical Manifestations of Hypoglycemia**
  + Autonomic
    - Sweating, hunger, paresthesias, tremors, pallor, anxiety, nausea, palpitations
  + Neuroglycopenic (varies according to age)
    - Warmth, fatigue, weakness, dizziness, headache, inability to concentrate, blurred speech, difficulty speaking, confusion, bizarre behavior, lack of coordination, difficulty walking, coma, seizures
* **Differential diagnosis**:
  + Are ketones present in response to hypoglycemia?

|  |  |
| --- | --- |
| Hypoglycemia without ketosis | Hypoglycemia with ketosis |
| Hyperinsulinism (e.g. IDM, congenital hyperinsulinism, transient hyperinsulinism, Beckwith-Wiedemann syndrome, factitious) | Cortisol/ACTH deficiency |
| Defects in fatty acid oxidation / ketone synthesis | Growth hormone deficiency / hypopituitarism |
|  | Disorders of carbohydrate metabolism (e.g. Glycogen storage diseases, Disorders of gluconeogenesis) |
| Disorders of protein metabolism |
| Ingestions (ethanol, salicylates, beta-blockers, quinine, sulfonylureas) |
| Prolonged starvation |
| Increased glucose consumption (sepsis, organ failure) |
| Reactive hypoglycemia (mismatch of insulin secretion to carbohydrate consumption) |
| Ketotic hypoglycemia (otherwise healthy children with repeated AM hypoglycemia and ketosis) |
| Low glycogen stores - Small for gestational age (SGA), prematurity |

* **Evaluation**:
  + History
    - Birth details (weight, GA, maternal health/meds), symptoms of hypoglycemia, age of onset of symptoms, jaundice, association with feeding, potential drug exposures, unusual odors, recurrent “pneumonia” (metabolic acidosis)
  + Physical Exam
    - Stature, microphallus, midline defects, liver size, skin pigmentation, macrosomia, odor, hyperventilation, heart gallop or cardiomyopathy
  + **Critical labs** (drawn when any glucose <50 mg/dL, and prior to treatment with dextrose)
    - Repeat *plasma* glucose (confirm hypoglycemia). Insulin, c-peptide, pro-insulin.
    - Ketones (β-hydroxybutyrate in plasma, urinalysis). Growth hormone. Cortisol.
    - Metabolic work-up guided by metabolic experts.
  + Glucagon challenge
    - During hypoglycemia, injection of 1 mg glucagon IV followed by large increase in plasma glucose suggests hyperinsulinism as cause of hypoglycemia.
  + Clues towards hyperinsulinism:
    - Hyperinsulinemia (plasma insulin >2 uU/mL when PG < 50 mg/dL) if sensitive insulin assay.
    - Otherwise, look for evidence of inappropriate insulin effects - hypoketonemia, glycemic response to glucagon challenge, hypo-free fatty acidemia.
* **References**:

1. Sperling, Mark A. Pediatric Endocrinology 4th Edition.
2. Pediatric Endocrinology, Fifth Edition Volume 2. Lifshitz.