


Neuroendocrine challenges following hemispherectomy



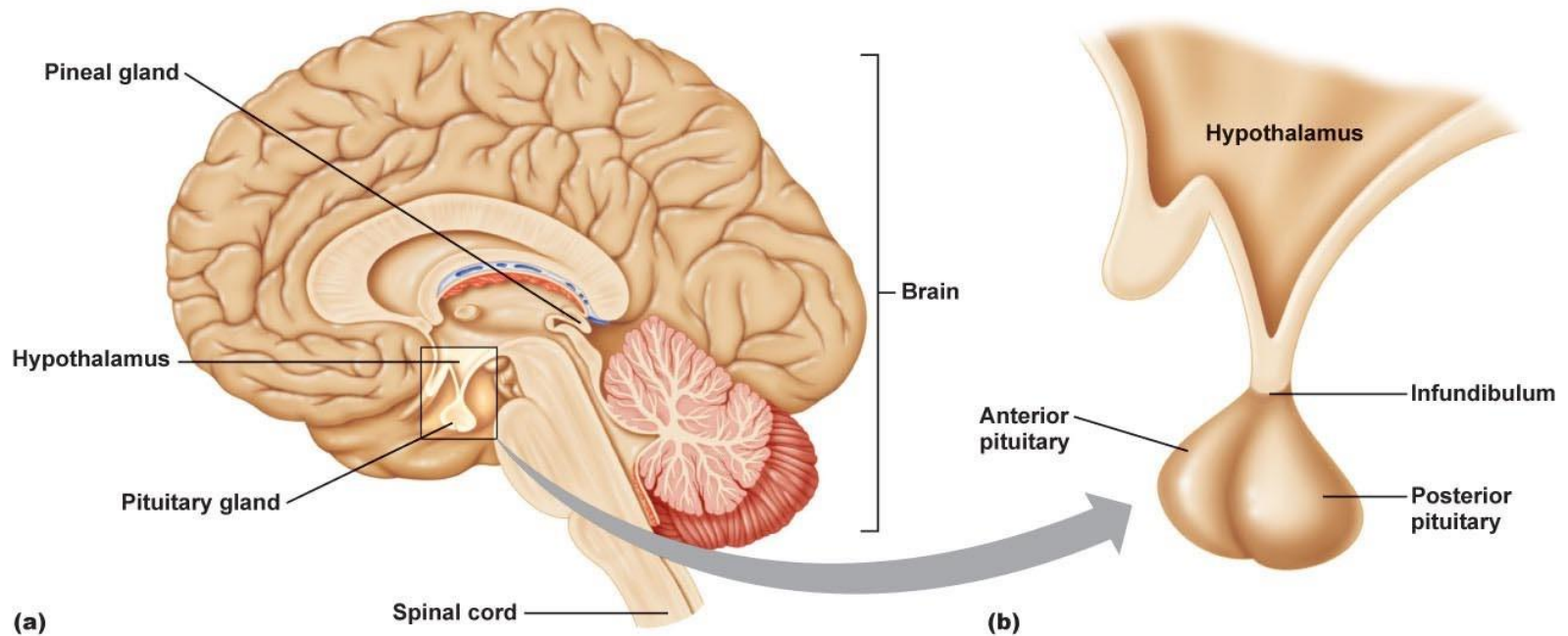
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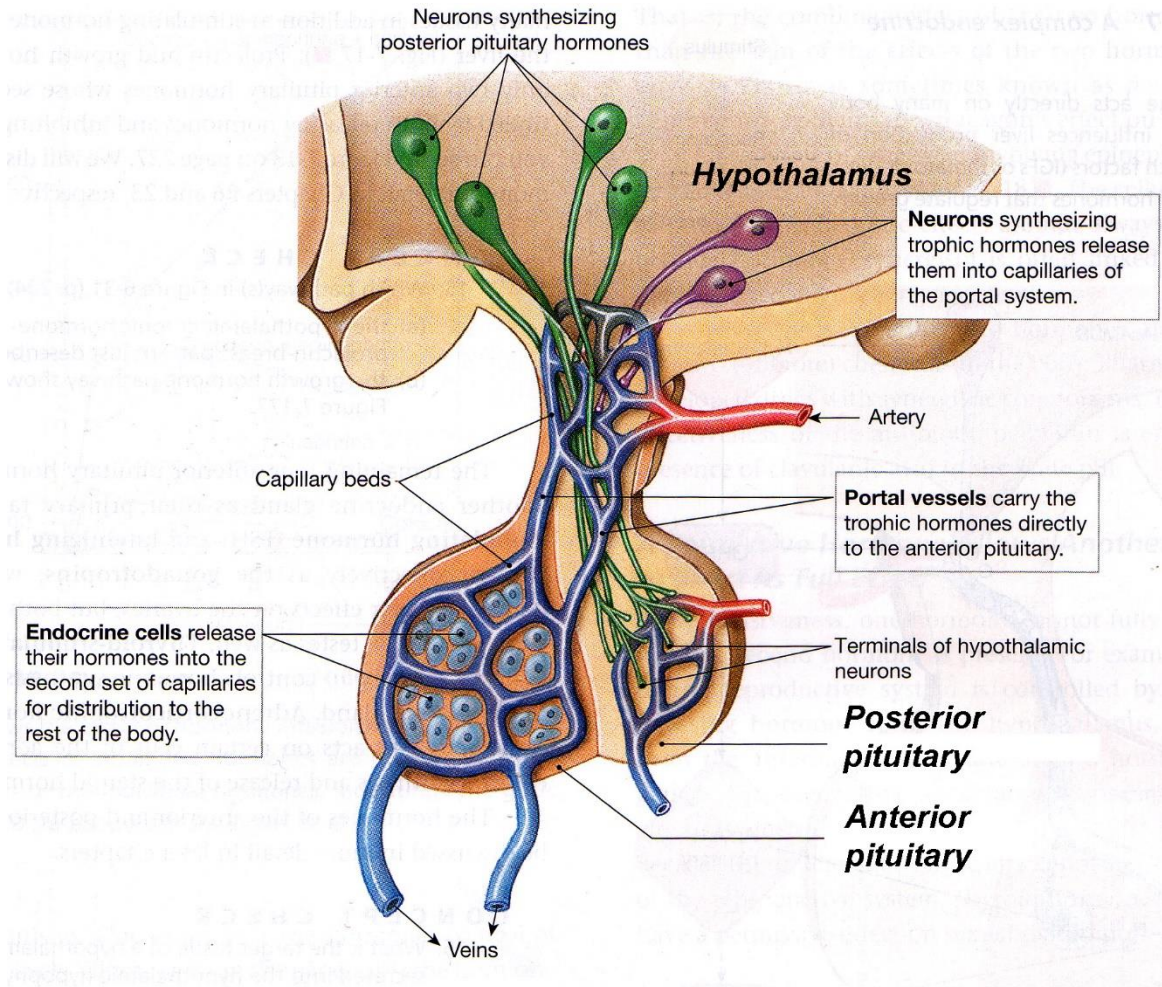
I am unable to find published information on the prevalence of endocrine problems following hemispherectomy except for single case studies

The following is based on limited experience and consideration of potential problems – mostly based on hydrocephalus in other circumstances

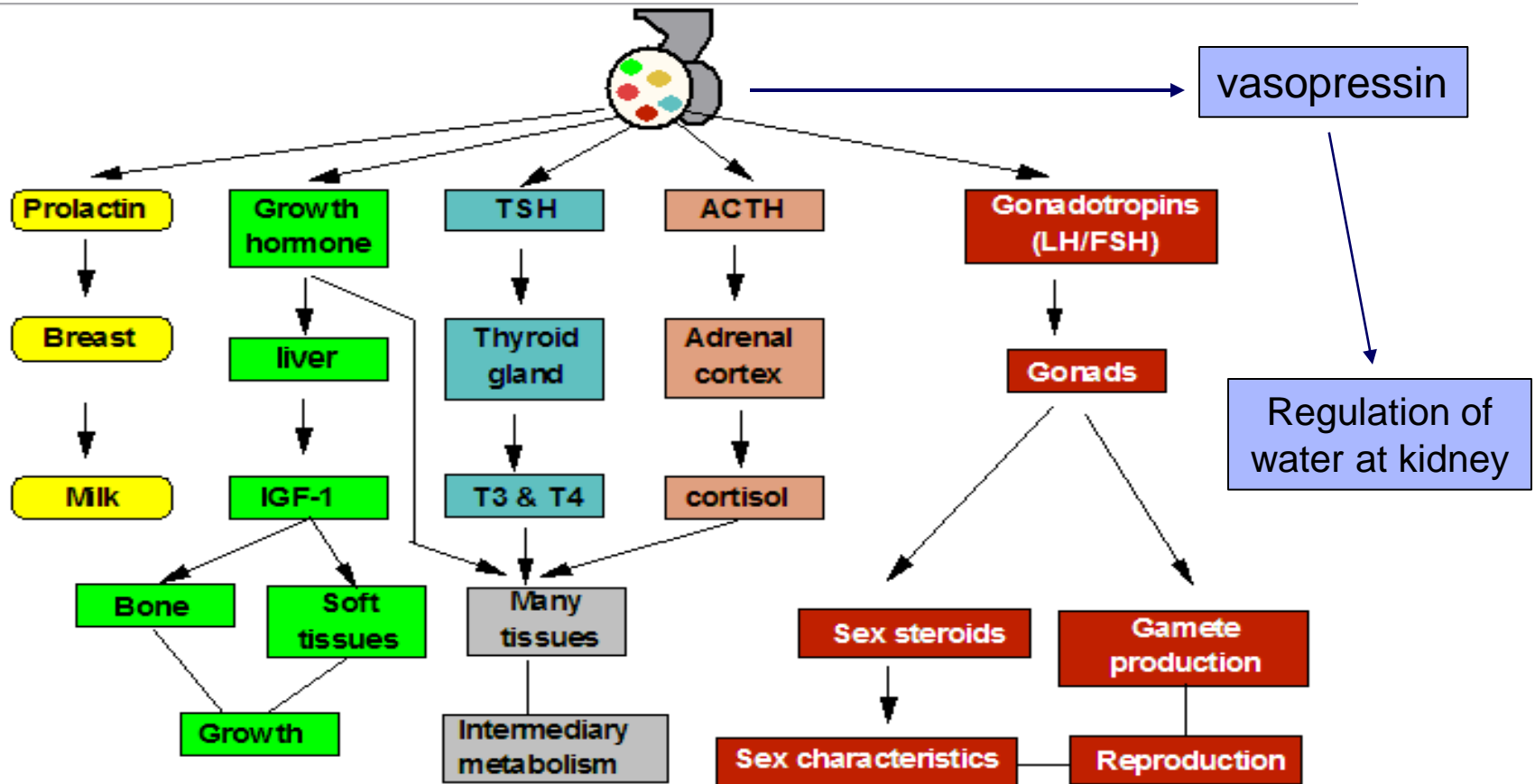
Location of the hypothalamus and pituitary



Hypothalamus and pituitary



Pituitary Hormones



Potential Endocrine effects of neurosurgical intervention and/or hydrocephalus

■ Immediate

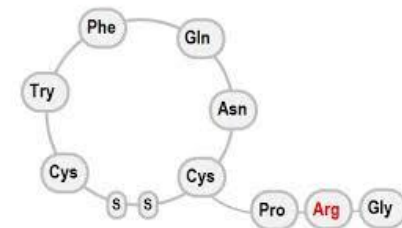
- Dysregulation of water balance
 - Diabetes insipidus/Inappropriate ADH excretion
 - Thirst dysregulation
- Hypothyroidism
- Adrenal insufficiency

■ Chronic

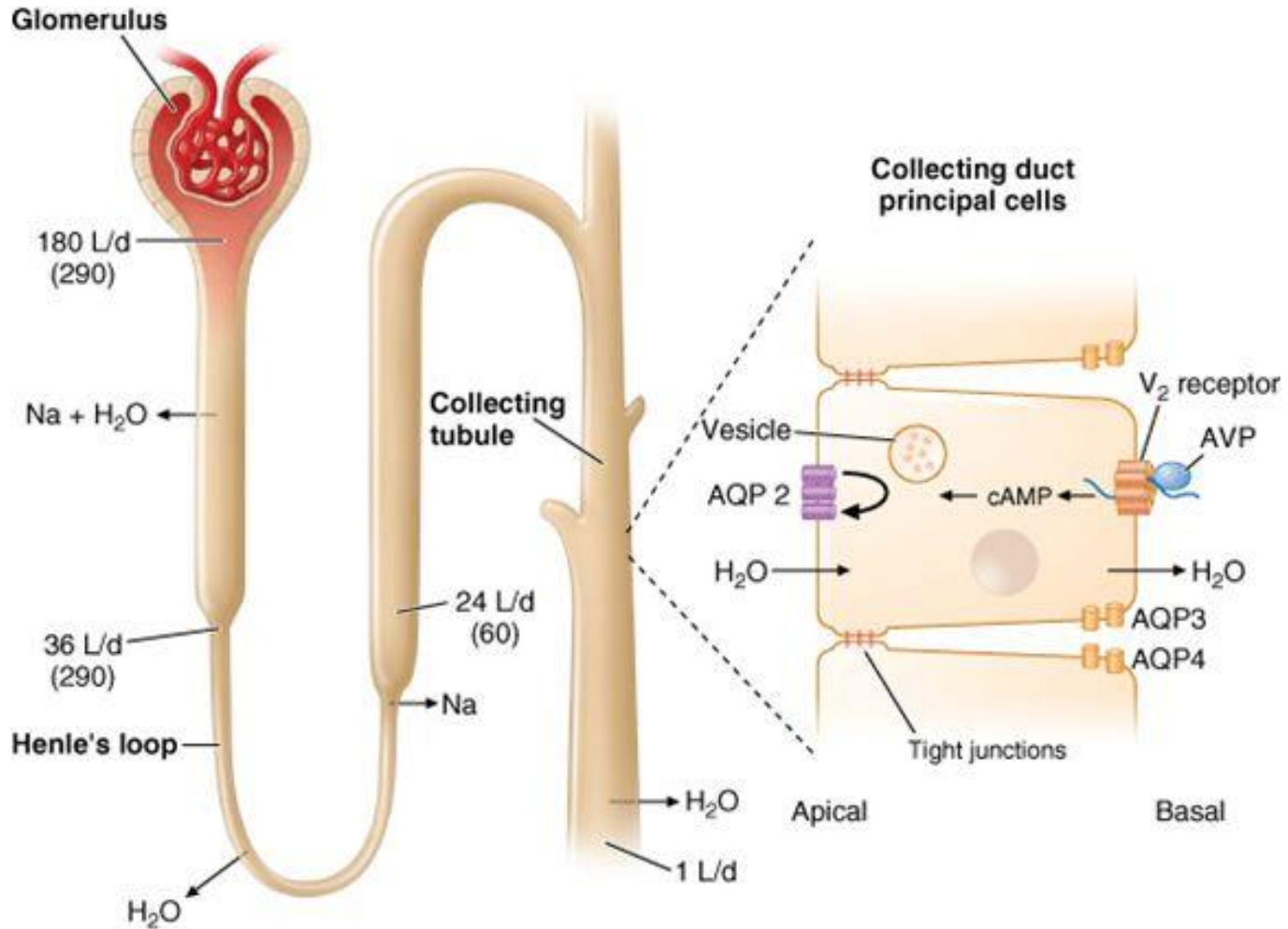
- growth hormone deficiency
- Premature/precocious puberty
- hypogonadism
- Other hypothalamic abnormalities
 - Appetite dysregulation
 - Temperature dysregulation

Diabetes Insipidus

- Deficiency of arginine vasopressin (AVP; anti-diuretic hormone)
 - Synthesized in the hypothalamus and transported to the pituitary through stalk
 - Subject to disruption
- AVP released in response to
 - Decreased blood volume (more important)
 - Increased blood concentration (less important)
- AVP
 - Promotes insertion of water channels (aquaporin) into collecting duct of kidney
 - Increases thirst



Vasopressin action



Diabetes Insipidus



- What does DI look like?
 - Excessive urinating
 - Excessive thirst
 - Normal to mildly elevated serum sodium (a sign of decreased volume) and blood concentration
 - Moderate to severe elevations if inadequate fluid provided

Diabetes Insipidus



- After neurosurgery or hydrocephalus, water regulation
 - Requires careful observation of urine output
 - May be variable and changeable!
 - Requires ongoing re-assessment
 - Immediate: risk for post-operative triple-response
 - Chronic: water balance and thirst dysregulation

The Triple Response



- Immediate diabetes insipidus
 - May last 24-48 hours and resolve, turn into excessive secretion, or be permanent
 - Diagnosis
 - Increased urine output
 - Rising serum sodium with dilute urine
 - Treatment
 - Increase fluid
 - Hyperglycemia
 - Nursing problems with fluid volumes and urine output
 - Pharmacologic intervention – vasopressin, desmopressin, thiazide diuretic

The Triple Response



- Unregulated AVP secretion (SIADH)
 - Occurs following period of DI –
 - Reflecting damage and release of pre-formed AVP?
 - What does it look like?
 - Decreased urine output with concentrated urine
 - Falling serum sodium
 - Treatment
 - Fluid restriction
 - Other
 - Salt, increased protein, Urea, mannitol, “vaptans”

The Triple Response



- Longer-term diabetes insipidus
 - follows period of excess ADH or reflects continuation of immediate DI
 - Diagnosis
 - Rising urine output
 - Rising serum sodium
 - Low urine specific gravity
 - Treatment
 - Increased fluids
 - pharmacology

Diabetes Insipidus



- Use of medications is recommended for
 - Easing of nursing – large fluid volumes may be needed
 - Hyperglycemia from large volumes of glucose containing fluids
 - Patient comfort
 - A child with DI who is drinking freely may not have an elevated serum sodium but may be miserable due to need to urinate frequently.

Medications



- Aqueous pitressin – Native AVP
 - Short-acting
 - Constant infusion vs. injection
 - Increases BP
- dDAVP (desmopressin) - modified AVP
 - No BP effect
 - Long-acting
 - Oral, injection, nasal
- Thiazide diuretic

Initial Medication



- Non-alert/non-drinking/IV fluids
 - short - acting pitressin
 - dDAVP and IV fluids are a bad combination – we inevitably screw up – and there is substantial risk for severely low sodium
- Alert/drinking/intact thirst
 - DDAVP
 - If the child has normal thirst and access to water, he/she will regulate better than we can
 - risk for low or high sodium if thirst is not reliable

Chronic management



- DDAVP – oral, nasal
 - Response is highly variable and every child needs dose finding
- DI may be complicated by abnormal thirst - management of fluid intake
 - Hypodipsic
 - Polydipsic
- Water balance may be variable and unpredictable requiring attentive monitoring for changes
- Thiazide diuretics preferred for children receiving the majority of their nutrition as liquid –
 - infants, g-tube dependency

Pituitary Hormones



Pubertal abnormalities



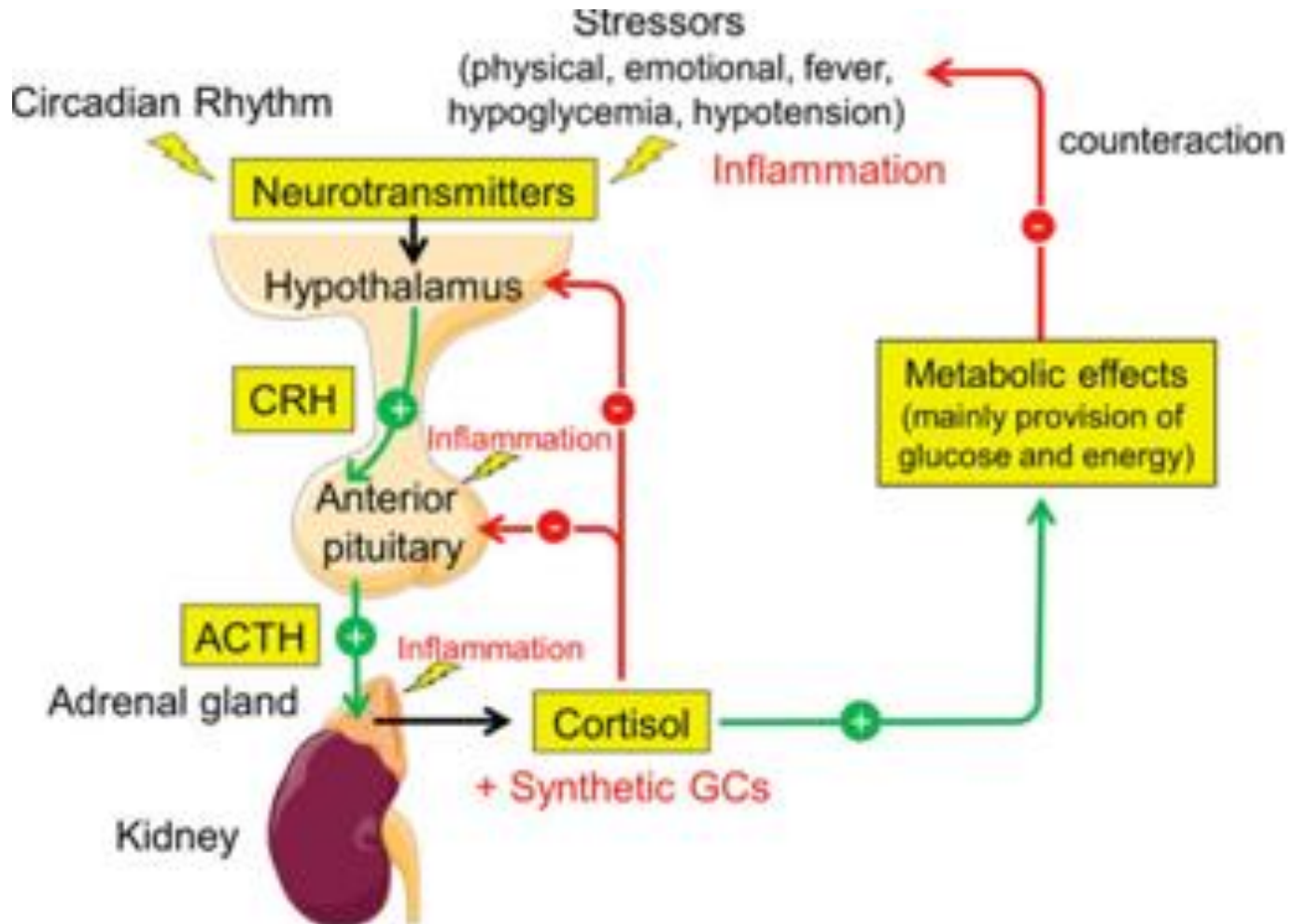
- Secondary (hypothalamus/pituitary) hypogonadism
 - delayed or arrested puberty
 - menstrual irregularities – early or late onset
- Premature/precocious puberty
 - mechanism unknown
 - Early hypothalamic activation?
 - loss of inhibition from higher centers?

Treatment



- Early puberty
 - Needs careful monitoring for loss of adult height potential
 - May need evaluation for GH deficiency
 - GnRH agonist therapy for height or emotional indications
 - Lupron, suprellin
- Delayed puberty or hypogonadism
 - Estrogen/testosterone replacement therapy
 - Treatment important for muscle and bone development in adulthood

Hypothalamus-pituitary- adrenal axis



Adrenal insufficiency



- Prevalence of adrenal insufficiency following hemispherectomy is unknown but is increased with hydrocephalus
- Symptoms
 - Acute – low blood pressure, low blood sugar, shock
 - Chronic –reduced energy, appetite, stamina, low blood sugar
- Diagnosis can be challenging and requires consultation with an endocrinologist
- Treatment
 - hydrocortisone
 - decadron post-operative will provide for any possible cortisol need

Growth impairment



- Potential causes
 - Hypothyroidism – serum testing
 - GH deficiency – monitoring of growth
 - pubertal abnormalities

Thank you for your attention

