

## بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

الرَّحْمَنُ (١) عَلَّمَ الْقُرْآنَ (٢) خَلَقَ الْإِنْسَانَ (٣) عَلَّمَهُ الْبَيَانَ (٤)

الشَّمْسُ وَالْقَمَرُ بِحُسْبَانٍ (٥) وَالنَّجْمُ وَالشَّجَرُ يَسْجُدَانِ (٦) وَالسَّمَاءَ

رَفَعَهَا وَوَضَعَ الْمِيزَانَ (٧) أَلَّا تَطْغَوْا فِي الْمِيزَانِ (٨) وَأَقِيمُوا الْوَزْنَ

بِالْقِسْطِ وَلَا تُخْسِرُوا الْمِيزَانَ (٩)



الآيات الكريمة تبين سنه الله في خلقه وعلى ضوءها  
نفهم عمل الغدد الصماء وإفراز الهرمونات  
بطريقة منضبطة للغاية وحسب ميزان شديد  
الدقه وماذا يحدث لو اختل هذا الميزان

# **Regulation of Endocrine functions**

**(orchestrated inter play between )**

**(Hormones and Metabolic Balance )**

# I Neuro – Endocrine Control

## 1) Hypothalamic Hormones



### Long feed Back loops

$\uparrow T_3 \rightarrow TRH, TSH \downarrow$

$\downarrow T_3 \rightarrow TRH, TSH \uparrow$

### Short feed Back loops (tight control)

$TRH \uparrow \rightarrow TSH \uparrow$

$TSH \uparrow \rightarrow TRH \downarrow$

\* Failure of feed Back Mechanism  $\rightarrow$  escape from hypothalamic pituitary control

non suppressible thyroid gland  $\rightarrow$  graves disease or autonomus thyroid nodules

autonomous target organ function

## **(2) Pulsatile Nature of Hormone Secretion (Hormonal Rhythm )**

(output of feedback → 2 variables (amplitude & frequency of pulse

Somatotropin Releasing Hormone (SRH)  $\rightleftharpoons$  GH

Pulsatile secretion

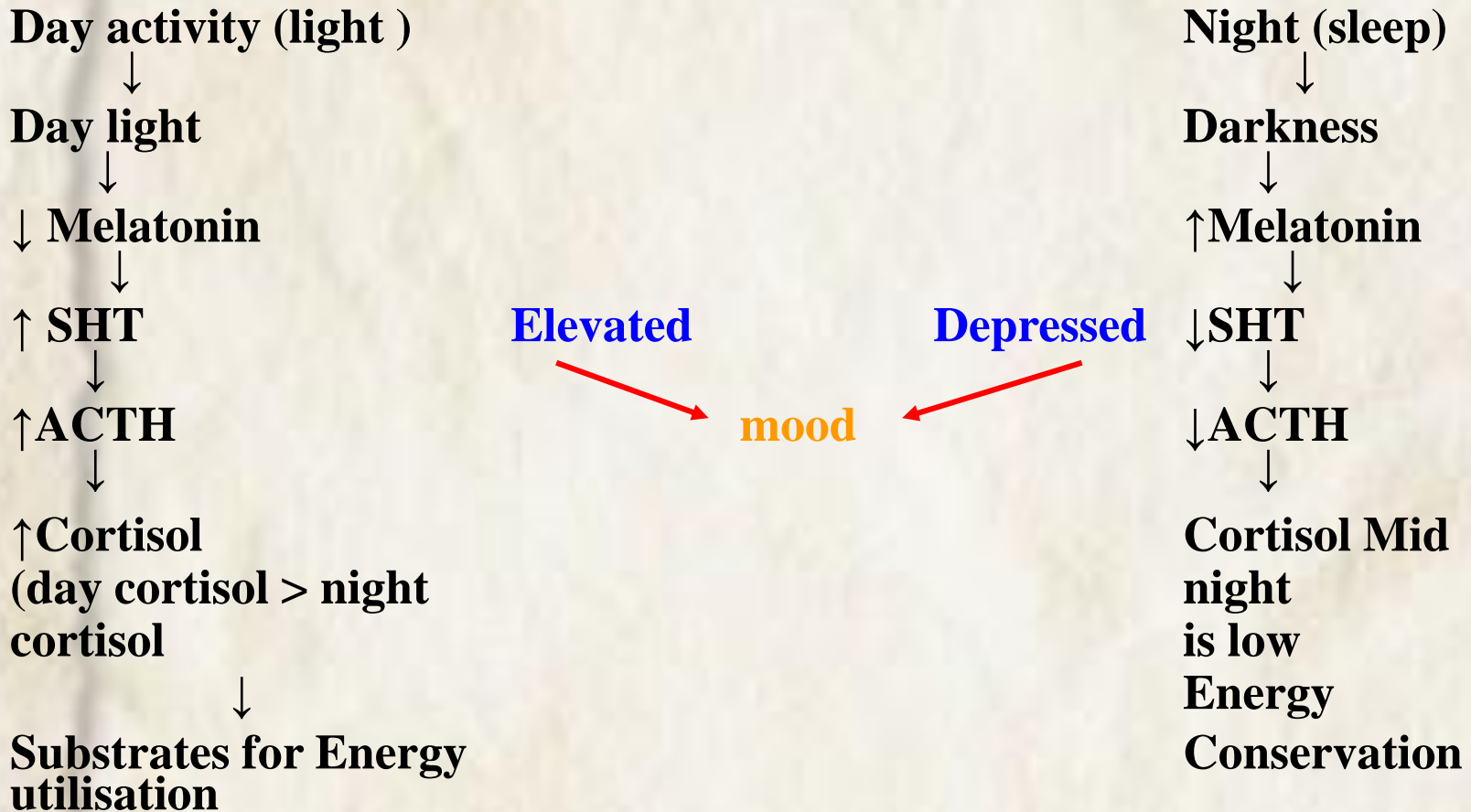
★ Neuroendocrine dysfunction

Dysrhythmia of pulsatile Nature

Of GH → Dwarfism

Pica gm –  $1/1000-000,000,000 = 1$  part /trillion of gm

# (3) Circadian Rythm Day – night activity cycle



## (4) Day and night Activity cycles are controlled by day light and darkness

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قُلْ أَرَأَيْتُمْ إِنْ جَعَلَ اللَّهُ عَلَيْكُمُ اللَّيْلَ سَرْمَدًا إِلَى يَوْمِ الْقِيَامَةِ مَنْ إِلَهُ غَيْرُ اللَّهِ يَأْتِيكُمُ

بِضِيَاءٍ أَفَلَا تَسْمَعُونَ سورة القصص آية رقم ٧١

**Sleep deprivation** : extreme fatigue

→ +++ catechol amines (orbelli phenomenon) → Reversible

Hypertension and insulin resistance

Extreme fatigue → Nervous break down



## 5) Input of peripheral Neurogenic impulses

Distension of stomach  $\xrightarrow{\text{Vagus}}$  ghrelin

Empty stomach  $\xrightarrow{\text{Vagus}}$  orexin

Dorsal vagal nucleus and tractus solitarius , Arcuate Nucleus

★ Maintain energy balance prevents morbid obesity and cachexia



## 6) Autonomic Influences

Vagus → ↑ insulin

Sympathetic → ↓ insulin

control insulin secretion in  
Non fed state

autonomic neuropathy → Masked life threatening

fasting → Hypoglycaemia

## II Paracrine Action

Hormones released from one cell act on Adjacent cell

$\beta$ cells

$\alpha$  cells

(islet cells of pancreas)

Insulin  $\uparrow$

glucagon  $\downarrow$

Insulin  $\downarrow$

glucagon  $\uparrow$

Maintains Normal blood glucose

★ Pibrocystic disease of pancreas – chronic pancreatitis

→ brittle diabetes and serious hypoglycaemic reactions

### **III autocrine Action**

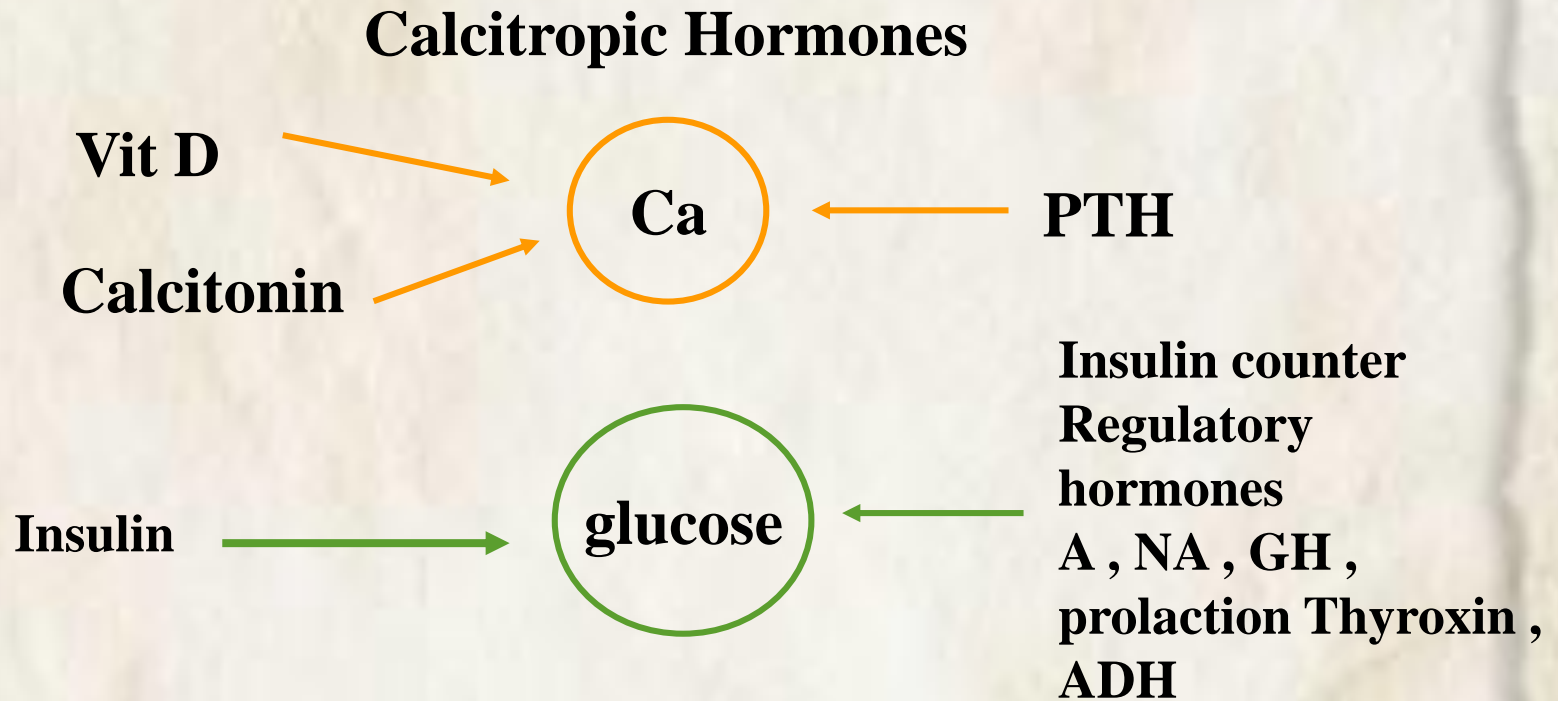
**autoregulation away from hypothalamic and pituitary remote control**

**escape from acute Wolf chaikoff effect**

**➤ in absence of this autoregulation Micronutrient substance ( $I_2$ ) becomes Toxic → Iodine Induced Hypothyroidism**

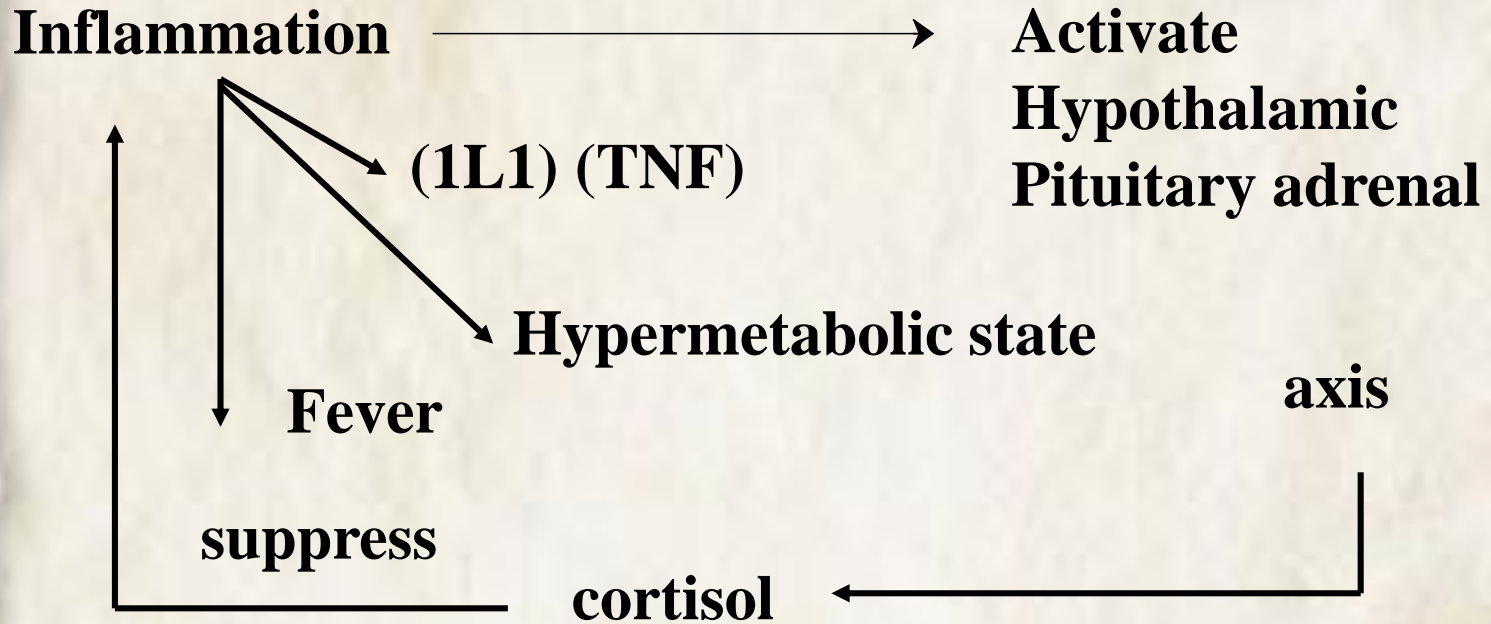


# IV-Orchestrated Inter play (Inter action) Between Hormones



- ❖ integrated action of these hormones prevents serious life threatening Metabolic consequences

# V- Immune Modulation



integrated action of Hormones prevents hyperpyrexia and cachexia

## **VI- Interaction between stress Hormones**



**GH , ADH , Thyroxine A , NA  
, Prolactin**



- 1) Provide substrate for energy utilisation thermogenesis and calorogenesis (energy loss)**
- 2) water retention**

**cortisol**

- 1) Blunt GH release  
TSH , TSH response  
To TRH**
- 2) water excretion**
- ❖ conserve Energy and  
prevent water  
Intoxication**



## **Role of estrogen in ♂**

**Counter balance testosterone Maintains Normal Physical and psychological status**

- 1) protect from prostatic cancer (in elderly ♂ oestrogen ↑ both the plasma level & bio-availability**
- 2) Protection from Acne , seborrhea , greezy skin and alopecia**
- 3) Modify behaviour , less aggressive behaviour**

## **Role of Androgen In ♀**

- 1) Protection from Breast cancer (Androgen therapy for metastatic Breast cancer )**
- 2) Protection from anemia ( erythropoietin production)**
- 3) Protection from post – Menopausal osteoporosis (patients with addisons disease are at high risk)**
- 4) ↑ apocrine and sebaceous gland secretion prevents dry skin and loss of hair luster**
- 5) ↑ Physical stamina , Endurance and physical fitness**

## **Role of prolactin in ♂**

- 1) Complementary for GH function (synergism) provide substrates for action of GH , prevents GH resistance . Most important substrate is (ca) (constitute 70 % of bone ) prolactin damp down action of sex hormones on bone makes ca more easily mobilized from bone**
  - 2) prolactin is a stress hormone ↑ in stress eg surgery , myocardial infarction infection , helps energy utilisation in stress**
  - 3) prolactin stimulate immune cell T , B lymphocytes proliferation and survival prolactin receptors are found in T , B lymphocytes (importance of Breast Milk )**
  - 4) prolactin , plays some Role in behaviour it is affected by anxiety and Emotion**
- ❖ Folk Med : lactating women should not be exposed to emotional distress**
  - ❖ Wolf Barking inhibit cow lactation**



# Role of oxytocin in Oxytocin overlap in function with ADH

<b>ADH</b>	<b>Oxytocin</b>
<b>1.</b> Nona peptide	<b>1.</b> Nona peptide
<b>2.</b> supra – optic nucleus	<b>2.</b> paraventricular N
<b>3.</b> stress Hormone	<b>3.</b> stress Hormone ↑ Brain B - Endorphins and ADH used by Addicts
<b>2.</b> ↑renal Medullary hyper osmolality , water retention	<b>4.</b> ↓ Medullary Hyper osmolality ↑ Naturesis ↓ water load prevents water intoxication
<b>5.</b> ↑ CRH through circum – ventricular organs → Na <sup>+</sup> water retention + hypertension	<b>5.</b> ↓ CRH → ↓ (Na <sup>+</sup> ) load and water retention prevents severe Hypertension during stress

# **Interaction between Hormones during pregnancy**

**Pregnancy is (stressful situation)**

**Free cortisol (double Normal )**

**High plasma progesterone Blunt effect of cortisol on  
renal Tubules prevents ++ Na<sup>+</sup> and water retention  
and development of Hypertension**

**↑ oestradiol during pregnancy →**

**↑ Hypertensinogen and aldosterone secretion**

**→ ++ Na<sup>+</sup> retention**

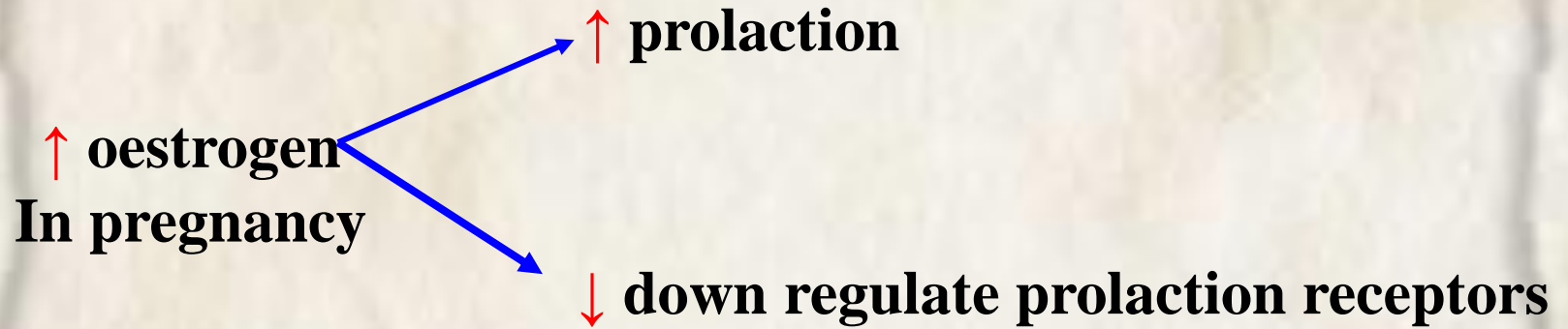
**→ mineralocorticoid Hypertension**

**progesterone also ↑ during pregnancy it in**

**hibits action of aldosterone on renal Tubules →**

**prevents Mineralco – corticoid Hypertension**

**and toxemia of pregnancy**



**After labour oestrogen ↓ → Lactation**

**Lactating Mother can nurse her baby**

# **Facilitated Anabolism**

**Response of glucagons to fasting decrease in last trimester = Fasting hypoglycaemia may occur**

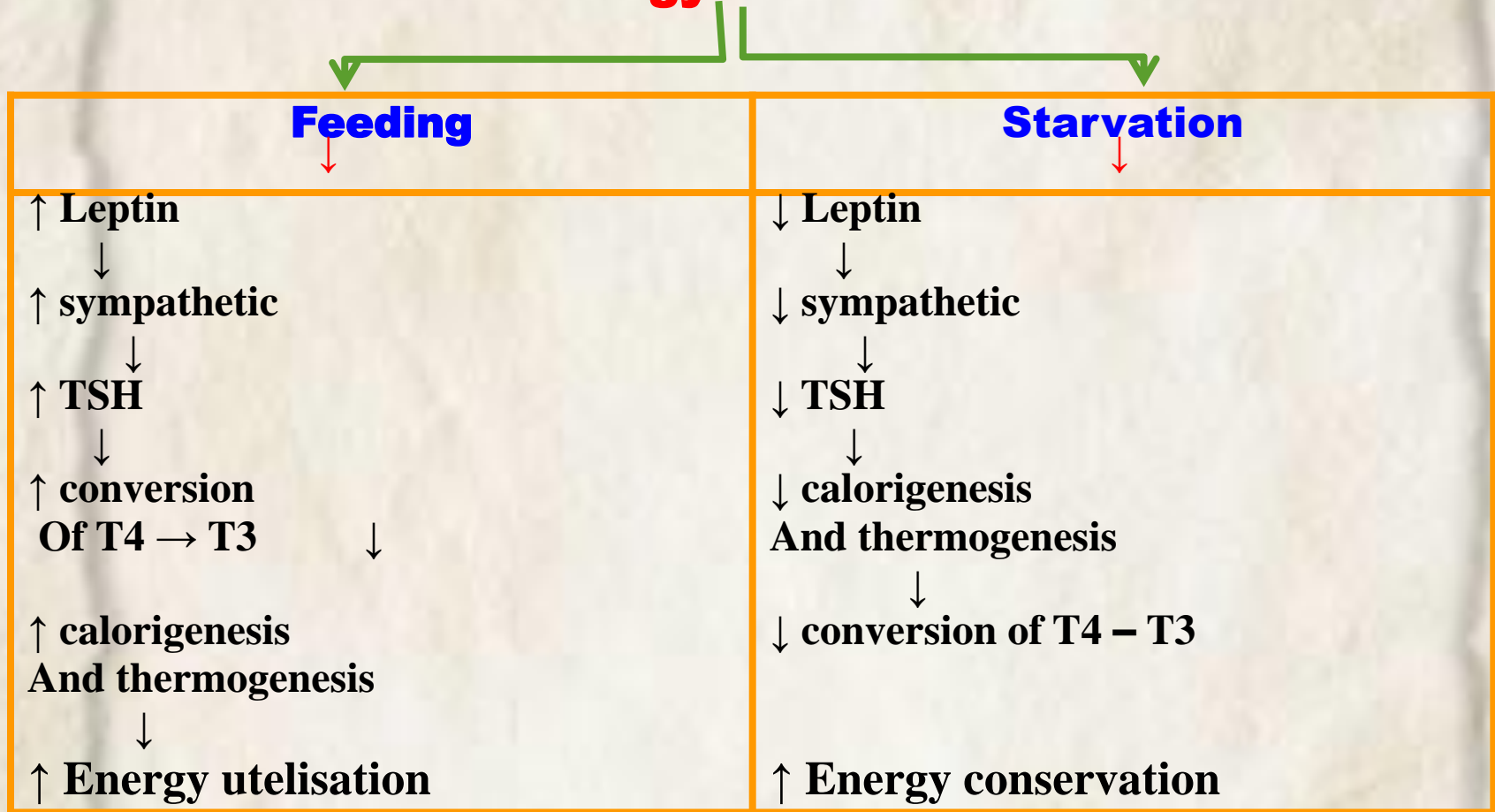
**Facilitated Anabolism**



**Conserve Energy for labour other wise uterine inetria and life threatening foetal distress will occur**



# Energy Balance



## Disequilibrium of this energy balance

Cachexca

Morbid obesity

{ وأقيموا الوزن بالقسط ولا تخسروا الميزان }

صدق الله العظيم

وسبحان الخلاق العظيم

**Tank you**