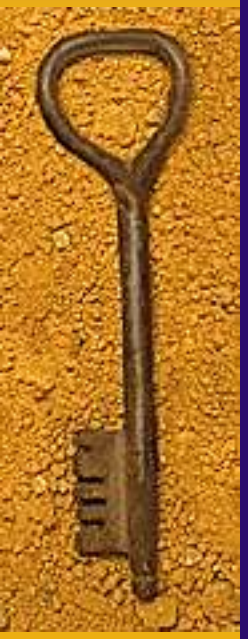
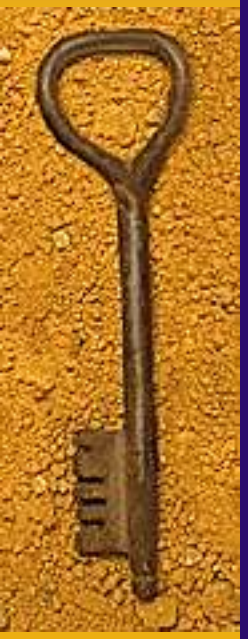
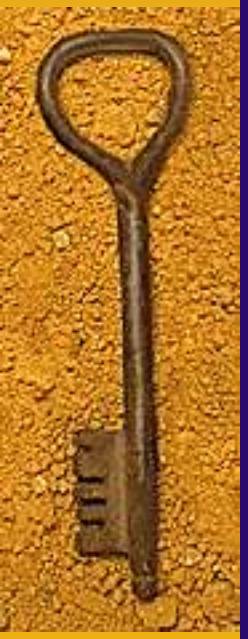


THYROID GLAND DISORDERS



THYROID GLAND DISORDERS

- **GENERAL ASPECTS OF THYROID GLAND**
  - **Anatomy: weight range from 12 to 30g**
  - **Located in the neck, anterior to the traquea**
  - **Produces: T4 & T3 (active hormone)**
  - **Regulation: “negative Feed-back” axis**



THYROID GLAND DISORDERS

- THYROID GLAND REGULATION
  "negative Feed-back" axis

(negative effect)

- Hypothalamus

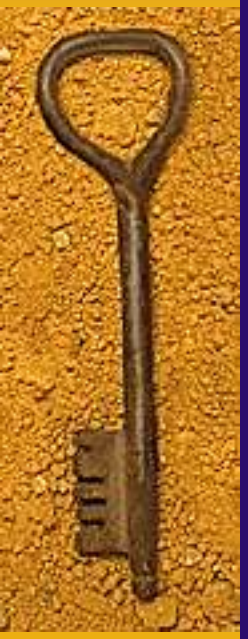
(TRH positive effect)

- Pituitary gland

(TSH, positive effect)

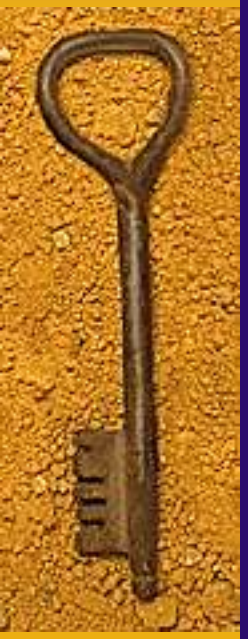
- Thyroid gland

T3 & T4



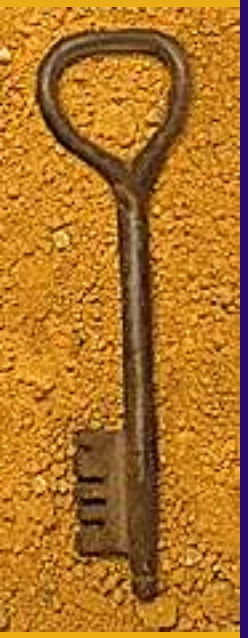
THYROID GLAND DISORDERS

- **Thyroid hormones:**
  - **T4: (Thyroxine) is made exclusively in thyroid gland**
    - **Ratio of T4 to T3 ; 5::1**
    - **Potency of T4 to T3; 1::10**
    - **T4 is the most important source of T3 by peripheral tissue deiodination " T4 to T3 "**



THYROID GLAND DISORDERS

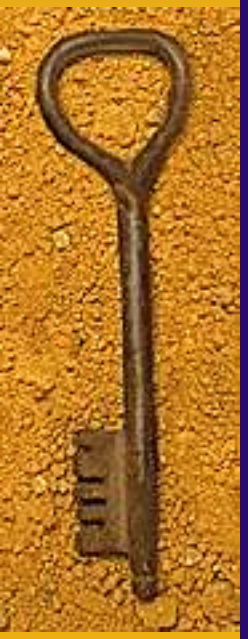
- **Thyroid hormones:**
  - **T3: (Triiodothyronine) main source is peripheral deiodination:**
    - **Ratio of T3 to T4 ; 1::5**
    - **Potency of T3 to T4; 10::1**
    - **T3 is the most important because more than 90% of the thyroid hormones physiological effects are due to the binding of T3 to Thyroid receptors in peripheral tissues.**



THYROID GLAND DISORDERS

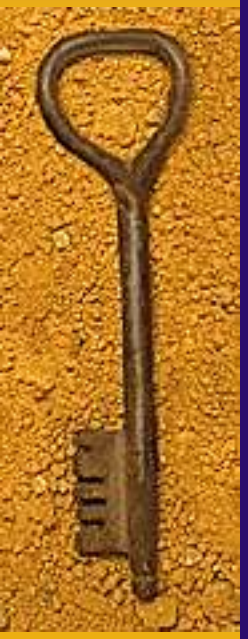
- PHYSIOLOGY EFFECTS OF THYROID HORMONES

- THEY ARE NOT ESSENTIAL FOR LIFE, BUT ARE EXTREMELY HELPFUL



THYROID GLAND DISORDERS

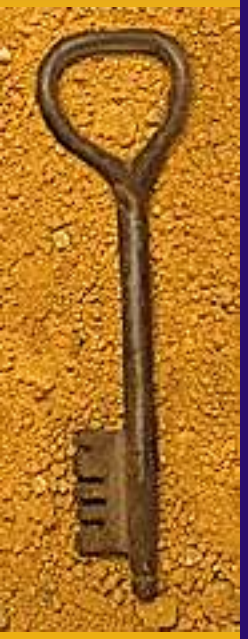
- **THYROID HORMONE EFFECTS:**
  - **Affects every single cell in the body**
    - **Modulates:**
      - **Oxygen consumption**
      - **Growth rate**
      - **Maturation and cell differentiation**
      - **Turnover of Vitamins, Hormones, Proteins, Fat, CHO**



THYROID GLAND DISORDERS

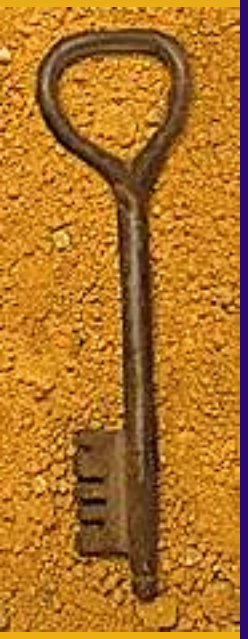
♦ MECHANISMS OF THYROID HORMONE ACTION

- Act by binding to Nuclear receptors, termed Thyroid Hormone Receptors (TRs), Increasing synthesis of proteins
- At mitochondrial level increases number and activity to increasing ATP production
- At Cell membrane increases ions and substrates transmembrane flux



THYROID GLAND DISORDERS

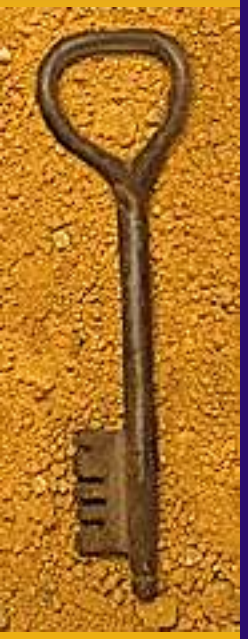
- **THYROID HORMONE EFFECTS**
  - CALORIGENESIS
  - GROWTH & MATURATION RATE
  - C.N.S. DEVELOPMENT & FUNCTION
  - CHO, FAT & PROTEIN METABOLISM
  - MUSCLE METABOLISM
  - ELECTROLYTE BALANCE
  - VITAMIN METABOLISM
  - CARDIOVASCULAR SYSTEM
  - HEMATOPOIETIC SYSTEM
  - GASTROINTESTINAL SYSTEM
  - ENDOCRINE SYSTEM
  - PREGNANCY



THYROID GLAND DISORDERS

♦ THYROID HORMONE EFFECTS

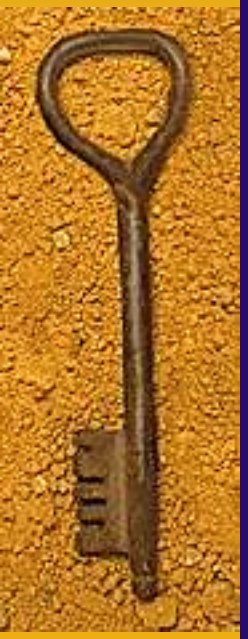
- **CALORIGENESIS**
  - Controls the Basal Metabolic Rate (BMR)
- **CHO METABOLISM**
  - Increases:
    - Glucose absorption of the GI tract
    - Glucose consumption by peripheral tissues
    - Glucose uptake by the cells
    - Glycolysis
    - Gluconeogenesis
    - Insulin secretion



THYROID GLAND DISORDERS

♦ THYROID HORMONE EFFECTS

- GROWTH & MATURATION RATE
- C.N.S. DEVELOPMENT & FUNTION
  - "ESSENTIAL" in the newborn to prevent development of "CRETINISMS" & to a normal "IQ"
  - Modulation of brain cerebration
  - Mood modulation



THYROID GLAND DISORDERS

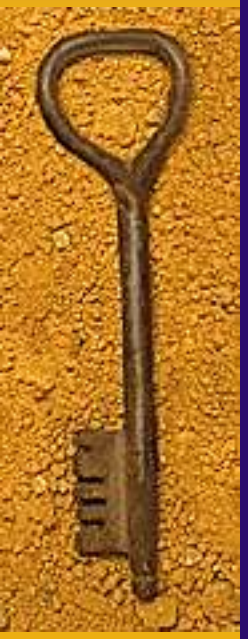
♦ THYROID HORMONE EFFECTS

- FAT & PROTEIN METABOLISM

- Increase lipolysis and lipid mobilization with:
  - Cholesterol
  - Triglicerides
  - Free fatty acids

– MUSCLE METABOLISM

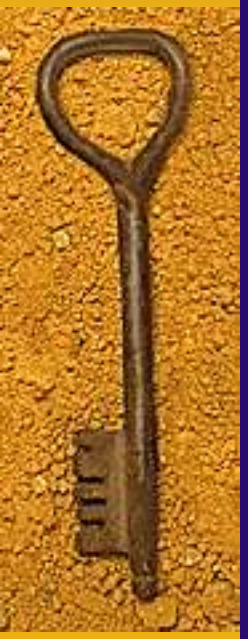
- Modulates;
  - Strength & velocity of contraction



THYROID GLAND DISORDERS

♦ THYROID HORMONE EFFECTS

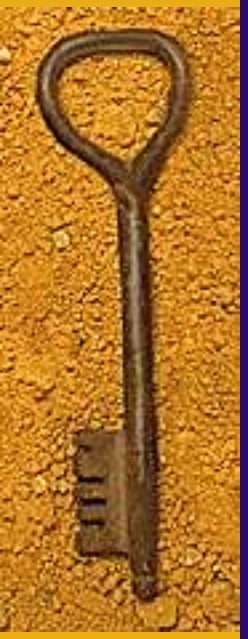
- **ELECTROLYTE BALANCE**
  - Low Thyroid hormones could induce hyponatremia
- **VITAMIN METABOLISM**
  - Modulates vitamin consumption
- **HEMATOPOIETIC SYSTEM**
  - Could induce anemia



THYROID GLAND DISORDERS

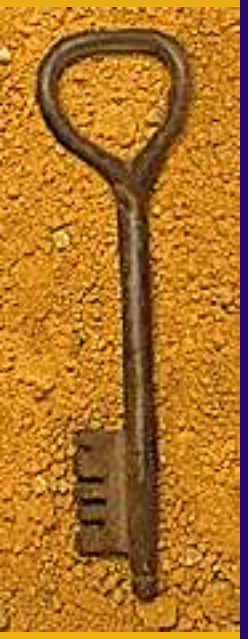
♦ THYROID HORMONE EFFECTS

- **CARDIOVASCULAR SYSTEM**
  - **Hyperthyroidism, increases:**
    - **Heart rate & myocardial strenght**
    - **Cardiac output**
    - **Peripheral resistances (Vasodilatation)**
    - **Oxygen consumption**
    - **Arterial pressure**
  - **Hypothyroidism, reduces:**
    - **Heart rate & myocardial strenght**
    - **Cardiac output**
    - **Peripheral resistances (Vasodilatation)**
    - **Oxygen consumption**
    - **Arterial pressure**



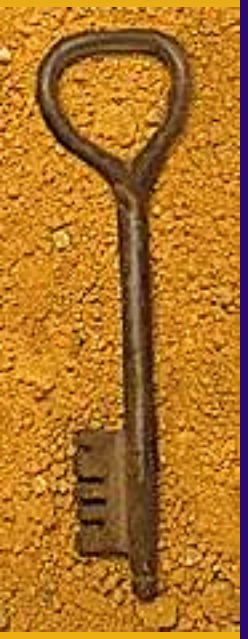
THYROID GLAND DISORDERS

- **THYROID HORMONE EFFECTS**
  - **GASTROINTESTINAL SYSTEM**
    - Modulate bowel movements and absorption
  - **ENDOCRINE SYSTEM**
    - Modulates pituitary axis, affecting GH, ACTH, FSH, LH, so-on
  - **PREGNANCY**
    - Modulates growth rate and affects lactation



THYROID GLAND DISORDERS

- **DIVIDED INTO:**
  - **THYROTOXICOSIS (Hyperthyroidism)**
    - **Overproduction of thyroid hormones**
  - **HYPOTHYROIDISM (Gland destruction)**
    - **Underproduction of thyroid hormones**
  - **NEOPLASTIC PROCESSES**
    - **Beningn**
    - **Malignant**

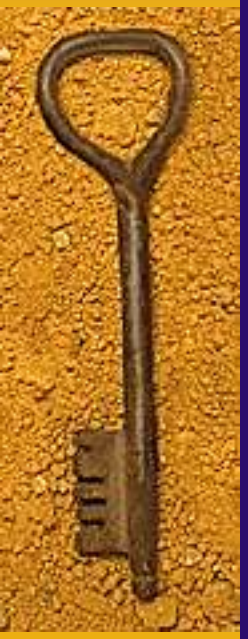


THYROID GLAND DISORDERS

♦ LABORATORY EVALUATION

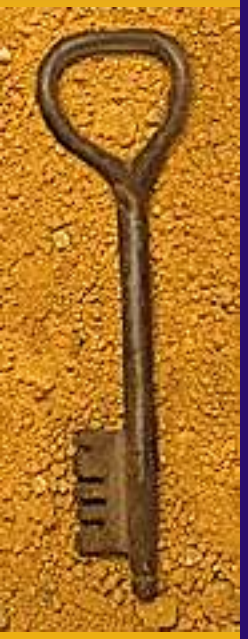
TSH normal, practically excludes abnormality

- **If TSH is abnormal, next step: Total & Free T4 & T3**
- **TSI (Thyroid Stimulating Ig)**
- **TPO (Thyroid Peroxidase Ab)**
- **Antimitochondrial Ab**
- **Serum Tg (Thyroglobulin)**
- **Radioiodine uptake & Thyroid scaning**
- **FNA, Fine-needle aspiration**
- **Thyroid ultrasound**



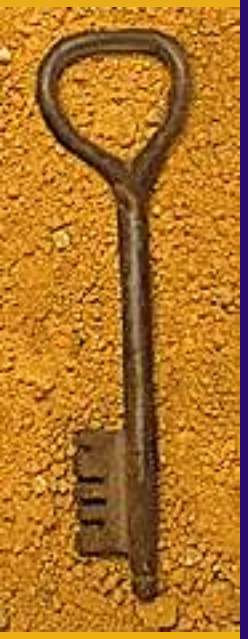
THYROID GLAND DISORDERS

- **TSH High usually means Hypothyroidism**
  - **Rare causes:**
    - **TSH-secreting pituitary tumor**
    - **Thyroid hormone resistance**
    - **Assay artifact**
- **TSH low usually indicates Thyrotoxicosis**
  - **Other causes**
    - **First trimester of pregnancy**
    - **After treatment of hyperthyroidism**
    - **Some medications (Esteroids-dopamine)**



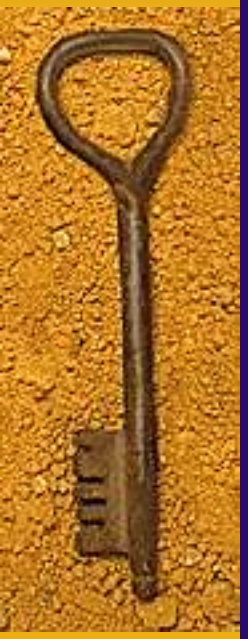
THYROID GLAND DISORDERS

- **THYROTOXICOSIS:**
  - is defined as the state of thyroid hormone excesss
- **HYPERTHYROIDISM:**
  - is the result of excessive thyroid gland function



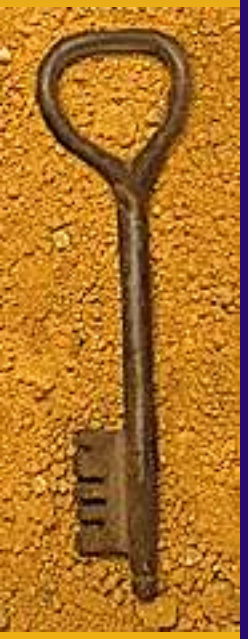
THYROID GLAND DISORDERS

- **Abnormalities of Thyroid Hormones**
  - **Thyrotoxicosis**
    - **Primary**
    - **Secondary**
    - **Without Hyperthyroidism**
    - **Exogenous or factitious**
  - **Hypothyroidism**
    - **Primary**
    - **Secondary**
    - **Peripheral**



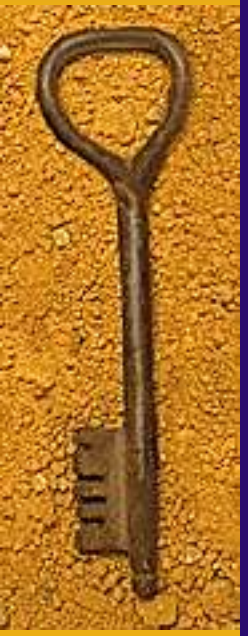
THYROID GLAND DISORDERS

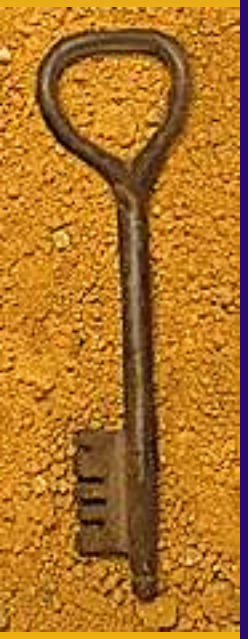
- **Causes of Thyrotoxicosis:**
  - **Primary Hyperthyroidism**
    - Grave´s disease
    - Toxic Multinodular Goiter
    - Toxic adenoma
    - Functioning thyroid carcinoma metastases
    - Activating mutation of TSH receptor
    - Struma ovary
    - Drugs: Iodine excess



THYROID GLAND DISORDERS

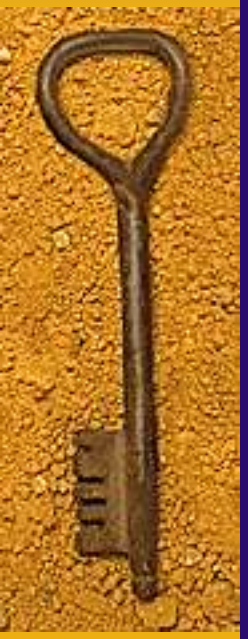
- **Causes of Thyrotoxicosis:**
  - **Thyrotoxicosis without hyperthyroidism**
    - Subacute thyroiditis
    - Silent thyroiditis
    - Other causes of thyroid destruction:
      - Amiodarone, radiation, infarction of an adenoma
    - Exogenous/Factitia
  - **Secondary Hyperthyroidism**
    - TSH-secreting pituitary adenoma
    - Thyroid hormone resistance syndrome
    - Chorionic Gonadotropin-secreting tumor
    - Gestational thyrotoxicosis





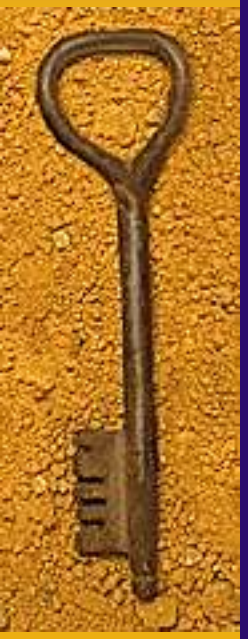
THYROTOXICOSIS

- **Symptoms:**
  - Hyperactivity
  - Irritability
  - Dysphoria
  - Heat intolerance & sweating
  - Palpitations
  - Fatigue & weakness
  - Weight loss with increased appetite
  - Diarrhea
  - Polyuria
  - Sexual dysfunction
- **Signs:**
  - Tachycardia
  - Atrial fibrillation
  - Tremor
  - Goiter
  - Warm, moist skin
  - Muscle weakness, myopathy
  - Lid retraction or lag
  - Gynecomastia
  - * Exophtalmus
  - * Pretibial myxedema



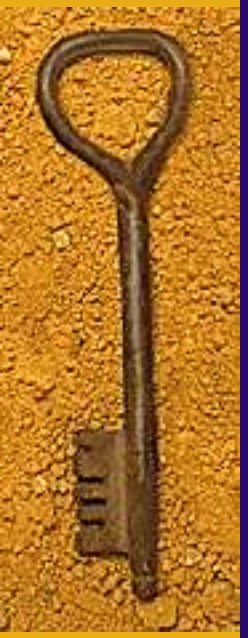
THYROID GLAND DISORDERS

- **Differential diagnosis:**
  - Panic attacks
  - Psychosis
  - Mania
  - Pheochromocytoma
  - Hypoglycemia
  - Occult malignancy



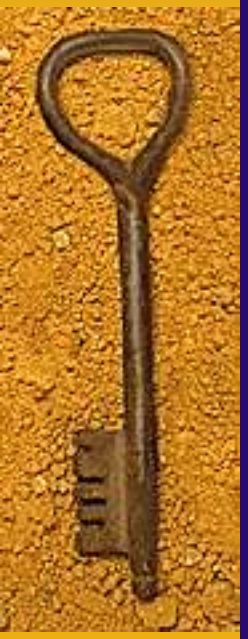
THYROID GLAND DISORDERS

- **Treatment:**
  - **Reducing thyroid hormone synthesis:**
    - **Antithyroid drugs (Methimazole, Propylthyouracil)**
    - **Radioiodine (^{131}I)**
    - **Subtotal thyroidectomy**
  - **Reducing Thyroid hormone effects:**
    - **Propranolol**
    - **Glucocorticoids**
    - **Benzodiazepines**
  - **Reducing peripheral conversion of T4 to T3**
    - **Propylthyouracil**
    - **Glucocorticoids**
    - **Iodide (Large oral or IV dosage) (Wolf-Chaikoff effect)**



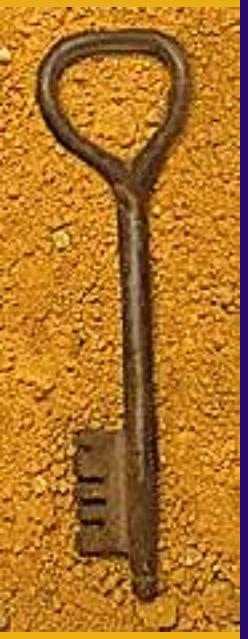
THYROID GLAND DISORDERS

- **Treatment: Special considerations:**
  - **Thyrotoxic crisis or Thyroid storm:**
    - **It´s a life-threatening exacervation of thyrotoxicosis, acompanied by fever, delirium, seizures, coma, vomiting, diarrhea, jaundice.**
    - **Mortality rate reachs 30% even with treatment**
    - **It´s usually precipitated by acute illness, such as:**
      - **Stroke, infection,trauma, diabeic ketoacidosis, surgery, radioiodine treatment**
    - **Propylthyouracil IV or Nasogastric tube**
    - **Radioiodine (^{131}I)**
    - **Propranolol**
    - **Glucocorticoids**
    - **Benzodiazepines**
    - **Iodide (Large oral or IV dosage) (Wolf-Chaikoff effect)**



THYROID GLAND DISORDERS

- **HYPOTHYROIDISM**
  - **Primary**
    - **Autoimmune (Hashimoto´s)**
    - **Iatrogenic Surgery or ^{131}I**
    - **Drugs: amiodarone, lithium**
    - **Congenital (1 in 3000 to 4000)**
    - **Iodine defficiency**
    - **Infiltrative disorders**

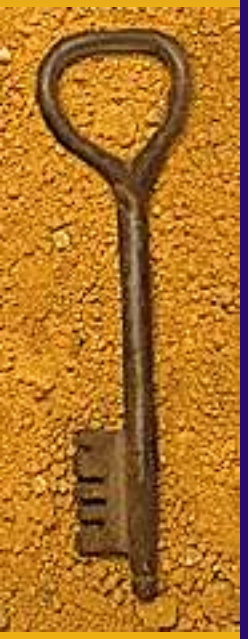


THYROID GLAND DISORDERS

- **Hashimoto´s Thyroiditis or Goitrous thyroiditis**

– **Mean anual incidence:**

- **Women 4:1000 Men 1:1000**
- **Risk factors; TPO antibodies (90%) Japanese, previous history, high I intake**
- **Average age: 60**
- **Frequently associated to other autoimmune disorders such as: AR, SLE, Sjogren´s so-on.**
- **Treatment: Levothyroxine**

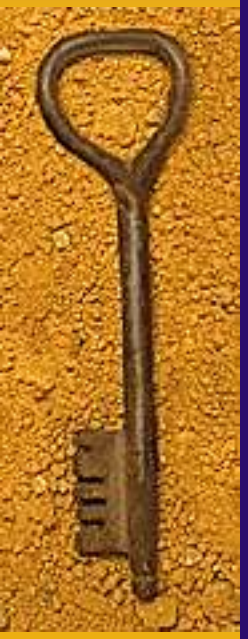


THYROID GLAND DISORDERS

- **CONGENITAL HYPOTHYROIDISM**

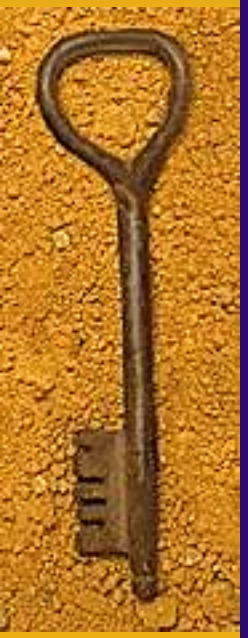
- **Prevalence: 1 in 3000 to 4000 newborns**
  - **Cause: Dysgenesis 85%**
  - **Dx: Blood screning (TSH &/or T4)**

- **Treatment:**
  - **Supplemental Tx. With Levothyroxine is "essential" for a normal C.N.S. Development and prevention of mental retardation**



THYROID GLAND DISORDERS

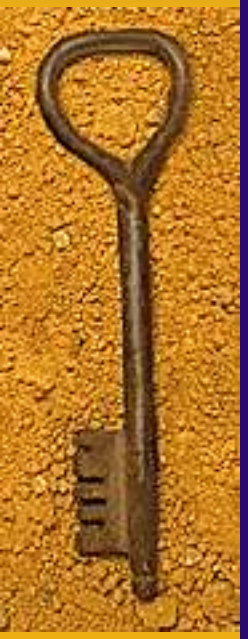
- **HYPOTHYROIDISM**
  - **Secondary**
    - **Pituitary gland destruction**
    - **Isolated TSH deficiency**
    - **Bexarotene treatment**
    - **Hypothalamic disorders**
  - **Peripheral:**
    - **Rare, familial tendency**



HYPOTHYROIDISM

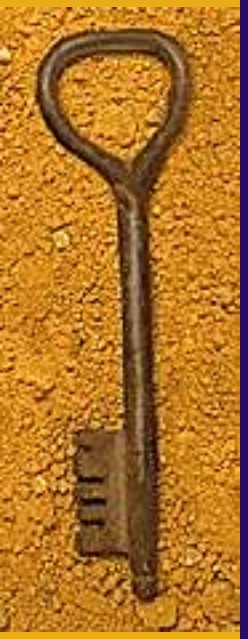
- **Symptoms:**
  - Tiredness
  - Weakness
  - Dry skin Sexual dysfunction
  - Dry skin
  - Hair loss
  - Difficulty concentrating

- **Signs:**
  - Bradycardia
  - Dry coarse skin
  - Puffy face, hands and feet
  - Diffuse alopecia
  - Peripheral edema
  - Delayed tendon reflex relaxation
  - Carpal tunel syndrome
  - Serous cavity effusions.



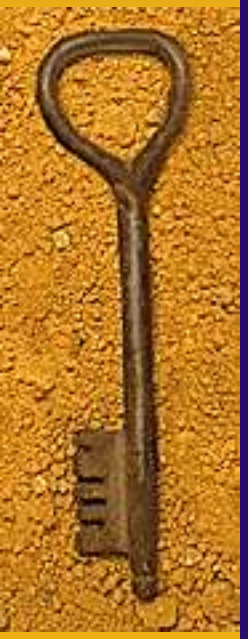
THYROID GLAND DISORDERS

- **SPECIAL TREATMENT CONSIDERATIONS**
- **Myxedema coma**
  - **Reduced level of consciousness, seizures**
  - **Hypotension/shock**
  - **Hypothermia**
  - **Hyponatremia**
- **Usually in elderly hypothyroid pts.**
- **Usually precipitated by intercurrent illnesses that impairs ventilation**
- **It´s an Emergency with a high mortality rate**
- **Treatment: Lyotironine(T3) or T4, Hydrocortisone, external warming, IV fluids**



THYROID GLAND DISORDERS

- SPECIAL TREATMENT CONSIDERATIONS
- Elderly patients
- Coronary Artery Disease
- Poor adrenal gland reserve
- Childrens
- Pregnancy
- Emergency surgery (Non thyroid related)



THYROID GLAND DISORDERS

- **THYROID GLAND NEOPLASIAS**

- **Out of the focus of this lecture**