

**The problem of iodine
deficiency: an
epidemiological, clinical,
social values. Solutions**

Goiter - History

1811 - Curtua - opening element Iodine

1850 - Chatin - iodine therapy prevents the development of endemic goiter and cretinis

1896 - Baumann - iodine and thyroid are closely linked

1917 - Marine and Kimball - proven therapeutic effect of iodine in endemic goitre

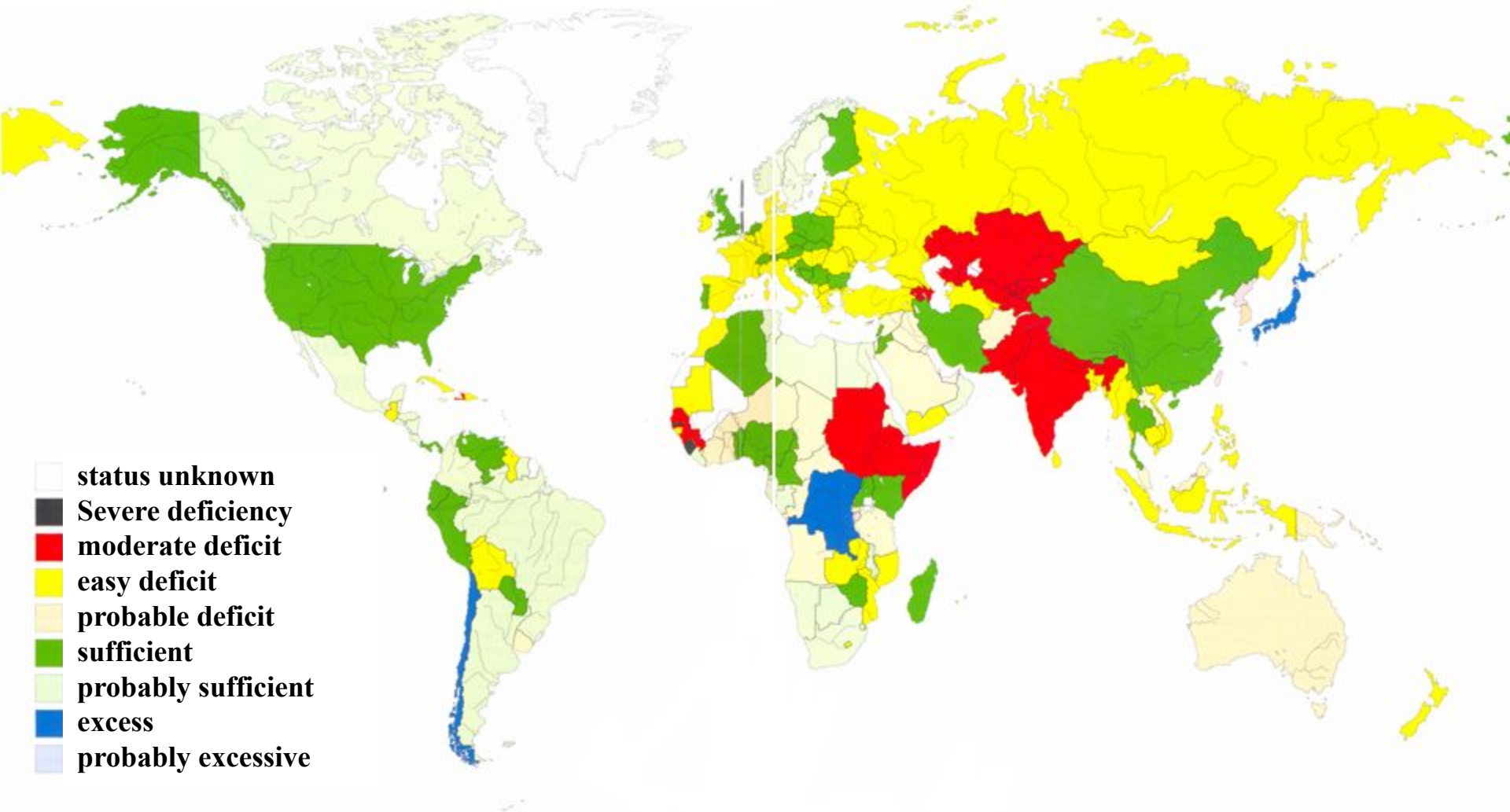
1936-1967 - Barker, Hercus and others - opening goitrogenic effect of various drugs and food

1955 - OV Nikolaev - creating the first Soviet classification of endemic goiter

Iodine deficiency disorders

- ✓ **Some of the most common non-communicable diseases in humans**
- ✓ **In general, the Earth:**
- ✓ **1.5 billion people live in areas with iodine deficiency**
- ✓ **600 million have goiter**
- ✓ **40 million have severe mental impairment as a result of iodine deficiency**

The prevalence of IDD in the World

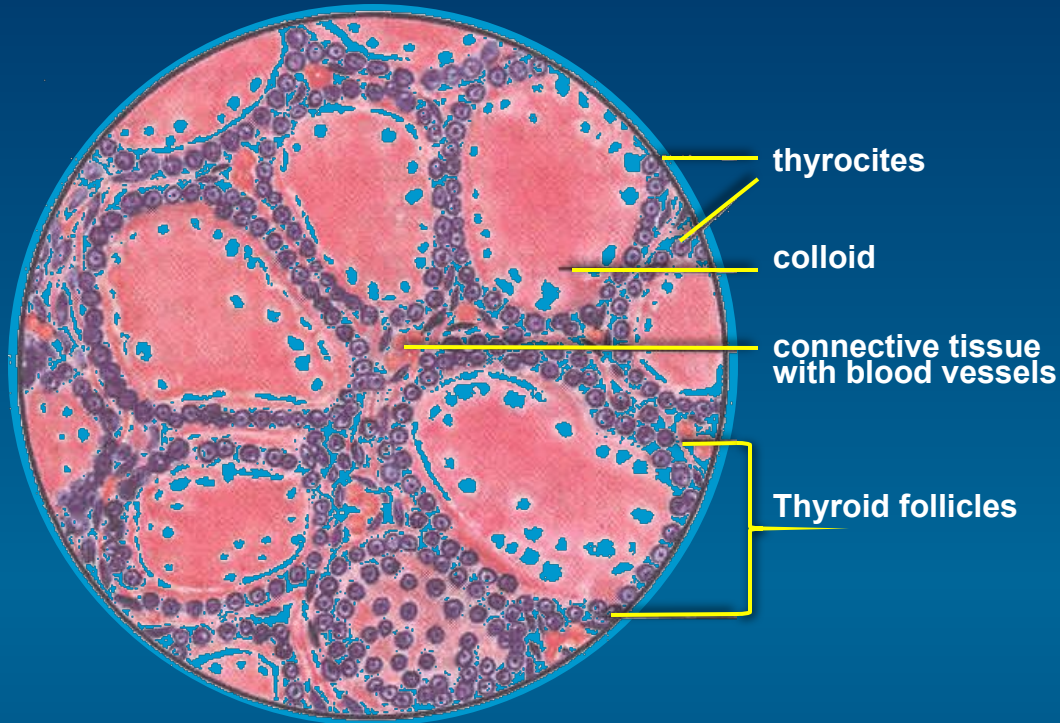


Anatomy and physiology of the thyroid gland



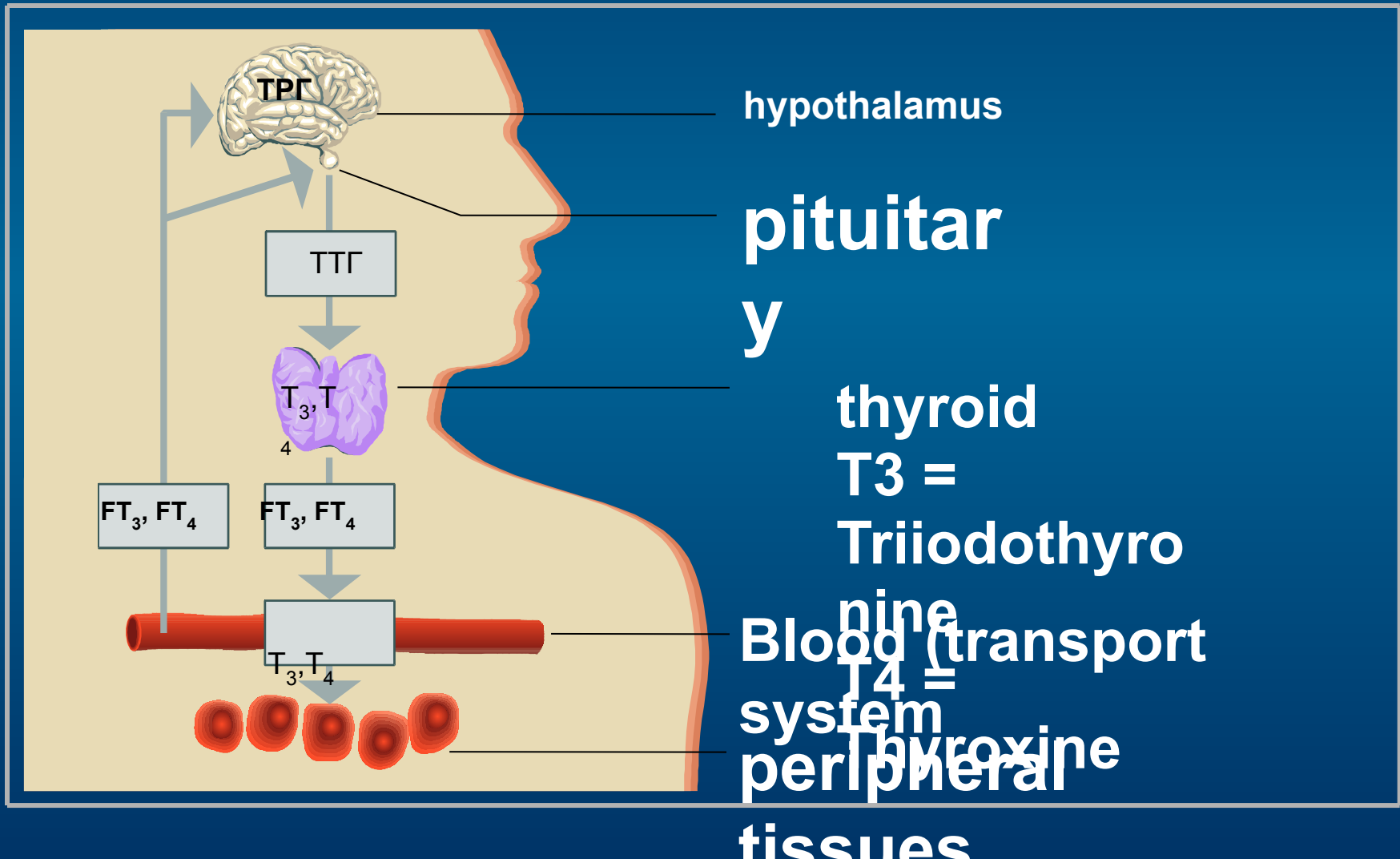
- The largest endocrine gland of human
- **Weight:** about 20 grams
- **Size:** nail phalanx of the thumb
- **Volume:** no more than 18 ml (women), not more than 25 ml (men). In children, thyroid volume is calculated according to the table
- Has 2 parts (left and right) and some additional (pyramidal)

Anatomy and physiology of the thyroid gland



- **Two types of cells: follicular and parafollicular (C) cells**
- **C-cells produce calcitonin**
- **Follicular cells form follicles filled with colloid and produce thyroid hormones**

Regulation of the function of the thyroid gland



Hypothalamic-pituitary-thyroid system

- TSH - the main stimulant of secretion of T3 and T4
- TSH secretion is controlled by:
 - Thyrotropin-releasing hormone (stimulation of the synthesis and secretion)
 - T3 and T4 (inhibition of secretion by a negative feedback loop)
 - Other factors which influence secretion (dopamine (-), somatostatin (-), glucocorticoids (-), estrogen (+), etc.)

Participation of thyroid hormones in the development and regulation:

**Nervous system
and psyche
thyroid**

**Gastro-intestin
al tract**

Skin and hair



**The
cardiovascular
system**

**reproductive
function**

Musculoskeletal

**systems
hematopoiesis**

Goiter - diffuse thyroid enlargement, defined either by palpation or by imaging

Goiter is indicated increased thyroid volume exceeding 18 mL in women and more than 25 ml in men

Women crop develops in 2-3 times more often than men, usually during periods of increased demand for thyroid hormone - during puberty and pregnancy

Uniform increase in thyroid cancer called diffuse goiter, the availability of education in it - the hub

- **SCA - increase in thyroid**
- **Goiter - diffuse enlargement of thyroid in the population by more than 5% of children of primary and secondary school age. Due to the lack of intake of iodine or other goitrogenic factors**
- **Sporadic goiter - diffuse enlargement of thyroid occurring in a population of less than 5% of children of primary and secondary school age. Due to congenital or acquired defects in the synthesis of thyroid hormones**

Classification of thyroid disease

Single international classification of thyroid disease is still

there is no

The most widely used is the classification, which is based on the functional state of the thyroid

Classification of thyroid disease

The main syndromes :

Thyroid function

1. Normal - euthyroidism
2. Increased - thyrotoxicosis (hyperthyroidism)
3. Reduced - hypothyroidism

Thyroid size

1. normal
2. Increase - goiter
3. reduced

Examination: palpation

Modern classification of goitre (WHO, 2001)

0 st. - no goiter

1 st. - Palpable goiter:
sizes larger share of the distal phalanx of the thumb of the subject, the crop is palpable, but not visible to the eye

2 st. - Visible goiter: Goiter palpable and visible to the eye

Examination: palpation



Classification of thyroid size by OV Nikolaev (1955)

0 degree
grade I
II degree
III degree
IV degree
V level

- ✓ The thyroid gland is not palpable
- ✓ Enlarged thyroid gland clearly detectable, especially the Isthmus
- ✓ Enlargement of the thyroid gland is well defined not only feeling, but clearly visible when viewed in time swallowing
- ✓ Thyroid enlargement is noticeable not only during swallowing, there is a so-called thick neck
- ✓ The form of the neck dramatically changed; goiter clearly visible
- ✓ Goiter reaches a very large size



Проявления



Etiology of diffuse toxic goiter (1811-2002 gg.)

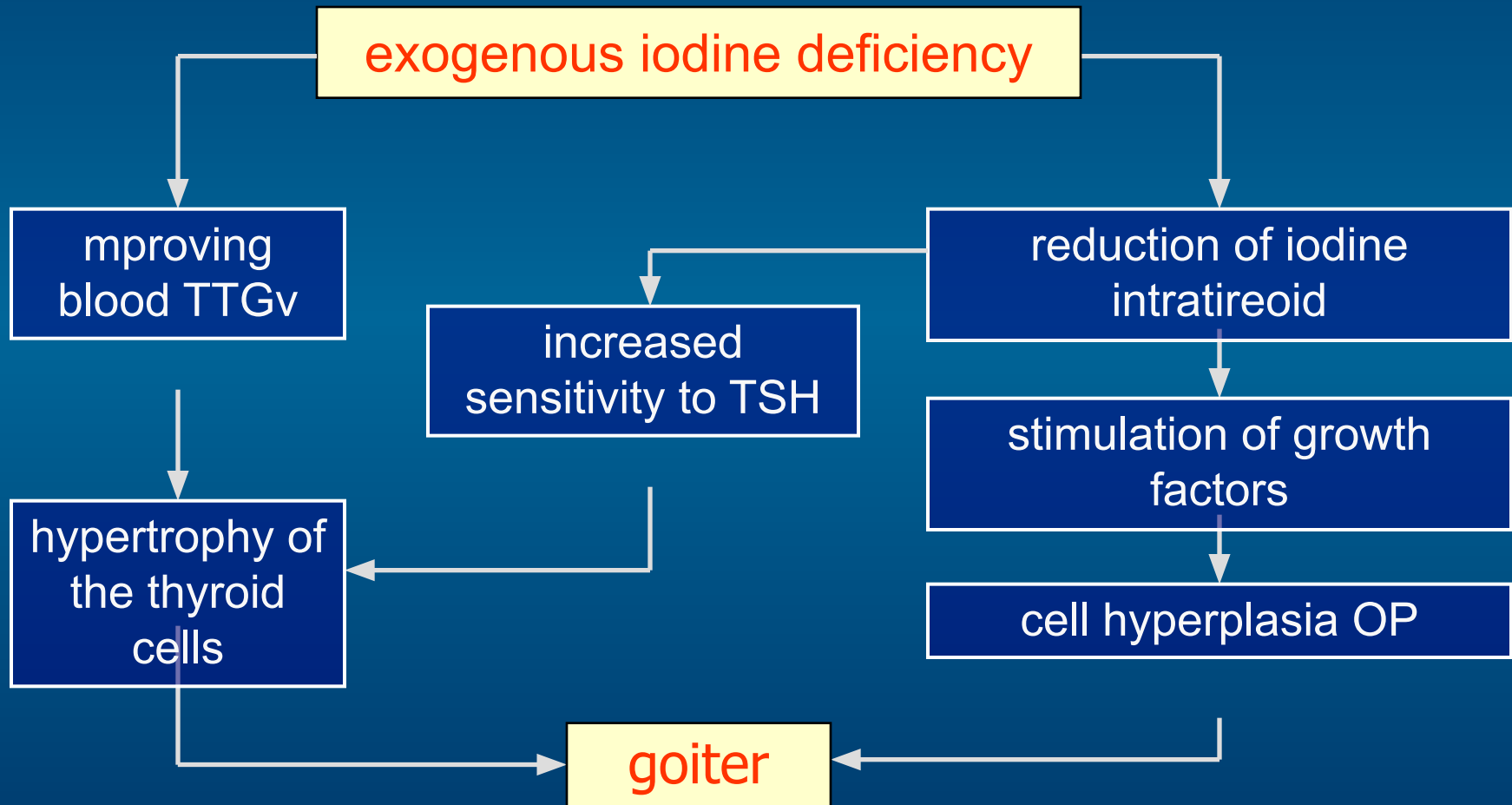
I. External factors (cause of endemic goiter) various strumogeny, namely

- imbalance of trace elements (J)
- organic and inorganic substances
- radiation

II. Internal factors (causing sporadic goiter and increase the expression of the region of endemic)

- genetic predisposition
- pregnancy
- smoking

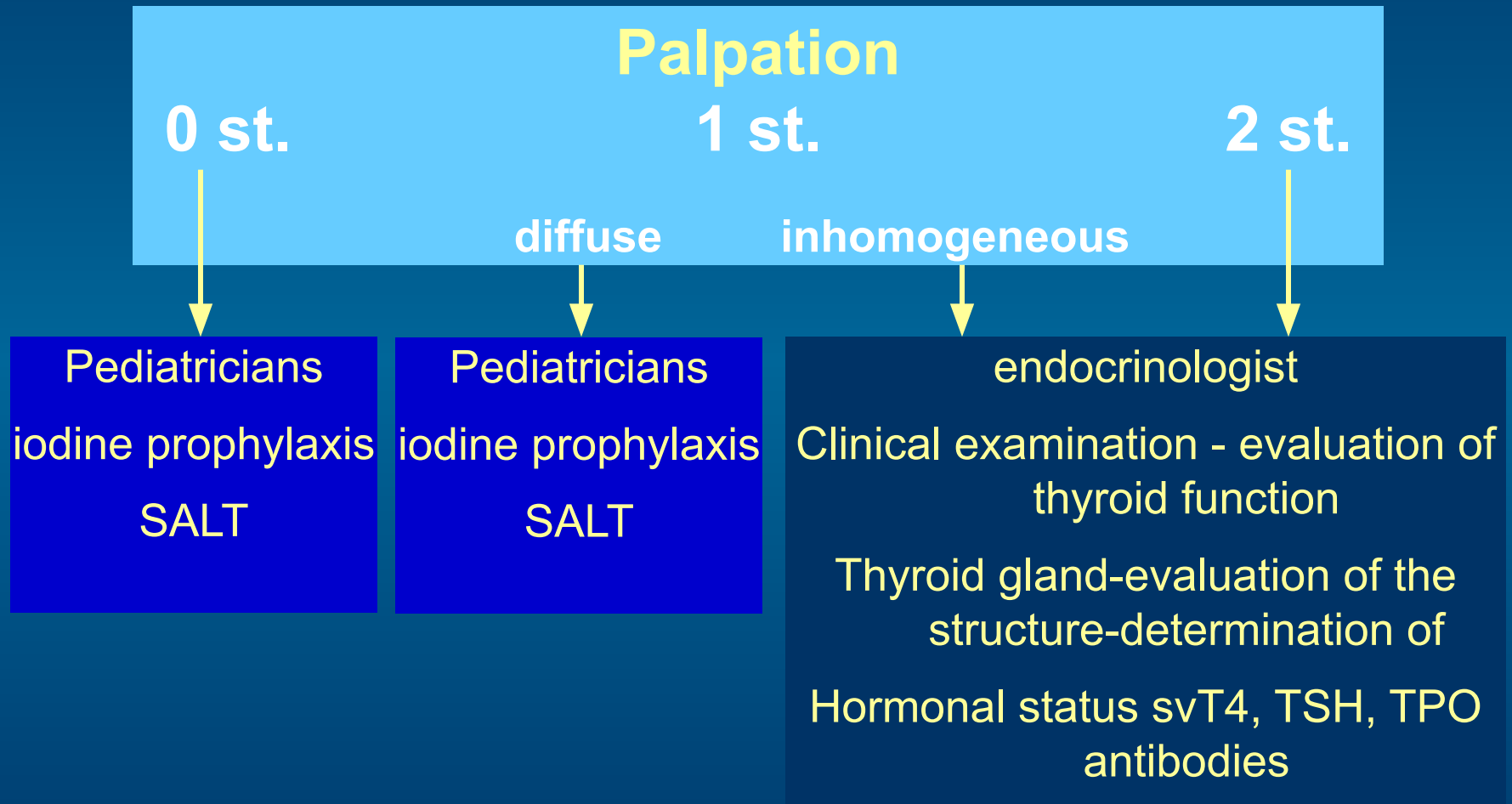
Pathogenesis of iodine deficiency diffuse toxic goiter



Diagnosis of IDD

- . Evaluation of epidemiology (prevalence) of IDD in the country as a whole and its individual regions to plan preventive and therapeutic measures and assess their effectiveness,**
- 2. Identification of clinical signs of IDD in a given patient.**

Algorithm study of children and adolescents living in iodine deficiency region

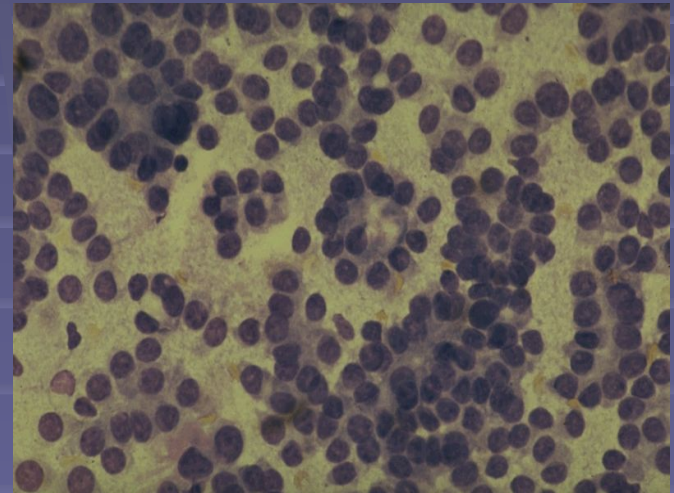
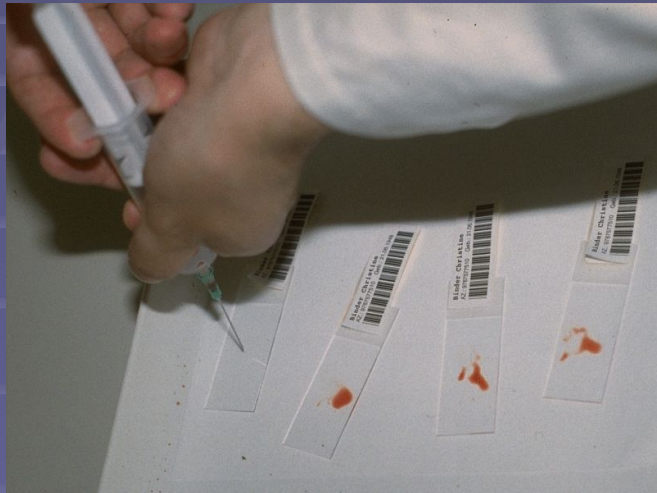


Laboratory studies

- ▶ TSH regulator of the thyroid gland, the main parameter in assessing its function
- ▶ T3 triiodothyronine
- ▶ T4 thyroxine
- ▶ antibodies
 - ▶ thyrocytes to peroxidase (TPO)
 - ▶ thyroglobulin (Tg-Ab)
 - ▶ thyrocytes TSH receptor (AT-rhTSH)



Fine needle biopsy of thyroid nodules



Clinical indicator: incidence of goiter in the population (quantitative, indirect indicator of iodine deficiency)

- Estimation of the size of thyroid palpation in epidemiological studies conducted by WHO (2001)
- Estimation of the size of thyroid ultrasound method is carried out with the regulations of the thyroid, the calculated relative to body surface area (WHO, 1997)

For the development of goiter in iodine deficiency requires a fairly long period of time (2-3 years or more). Equally, after the normalization of the iodine would need at least a few years before the incidence of goiter in school drops below 5%. In this context, the definition of the frequency of goiter should be considered as an additional (with respect to the investigation of the concentration of iodine in the urine), an indicator of iodine deficiency

Biochemical parameters: urinary iodine concentration (quantitative, direct indicator of iodine provision)

Method is used for population studies.

To assess the degree of iodine deficiency using:

1. The average value of the concentration of iodine in urine - the median

Median - the average with respect to which a number of distribution is divided into two halves

2. The frequency distribution of the concentration of iodine in urine, which estimates the percentage of samples with a concentration of iodine in the range:
 - to 20 mg / L,
 - from 20 to 49 mg / L,
 - from 50 to 99 mg / L,
 - from 100 to 299 mg / L,
 - and more than 300 mg / l.

Epidemiological criteria for assessing the severity of iodine deficiency

		The severity of IDD		
CRITERIA	population	easy	Average	severe
The frequency of goiter (Palpation)	schoolchild	5 - 19.9%	20 - 29.9%	> 30%
Volume sch.Zh. > 97 centile (U.S.)	schoolchild	5 - 19.9%	20 - 29.9%	> 30%
Urinary iodine content (Median, mg / L)	schoolchild	50 - 99	20 - 49	< 20
ТТГ > 5 мЕ/л	newborns	3 - 19.9%	20 - 39.9%	> 40%

The most dangerous medical and social consequences of iodine deficiency

**violation
reproductive
function
women**

infertility

**miscarriage
pregnancy**



**demographic
problems**

**violation of mental
function in offspring**

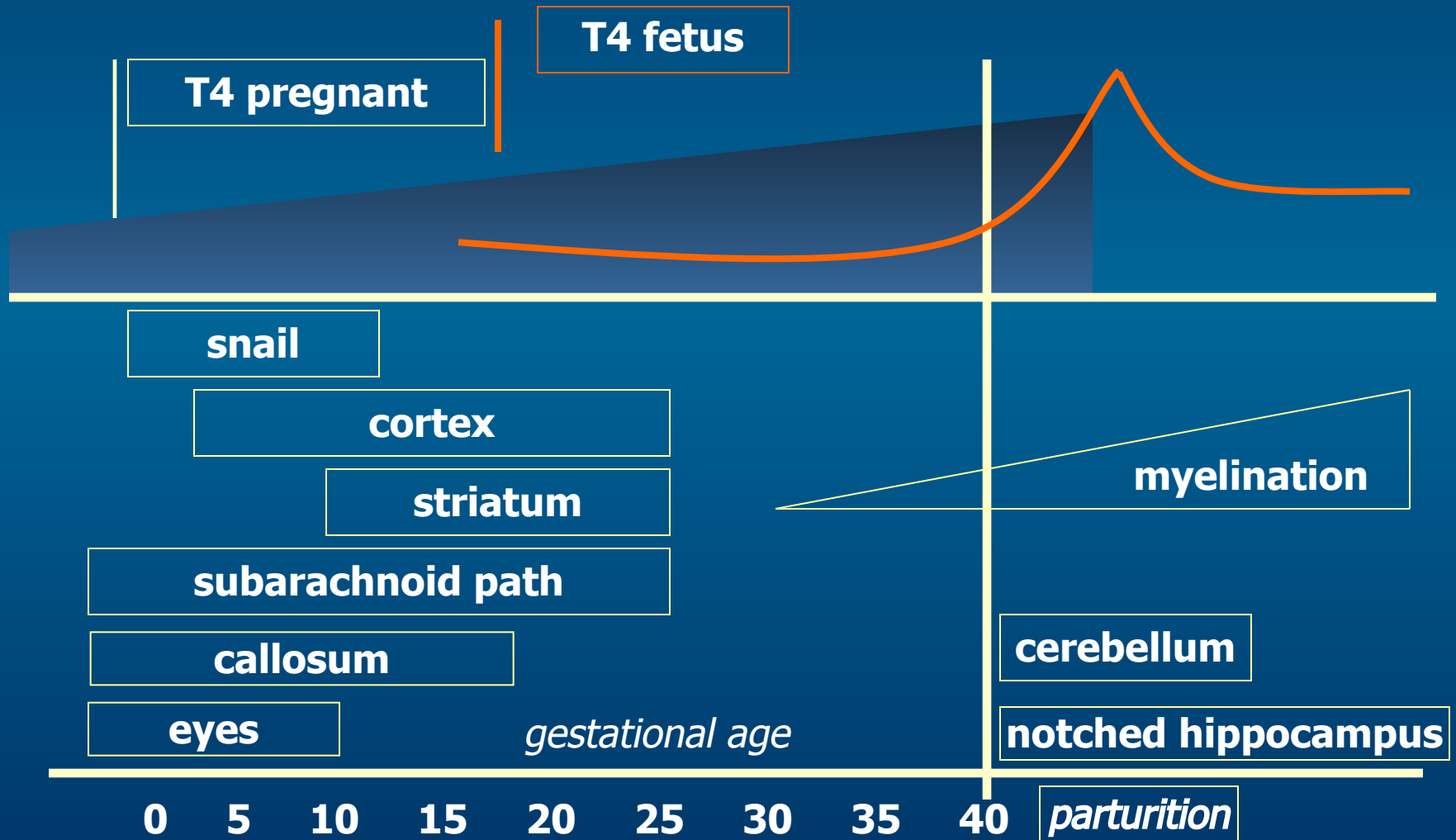
**rare:
neurologic
cretinism**

**often:
Light of psycho-
motor
violations
reduction
ability
learning**



**reduction
intellectual
potential of the population**

The main stages of development of the nervous system of the fetus and the need for thyroid hormones at various stages of pregnancy

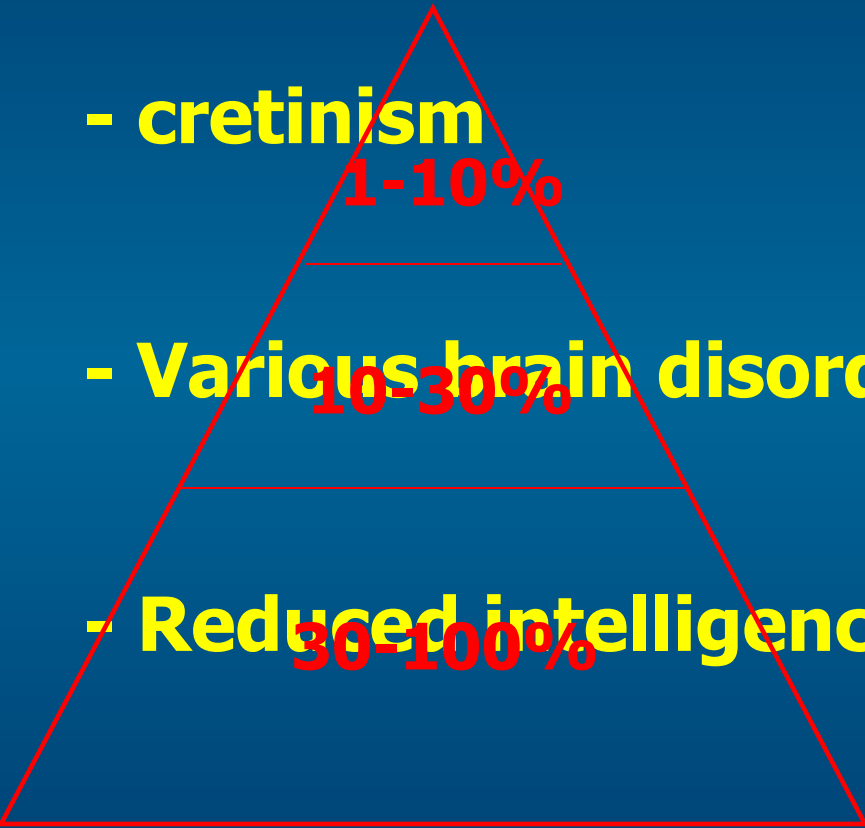


At risk of developing IDD

- ✓ **children**
- ✓ **adolescents**
- ✓ **pregnant women**
- ✓ **lactating women**

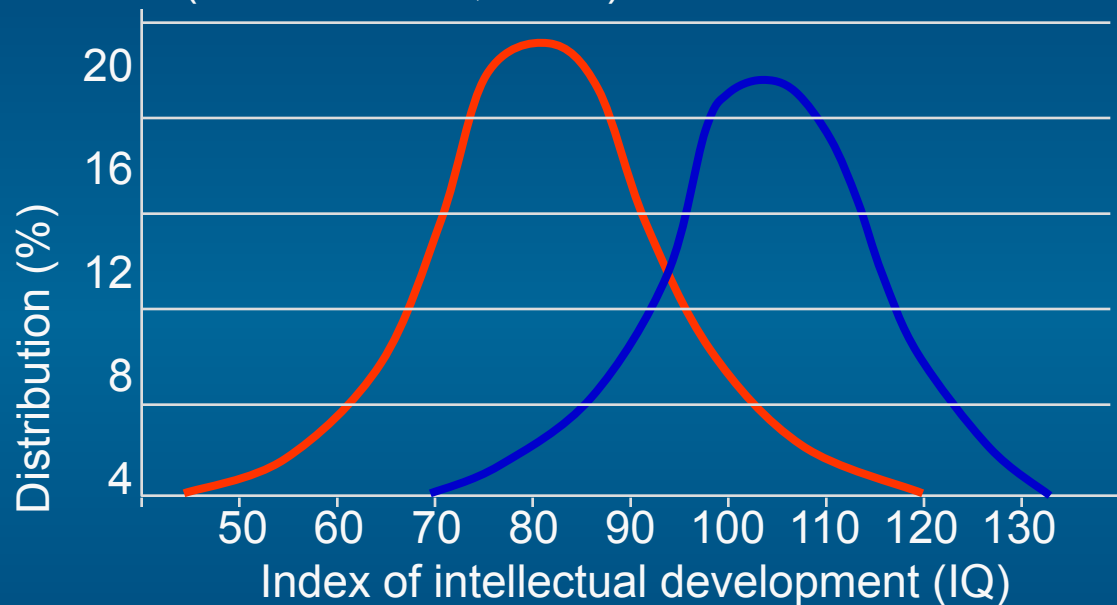


The structure of iodine disorders of mental development:

- 
- **cretinism**
1-10%
 - **Various brain disorders**
10-30%
 - **Reduced intelligence**
30-100%

Iodine deficiency and IQ-index

Intellectual development of children living in areas with different iodine software
(Bleichrodt N., 1989)



— Йодный дефицит

— Нормальное йодное обеспечение

Indicators IQ:
(intelligence quotient)
<25 - Idiot
25-50 - Imbeciles
50-70 - debilizm
70-90 - low intelligence
90-110 - standard
> 110 - high intelligence

Профилактический прием йода позволяет на 15–20% увеличить показатели умственного развития детей (IQ-индекс)