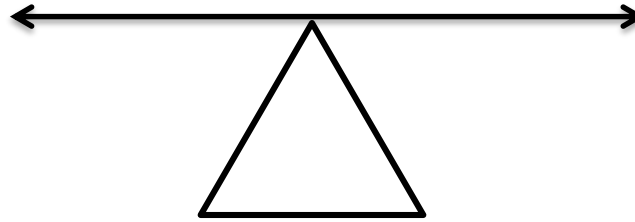


**REGULATION OF FOOD INTAKE
AND NUTRITIONAL STATE**

INTAKE



OUTPUT

CENTER OF SATIETY



CENTER OF HUNGER

(permanently active)

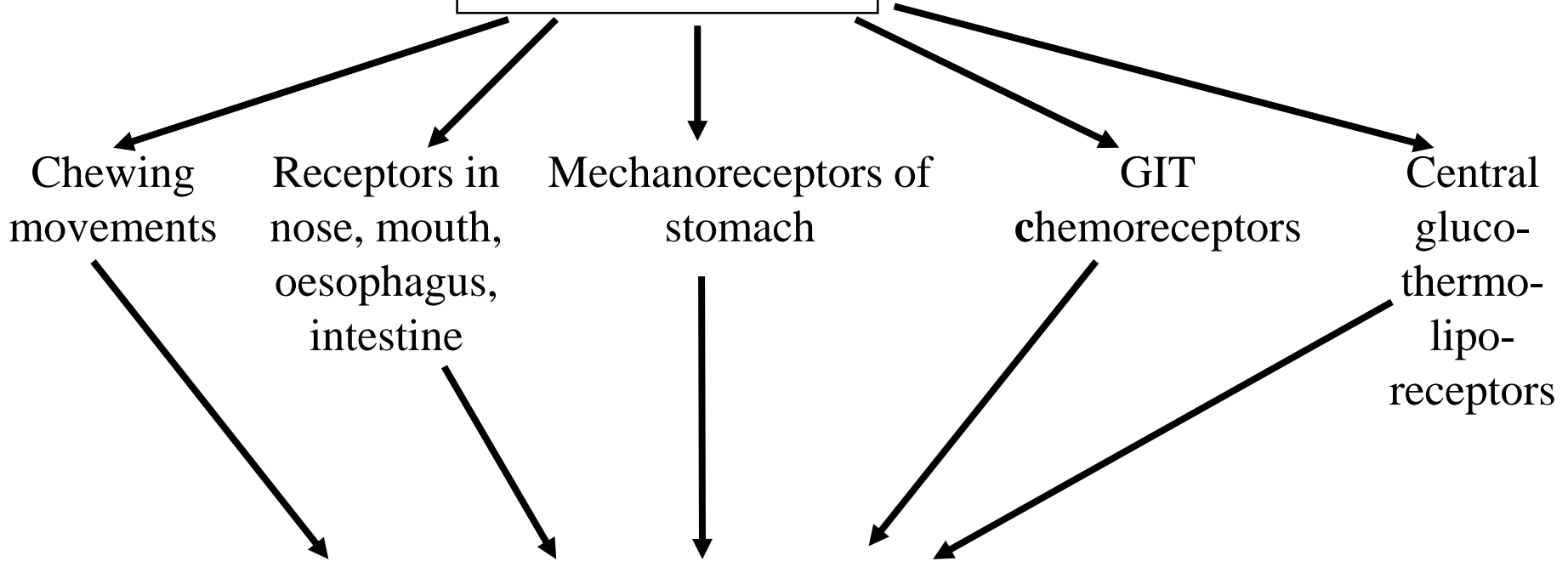
ncl. ventromedialis in hypothalamus

lateral hypothalamus

(nucleus under fasciculus telencephalicus medialis)

FEELING OF SATIETY

FOOD INTAKE



COMPILING THE INFORMATION IN CNS
(CENTER OF SATIETY = ncl. ventromedial in hypothalamus)

PRERESORPTIVE FEEDING

SATIETY

RESORPTIVE FEEDING

FEELING OF HUNGER

LACK OF FOOD

Hungry
contractions of
stomach

Decreased
glucose
availability

Decreased
heat
production

Changes of lipid
metabolism

Mechanoreceptors

Glucoreceptors

Internal thermoreceptors
(hypothalamus)

„Liporeceptors“

HUNGER

SHORT-TERMED REGULATION

LONG-TERMED REGULATION

Compensation of dietary mistakes

REGULATION OF FOOD INTAKE

HYPOTHESIS:

1. Lipostatic
2. H. of GIT peptides
3. Glucostatic
4. Thermostatic

OREXIGENIC FACTORS

- Neuropeptide Y
- Orexin A and B (hypocretin 1 and 2)
- Hormon concentrating melanin
- ARP (agouti-related peptide)
- Ghrelin (lenomorelin) – s.-c. hormone of hunger (released from „empty“ stomach)
- Insulin
- Sugars (fructose)

ANOREXIGENIC FACTORS

- POMC – derivative MC4-R
- CRH (corticoliberin)
- CART (cocaine- and amphetamine-regulated transcript)
- Peptide YY (pankreatic peptide; L-cells in ileum and colon, suppresses gastric motility, increases absorption)
- CCK (cholecystokinin)
- glucagon

MEDICAMENTS !!!

LEPTIN (ob-protein)

Secreted by adipocytes into the blood

Binding proteins

Effect on CNS (regulation of body mass and stability of adipose tissue)

- Pulsative and diurnal character of plasmatic levels
- Free and bound form (in serum)
- SLIM PEOPLE HAVE 2x MORE OF BOND FORM THAN OBESE PEOPLE
- LEPTIN REZISTANCE: often in obese patient with insulin resistance

RECEPTORS from cytokin family

- **Peripheral** (gonads)
- **Central** (hypothalamus, pituitary)

Transduction system is not elucidated

Modulates expression of genes for estrogens.

Regulation of obesity by leptin mediated by NPY and MSH.

Leptin controls adipose tissue by coordination of food intake, metabolism, autonomous nervous system and energy balance.

ADIPOSE TISSUE

LEPTIN RESISTANCE

LOSS OF BODY MASS

INCREASE OF BODY MASS

- LEPTIN

+LEPTIN

HYPOTHALAMUS

HYPOTHALAMUS

NPY

MSH

MSH RECEPTOR

NPY RECEPTOR (Y1, Y2, Y5)

POMC derivatives (MC4-R)

RESPONSE TO FASTING

RESPONSE TO OBESITY

- + Food intake
- Reproduction
- Temperature
- Energy expenditure

**PARASYMPATHETIC
ACTIVITY**

- Food intake
- + Energy expenditure

**SYMPATHETIC
ACTIVITY**

EXAMINATION METHODS

ANTROPOMETRIC METHODS

Inspection

Body mass (kg)

BMI

Waist circumference, waist-to-hip ratio

Percentage of body fat (calliper, impedance methods, densitometry, CT)

Percentage of ABM (% , underwater weighting)

Measurement of big muscle groups

BIOCHEMICAL METHODS

Total nitrogen balance

Loss of nitrogen in urine

Plasmatic values of proteins

Incorporation of AA

Plasmatic levels of prealbumins, transferin

Levels of vitamins or their metabolites in urine...

IMMUNOLOGICAL METHODS



NUTRITION

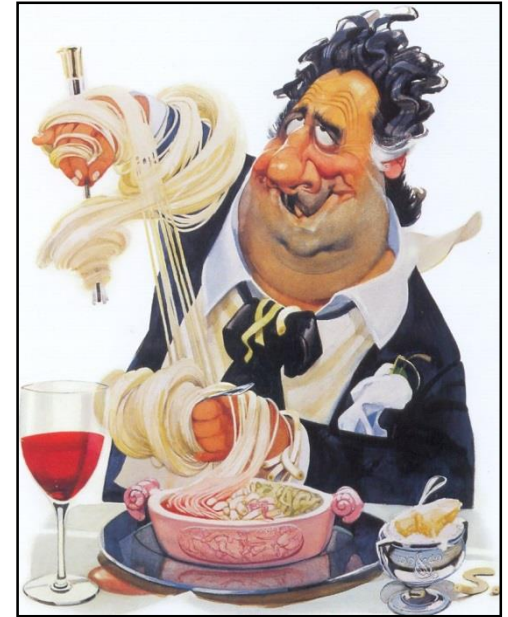
RECOMMENDED
SPECIAL DIETS

ASPECTS: evolutionary
 religious
 historical

PRINCIPLES OF RECOMMENDED NUTRITION

- Quantity
- Quality
- Special components
- Aesthetics
- Economy

Essential components in nutrition:
AA, FA, vitamins...



Nutritional habits: cultural and historical aspects
 social and economical

OBESITY (OVERWEIGHT)

Pathological increase of body mass caused by enormous increase of body fat with serious complications.

INCIDENCE

2008 in CR: **52%** population with higher body mass (35% overweight, 17% obesity), age over 45 – only 30% of population has normal body mass (men – 72% vs. women – 60%)

The percentage of children with obesity increases !!! (2014: 24% boys, 23% girls)

TYPES OF OBESITY:

ALIMENTARY (EXOGENOUS) – overeating
SECONDARY, SYMPTOMATIC

REASONS OF OVEREATING

Family habits vs. GENETIC PREDISPOSITION

Free food

Psychic disorders (depression, food intake disorders)

Religious reasons

Frequency of obesity negatively correlates with education



PROBLEMS RELATED TO OBESITY

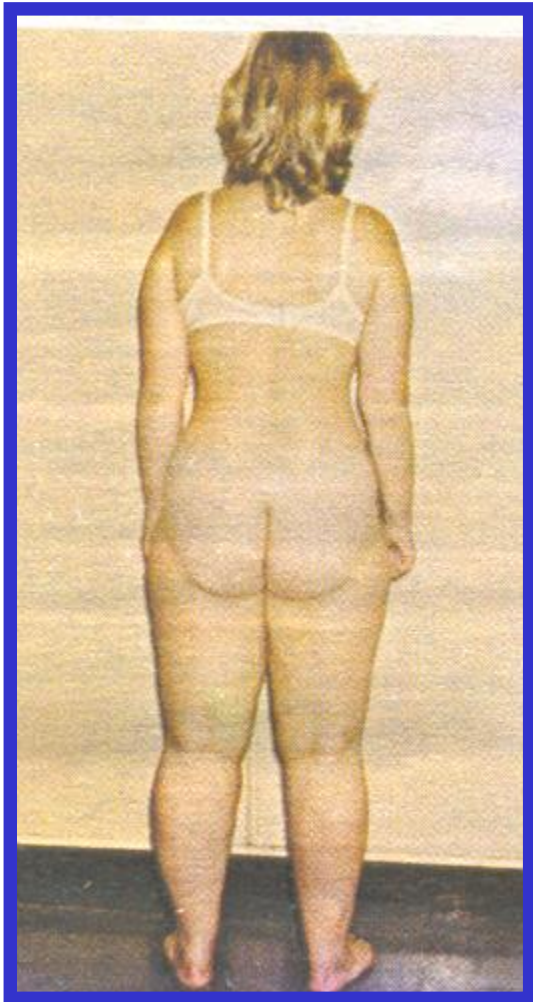
1. Non-agreeable appearance (social isolation, partnership problems, problems to find a corresponding job...)
2. Economical problems (increased expenses for food)
3. Early deterioration of joints (knees, hips, backbone)
4. Varices, thromboses, embolization
5. Diabetes mellitus
6. **Dyslipidemia**
7. **Hypertension**
8. **Myocardial infarction**
9. **Brain stroke**
10. Malignant tumors !!!
11. Fertility disorders (potency, period)

+ RISK BEHAVIOUR

Fat people die earlier, have worse life and suffer by number of vexatious diseases

FAT DISTRIBUTION

- **Diffuse** (creeping start of obesity)
- **Android** (high incidence of DM – type „apple“)
- **Gynoid** (type „pear“), special type - steatopygia





Madelung collar



Strie

SECONDARY OBESITY

- **Hypercorticalism**
- **Male hypogonadism**
- **Prolactinom**
- **Hypothalamic obesity**

THERAPY OF OBESITY

PREVENTION

1. Restriction of food intake

In men below 11 000 kJ/day, in women – below 8 000 kJ/day

Restriction of saccharides (INZ – antilipophilic hormone), restriction of lipids (sometimes „lipid“ day). NO – salt, spice, alcohol, caffeine.

2. Increase of energy expenditure by physical activity

Activity causing increase of HR up to 140-150/min.

Cyclic, swing movements (basic gymnastics)

Swimming in warm water.

3. Additional methods

Anorectics

Hormones of thyroid gland

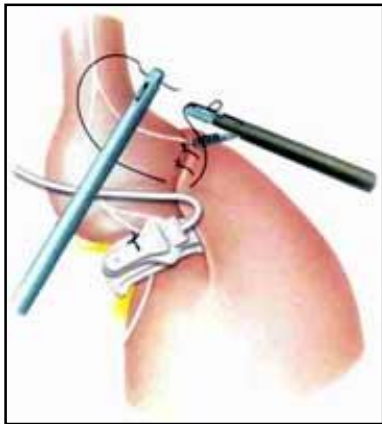
Spa

Psychotherapy

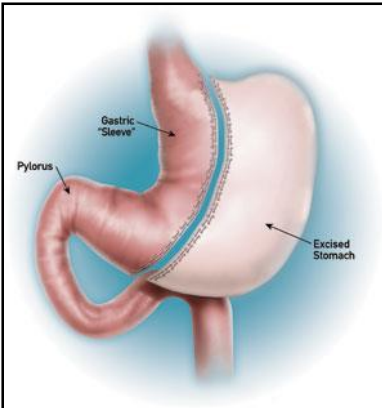
Surgical methods – BARIATRIC SURGERY



INTRAGASTRIC BALOON



STOMACH BANDING



SLEEVE-RESECTION OF STOMACH