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# **Obesity. Cachexia.**



Sabina Pálová



# Obesity

# Definition

- ▶ **Obesity** = excess of adipose tissue
  
- ▶ **More than 33% in women** (31-33% borderline)
- ▶ **More than 25% in men** (21-25%)
- ▶ adiposity-based chronic disease (ABCD)- 2016
- ▶ Increase caloric intake + sedentary lifestyle + genetic predisposition → accumulation of fat -  
**consequences!!!**

# Definition

- Most frequent evaluation: *body mass index (BMI)*
- weight/ height<sup>2</sup> (v kg/m<sup>2</sup>)  
(normal 18.5 - 24.9)

BMI over 30 – obesity

# Classification

- ▶ Důsledky pramenící z obezity narůstají při BMI nad 25
- ▶ Overweight – pre-obesity : BMI **25-29.9**
- ▶ Obesity grade 1: 30.0-34.9
- ▶ Obesity grade 2: 35.0-39.9
- ▶ Obesity grade 3: 40.0 or more ( severe or morbid)

# Distribution of fat tissue

- Waist circumference : >80cm (>88cm) women  
>94cm (>102cm) men

- Asian population 74/85 cm, 23,0 BMI

- Waist /hip ratio : > 0,9 women  
> 1,0 men

- Risk of metabolic disorders

# Distribution of fat tissue

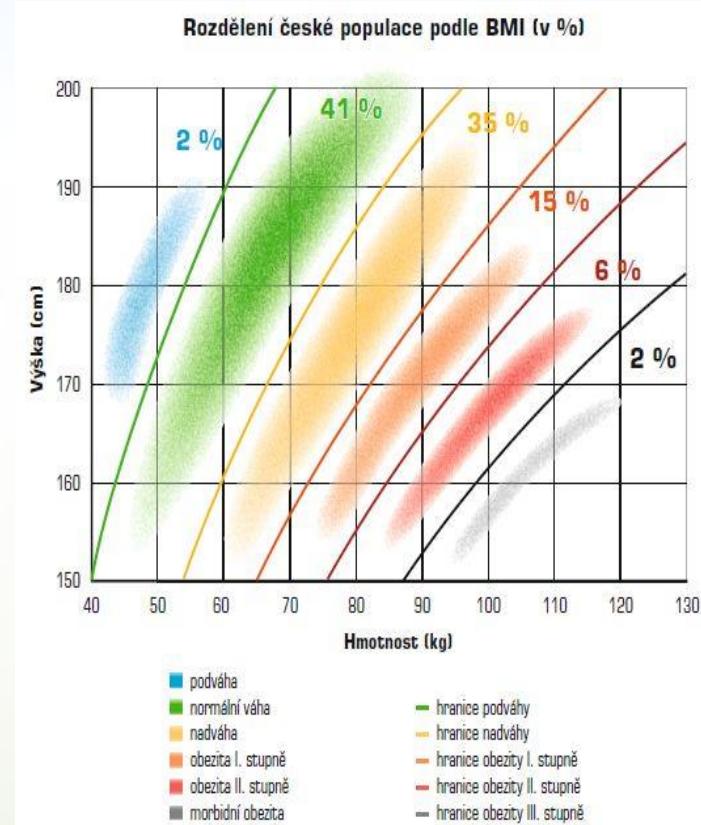
- ▶ Intraabdominal and abdominal subcutaneous fat tissue
  - **android type**
- ▶ **gynoid type** - hip, femoral dominant

# Distribution of fat tissue

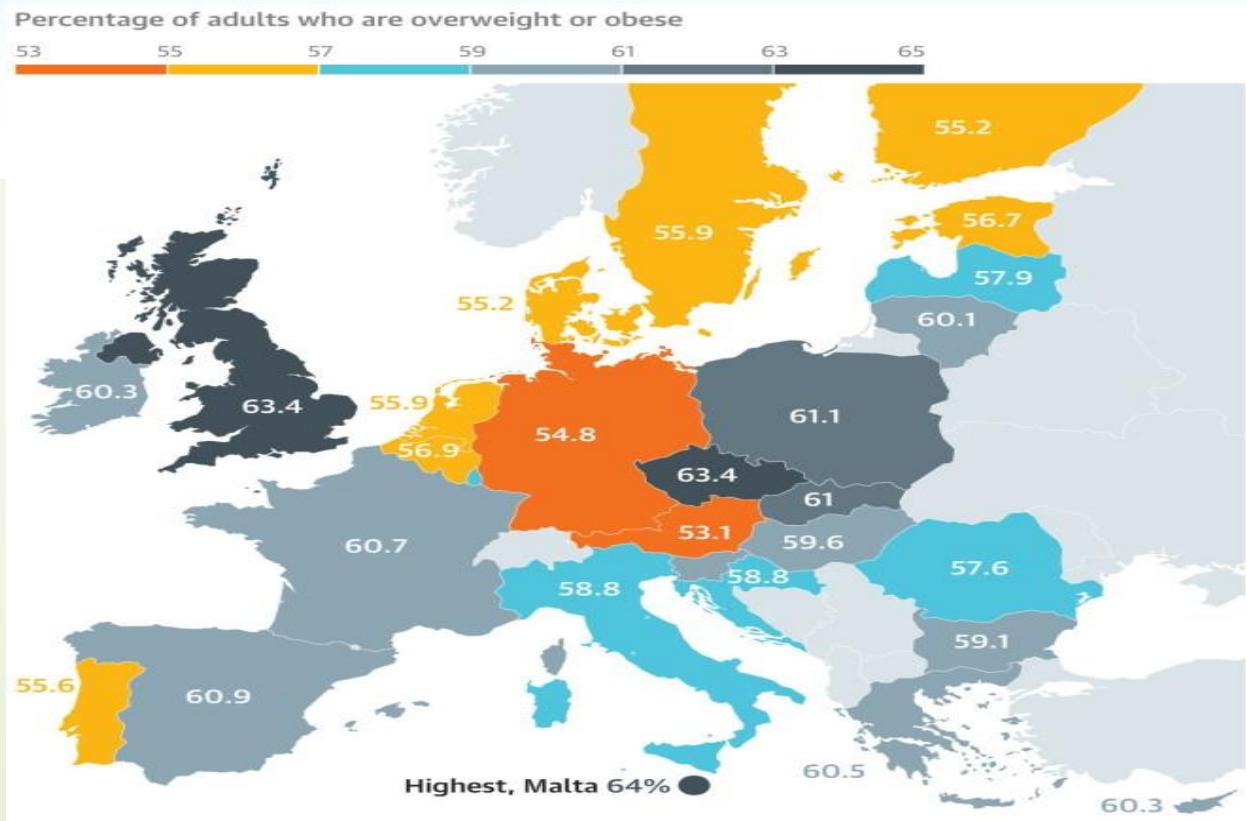


# Prevalence

- ▶ 2010 - 150 millions of adults, 15 millions of children
- ▶ ČR: 2011 – 2008:
- ▶ Overweight 35%
- ▶ Obesity 23%



# Europe



# Health costs

- ▶ Obesity treatment in ČR na **12,1 miliard Kč, 0,3 % HDP**

## Back pain, ischemic heart disease, DM 2. – highest cost

U.S.- \$190.2 billion per year,  
or 20.6% national health expenditures

Compared with a nonobese person, an obese person incurs \$2741 more in medical costs (in 2005 dollars) annually.



# Mortality

- ▶ BMI  $\geq 30$   50 – 100% ( 20-25)
- ▶ 4x KV, 2x oncologic disease
- ▶ Ideal BMI 23-25 whites, Asians, 23-30 for blacks
- ▶ BMI 40 –life expectancy is reduced by as much as 20 years in men and by about 5 years in women
- ▶ Over 75 years
- ▶ ICU patients BMI  $\geq 35$

# Examination

- ▶ 1. History
- ▶ a) FA
- ▶ b) OA: „weight history“, maximál weight, diets, eating habits, physical aktivity
- ▶ c) drugs
- ▶ d) 30% eating disorders



# Examination

- d) comorbidities: DM, hypertenze, dyslipidemia, endokrinopatie, KV disease, respiratory disease, cholecystolithiasis, artrosis

- 2. Physical examination:
- a) symptoms of diseases (xanthelasma, dyspnoe...)
- Cutaneous - intertriginous rashes from skin-on-skin friction; also search for hirsutism in women, acanthosis nigricans, and skin tags, which are common with insulin resistance secondary to obesity



# Examination

- b) BMI, waist/hip ratio
- c) antropometrie: skinfold thickness- kaliper, arm circumference
- d) quantification of obesity: **densitometry, bioimpedance, CT -L4/5, MRI**

# Types of obesity

- ▶ Primary obesity -95%
- ▶ Secondary obesity – 5%

# Secondary causes

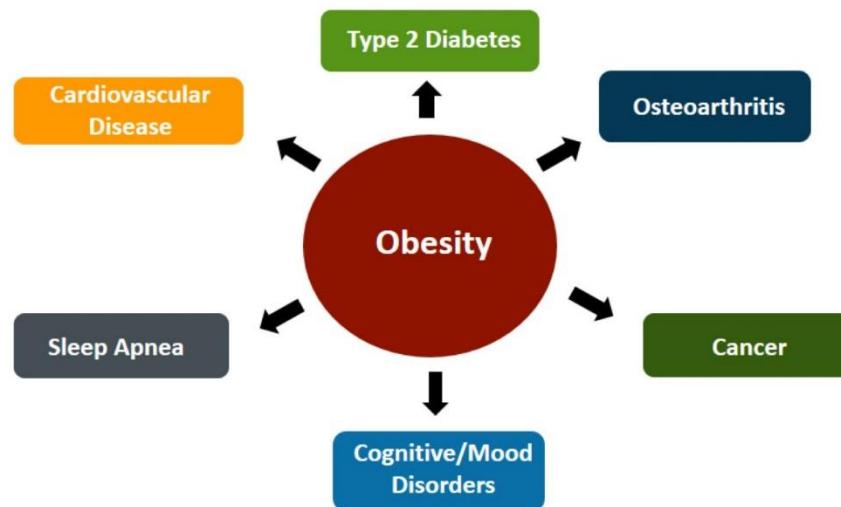
Figure 2

## Secondary Causes of Obesity

1. Hypothyroidism
2. Cushing's syndrome
3. Insulinoma
4. Hypothalamic obesity
5. Polycystic ovarian syndrome
6. Genetic syndromes such as Prader Willi, Alstroms, Bardet Biedl, Cohens, Borjeson Forssman Lehmann and Frohlich's syndrome
7. Growth hormone deficiency
8. Oral contraceptive use
9. Pregnancy
10. Medication related: including phenothiazines, sodium valproate, carbamazepine, tricyclic antidepressants, lithium, glucocorticoids, megestrol acetate, the thiazolidine diones, the sulphonylureas, insulin, adrenergic antagonists, serotonin antagonists especially cyproheptadine.
11. Smoking cessation
12. Eating disorders: especially binge eating disorder, bulimia nervosa and night eating disorder
13. Hypogonadism
14. Pseudohypoparathyroidism
15. Tube feeding related obesity

# Complications

Obesity as a Risk Factor for (and Multiplier of) a Range of Comorbid Conditions<sup>[a,b]</sup>



a. Pi-Sunyer X. Postgrad Med 2009;121:21-33.

b. Calle EE, et al. *N Engl J Med* 1999;341:1097-1105.

# Aims of therapy

- Weight loss 5-10% / 6 months
- Greater loss BMI  $\geq 35$
- Overweight : prevention of gain weight vs. reduction
- Obesitology



# Conservative therapy

- 1) diet
- 2) physical activity
- 3) behaviour therapy, psychotherapy
- 4) pharmacotherapy
- 5) elimination of risk factors

# Therapy of risk factors

- ▶ 1) art. hypertension
- ▶ 2) compensation of diabetes
- ▶ 3) OSA
- ▶ 4) dyslipidemia
- ▶ 5) psychosocial factors , PPP, afective disorders, body image
- ▶ 6) arthrosis, pain

# Diet

- ▶ Diet 7500 kcal - decrease ~1kg/week
- ▶ deficit 1000 kcal/d – decrease ~1kg/week
- ▶ Obese , men – higher basal metabolism → higher weight loss
- ▶ Chronic caloric restriction → metabolic turnover is decreased (adaptation)

## 2.Diet

- ▶ VLCD (very low calorie diet) – doctor control
- ▶ Short time
- ▶ Contraindication: DM (insulinotherapy), liver, renal disorders, pregnancy and breast feeding.

# Physical activity

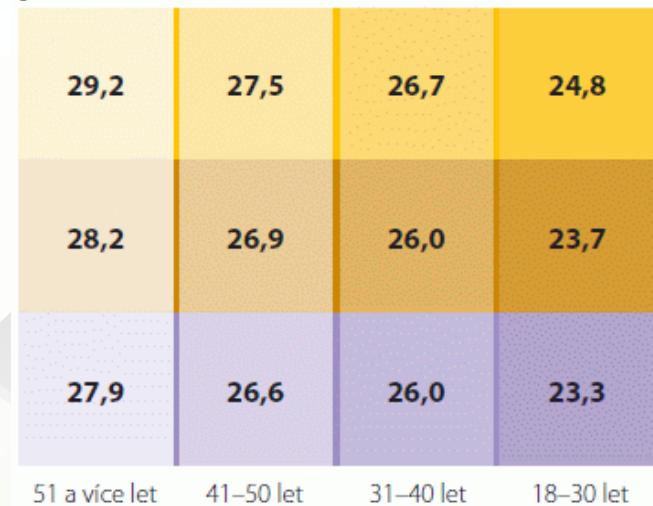
- Fit fat vs. unfit unfat – CVD mortality
- Decrease BP, insulinoresistance, lipid metabolism
- REE
- Anxiety, depression
- Diet adherence



# Physical activity

- Ownership of car vs. bicycle vs. dog
- Preventive character
- Sedentary job vs. active sport

BMI podle věku a sportovní aktivity provozované v mládí



Legenda:

- v mládí nesportoval(a)
- v mládí sportoval(a) rekreačně, nepravidelně
- v mládí sportoval(a) vrcholově, výkonostně

ZDROJ: STEM/MARK, Obezita 2008

# Physical activity

- **30-60 minutes daily**
- **Regular physical activity**

Čas strávený pohybovou aktivitou za týden podle intenzity

Legenda: ■ vůbec ■ méně než 1 hodinu ■ 1-2 hodiny ■ 2-4 hodiny ■ 4-8 hodin ■ více než 8 hodin



ZDROJ: STEM/MARK, Obezita 2008

# Pharmacotherapy

- ▶ BMI  $\geq 30.0$  nebo 27.0 + complications
- ▶ Non respondents after 3 months



The overall US obesity prescription drug market is growing with seasonal patterns of utilization



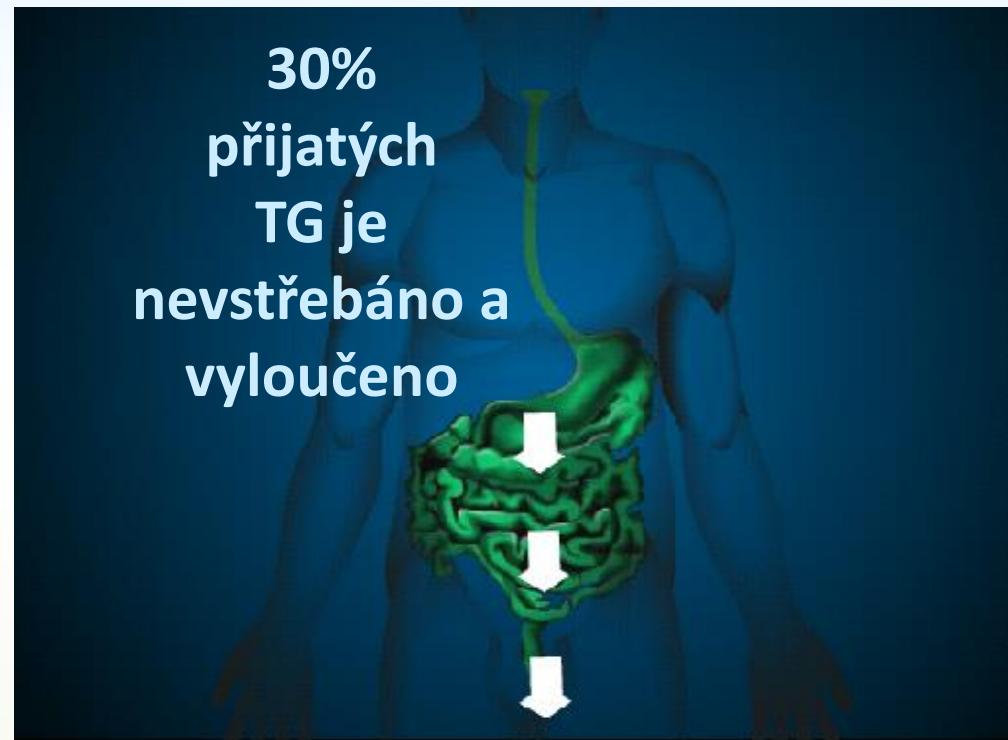
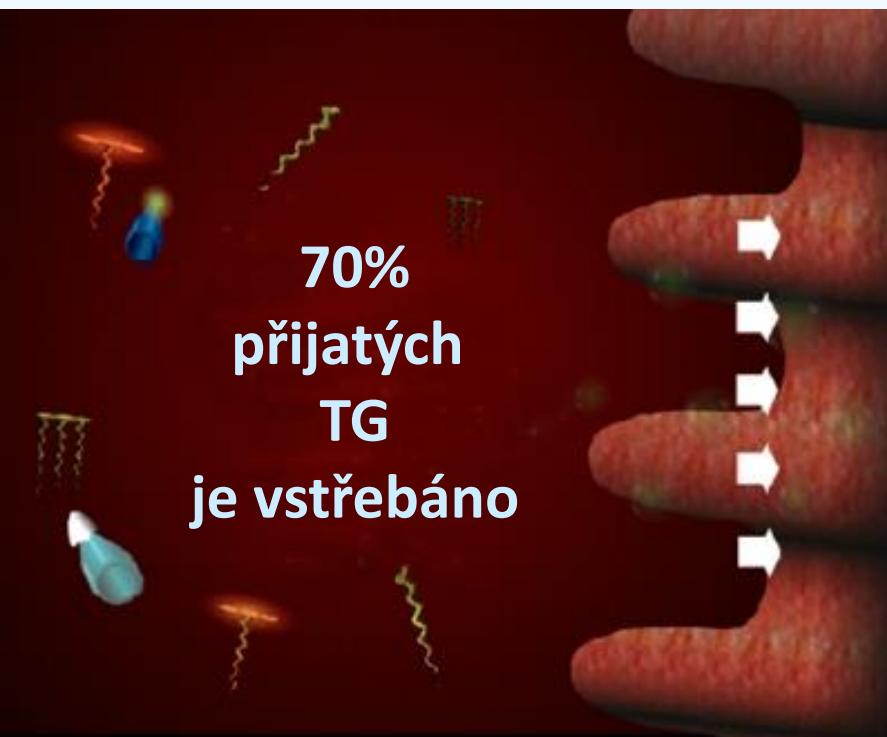
Source: IMS Health NPA Monthly and Analytics Link

# Pharmacotherapy

- ▶ a) **phentermine** (Adipex retard) – amphetamine-like, central effect with appetite decrease , severe side effects
- ▶ b) sibutramin (Meridia, Lindexa)
- ▶ c) **orlistat** (Xenical)
- ▶ d) prospektivní medikace
- ▶ e) Mysimba ( naltrexon, bupropion)

# Mechanism of action of orlistat

## - inhibition of intestine lipase



Orlistat decrease absorption ~ 30% diet fat

# Orlistat

- ▶ = inhibitor of pancreatic lipases → fat malabsorption
- ▶ ↓LDL, ↓ level insulin
- ▶ GIT side effects: fatty, oily stools, flatulence, fecal incontinence, urgent bowel movements, decreased absorption of fat-soluble vitamins

# Mysimba

- ▶ BMI nad 27 + complications or more than 30
- ▶ KI: liver disease, depressive disease, IMAO therapy, high blood pressure , history of seizures
- ▶ Naltrexon/bupropion – reduced food craving
- ▶ Average decrease -7,8kg/ vs. 1,8 kg (10%)



# Surgery - bariatric surgery

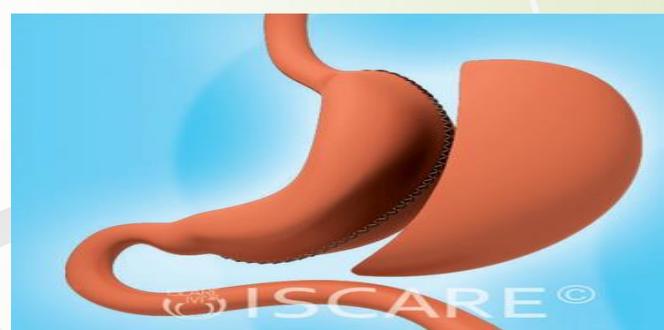
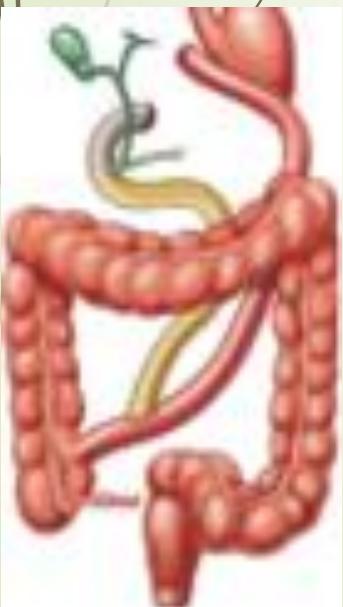
## 1) Restrictive

Adjustable gastric banding  
(laparoscopic surgery)

(indication BMI > 35, BMI lower with complications, failure of conservative treatment )

Gastric sleeve surgery

Gastric plication



## 2) Malabsorptive

Biliopancreatic diversion



# **Malnutrition**



# Malnutrition

- ▶ imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions.

# Etiology

- ▶ 1. anorexia
- ▶ 2. maldigestion
- ▶ 3. malabsorption
- ▶ 4. increased losses
- ▶ 5. decreased anabolismus
- ▶ 6. increased catabolismus

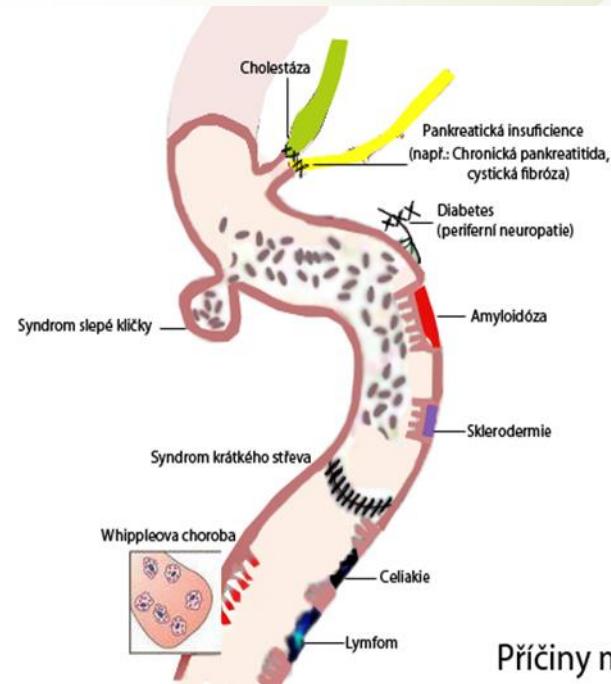
# Anorexia

- ▶ Chronic diseases
- ▶ Tumors
- ▶ Organ failures (renal, liver, heart)
- ▶ Anorexia nervosa
- ▶ Drugs



# Maldigestion + malabsorption

- ▶ Gastrectomy
- ▶ Pancreatic, biliary disorders
- ▶ Enzymatic deficiency
- ▶ Fistulas
- ▶ SBS
- ▶ Enteropathy



# Increased loses

- ▶ Fistulas
- ▶ Nephrotic syndrom
- ▶ Wounds



# Decreased anabolism

- ▶ Chronic diseases (liver, ...)
- ▶ Metabolic disorders

# Increased catabolism

- ▶ Sepse, trauma, surgery
- ▶ Tumors

# Malnutrition

- ▶ proteino-energetic= marantic type (simple starvation)
- ▶ protein malnutrition = kwashiorkor  
(stress starvation)

# Adaptation for starvation

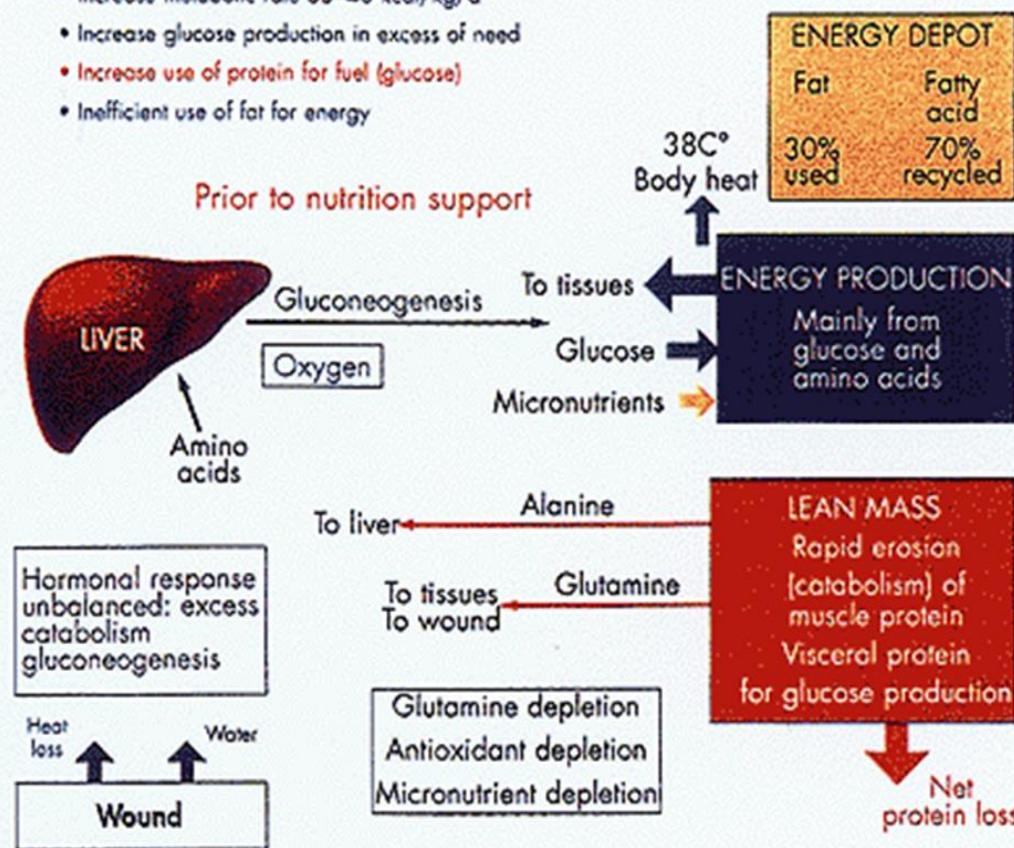
- ▶ **A. Simple starvation :**
- ▶ **Up to 72 hours:** liver + muscle glycogen (glycogenolysis), ↑ gluconeogenesis, ↑ lipolysis, ↑ proteolysis
- ▶ **After 72 hours :** ↓ basal and total metabolism (up to 40%), ↓ physical activity, ↓ thyroidal hormones , ↑ lipolysis → FFA→ ketone bodies (energy – brain!)

# Adaptation for starvation

Medscape® [www.medscape.com](http://www.medscape.com)

## Catabolic Insult-Induced Protein-Energy Malnutrition (Protein and Energy Production Abnormal)

- No adaptive responses activated
- Increase metabolic rate 35–40 kcal/kg/d
- Increase glucose production in excess of need
- Increase use of protein for fuel (glucose)
- Inefficient use of fat for energy

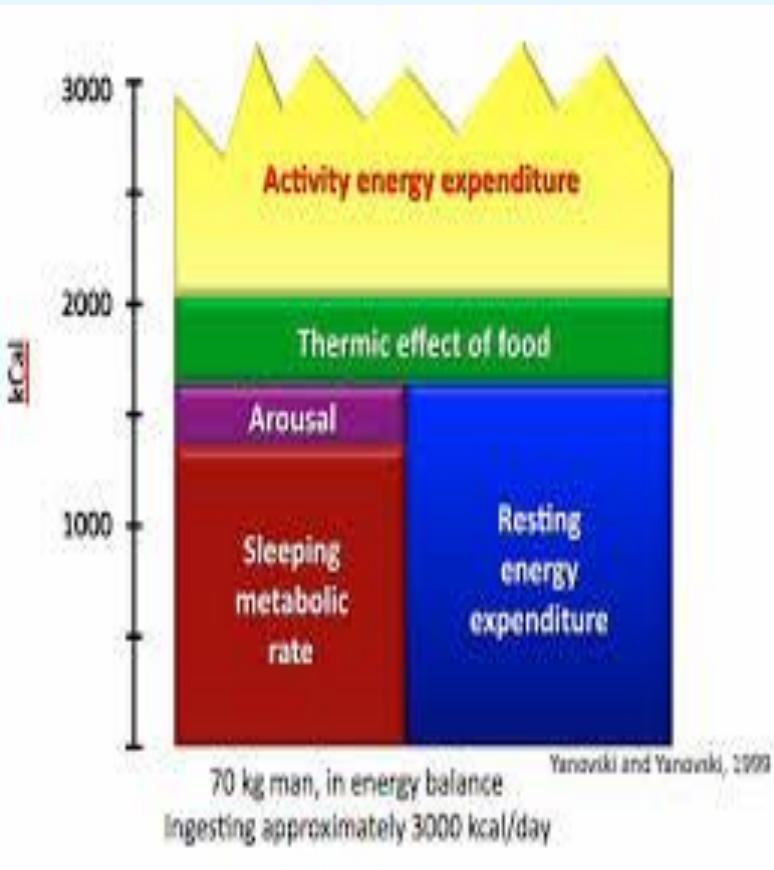


- ▶ **B. Stress starvation:** (trauma, infection etc.)
- ▶ Proteino-catabolic reaction, hyperglycemia, degradation of muscle mass
- ▶ Insufficient oral intake
- ▶ ↓ albumin, hypo-proteinemic edemas → intravascular hypovolemia → hypotension

# Incidence of malnutrition

- 1) Older patients 50 %, home for elderly 40-70%
  - 2) Chronic respiratory disorders 45 %
  - 3) Inflammatory bowel disease 80 %
  - 4) Tumors 85 %
  - 5) Critical care patients 65 %
  - 6) Population 10-30%
  - 7) 30% development during hospitalization—iatrogenic
- 3-4% cause of death !! ( 2000-3000/year) - avian flu

# Energy needs



## Calculate caloric needs

kcal/ kg BW

25	30	35	40	45
Bed rest	Sedentary/very light activity	light activity	moderate activity	heavy activity

- Estimate total caloric requirement (TCR) per day according to level of activity

From the presentation of Dr. Gabriel Jasul

# Protein needs

► Healthy adult

**0,8-1,0g/kg/day ( 56-70g)**

► Healthy elderly

**1,0-1,2 g/kg/day ( 70-84g)**

► Surgery

**1,5g/kg/day (105g)**

► Onkologic patients

**1,5-2,0 g/kg/day (105-140g)**



# Diagnoses

- ▶ Nutritional status, time of changes, ability of food intake, comorbidities
- ▶ Score, questionnaire .....
- ▶ Anamnesis
- ▶ Physical examination (TK, TF, TT, ....)
- ▶ Anthropometry – BMI, MAC,.....

## • Decrease of appetite:

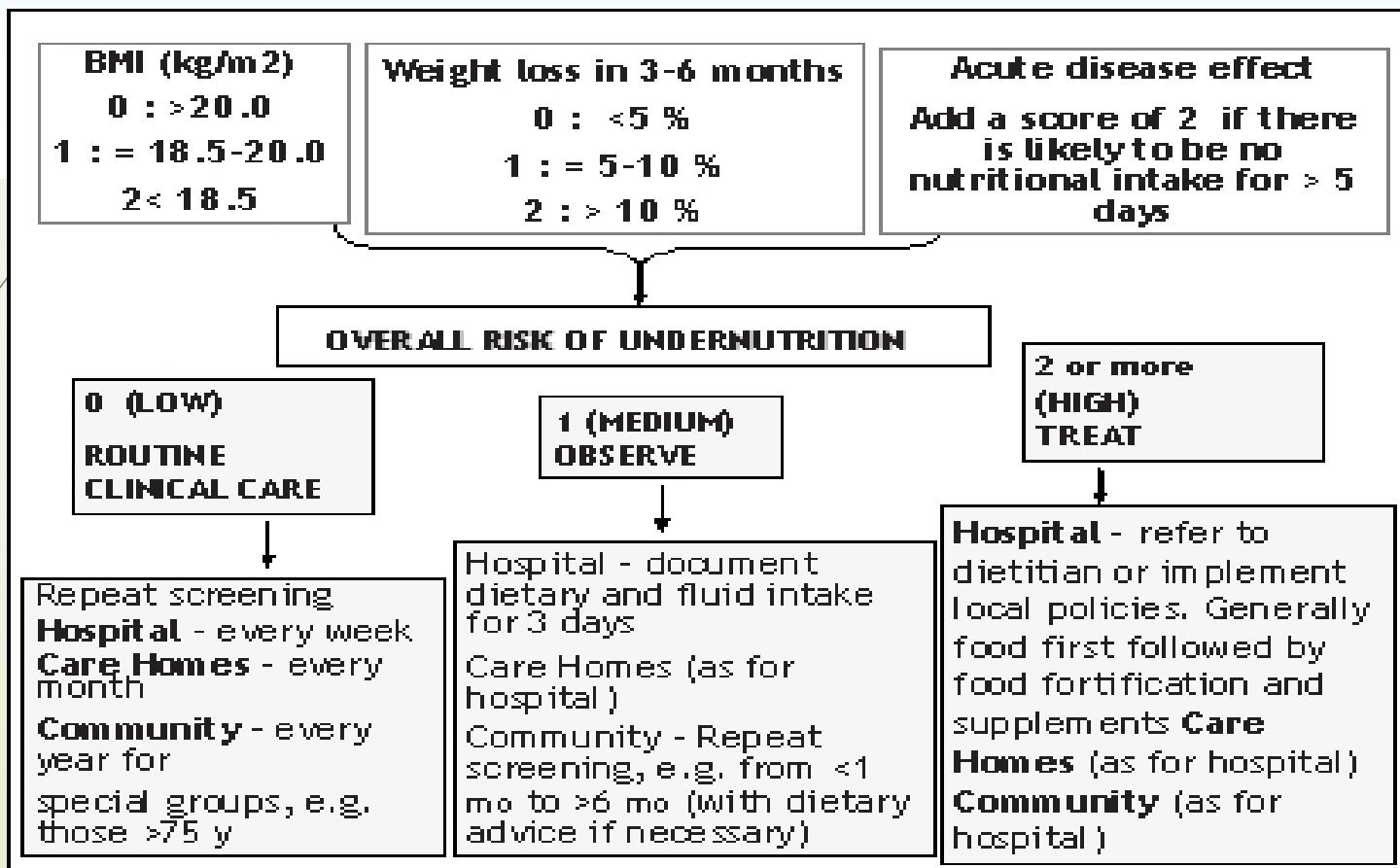
- Psuedoephedrin,
- Theophyllin,
- Chemotherapy
- Antibiotika
- Antikonvulzíva
- Opiáty
- Benzodiazepiny, TCA
- Metformin
- Digoxin, kličková diureтика,....

## • Increased of appetite :

- NSAIDS, "Megace" a antihistaminika

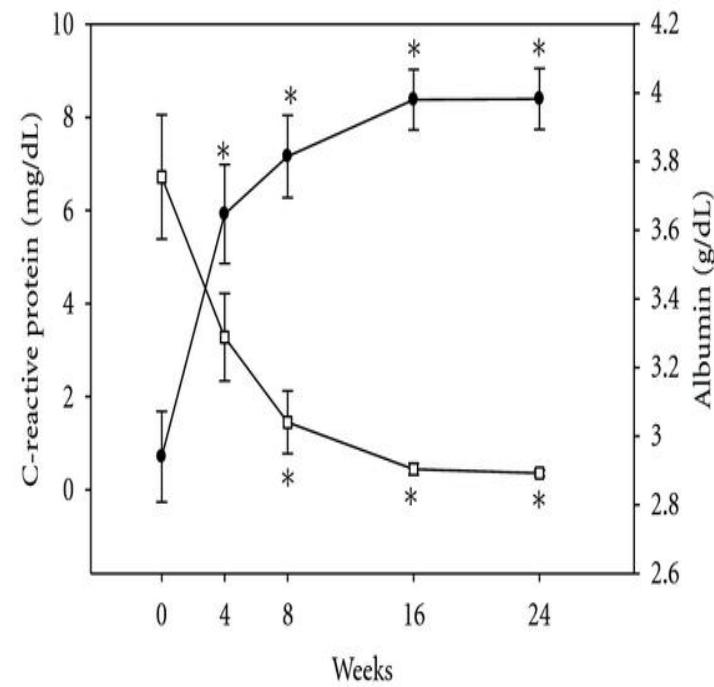


# Screening



# Laboratory examination

- ▶ Prealbumin, transferin  
(short halflife → changes !!)
- ▶ CRP
- ▶ Kreatinin (~ renal function , muscle mass)
- ▶ Urea, Na, K, Cl, P, Mg, Ca, Fe, Se, vitamines(B12, A,D,E)



# Parameters of malnutrition

- ▶ Albumin < 28g/l      transferin <1,5 g/l
- ▶ Prealbumin < 0,1g/l
- ▶ Lymphocytes < 1,5.10<sup>9</sup>/l
- ▶ BMI < 18,5
- ▶ Weight loss > 5% /1 month  
10%/ 6 months

# Impact of malnutrition

Medscape® [www.medscape.com](http://www.medscape.com)

Complications Relative to Loss of Lean Body Mass*		
LEAN BODY MASS (% LOSS OF TOTAL)	COMPLICATIONS (RELATED TO LOST LEAN MASS)	ASSOCIATED MORTALITY (%)
10	Impaired immunity, increased infection	10
20	Decreased healing, weakness, infection	30
30	Too weak to sit, pressure sores, pneumonia, no healing	50
40	Death, usually from pneumonia	100

\*Assuming no preexisting loss.

- ▶ bedsores
- ▶ Wound healing
- ▶ Hospital stay
- ▶ Rehabilitation
- ▶ Cost
- ▶ Increased mortality

# Pharmacotherapy

- ▶ Supplementation of multivitamines
- ▶ Stimulation of appetite ( anabolic) – no influence on mortality, quality of life + relatively important side effects
- ▶ Megace ( gestagen)
- ▶ canabinoides



# Nutritional recommendation

- Physical aktivity dependent
- **25-30kcal/kg**
- NO rebundant food restriction zbytečné |
- Frequent meals, snacks
- Nutritional dense food
- Flatulence causing food, structure of food
- 2x portion of favourite food, sauce + dipping , caloric beverage



# Enteral nutrition ( EV) - definition

- ▶ the provision of nutrients through the GI tract when the client cannot ingest, chew, or swallow food but can digest and absorb nutrients.

# Indication :

**Insufficient oral intake  
+ functional GIT**



# Contraindications

## Absolute:

- 1) Acute abdomen
- 2) Acute bleeding to GIT
- 3) Obstructive ileus

## Relative:

- 1) High output fistula
- 2) Circulatory shock
- 3) Severe diarrhea
- 4) Acute pancreatitis
- 5) Non-treatable vomiting
- 6) Non-compliance (MA)



# Types of application

- 1) Sipping
- 2) Nasogastric tube
- 3) Nasojejunal tube
- 4) Percutaneous endoscopic gastrostomy
- 5) PEJ
- 6) Jejunostomy

# Thank you.

