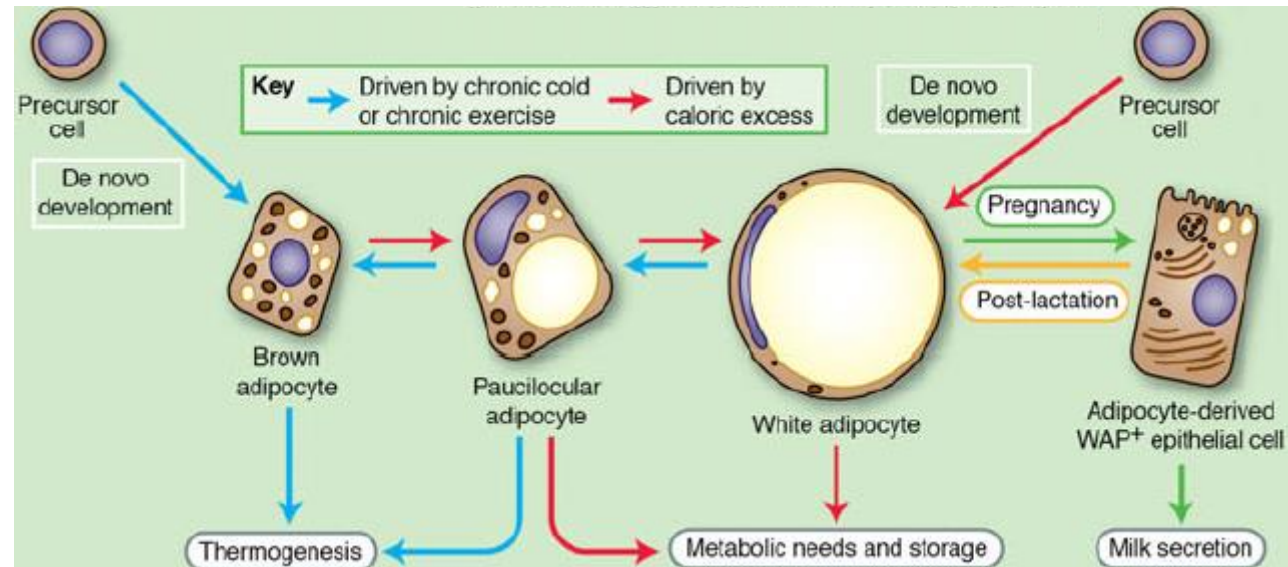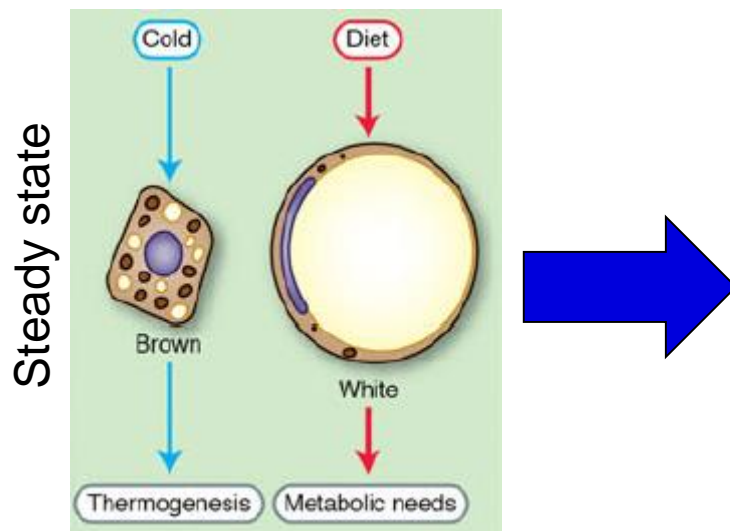# Evaluation of the nutrition state

Adipose tissue

- White (for storing dietary energy as TAGs)

- Brown (for ability to convert chemical energy into heat)

- Beige = harbored

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Fat tissue functions

— Thermogenesis

— Lactation

— Immune responses

— Fuel for metabolism

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Structure of adipose tissue

— Adipocytes

— Non-fat cells:
- — inflammatory cells (macrophages)
- — immune cells
- — preadipocytes
- — fibroblasts

— Connective tissue matrix

— Vascular tissue

— Neural tissue

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Abdominal fat

The abdominal fat is present in two main depots:

— Subcutaneous (80% of all body fat)

— Intra-abdominal (10–20% of total fat in men and 5–8% in women)

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Adipocytes

— New smaller adipocytes act as a buffers. They are more insulin-sensitive and have high avidity for FFAs and TGs uptake, preventing their deposition in non-adipose tissue (SCAT)

— Large adipocytes are insulinresistant, hyperlipolytic and resistant to anti-lipolytic effect of insulin (VAT)

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Clinical and prognostic differences

— Metabolic risks

— Metabolic syndrome

— Vascular risk and cardiovascular events

— Prediction of mortality

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Anthropometric indexes of abdominal adipose tissue mass

– WHR

– Waist circumference
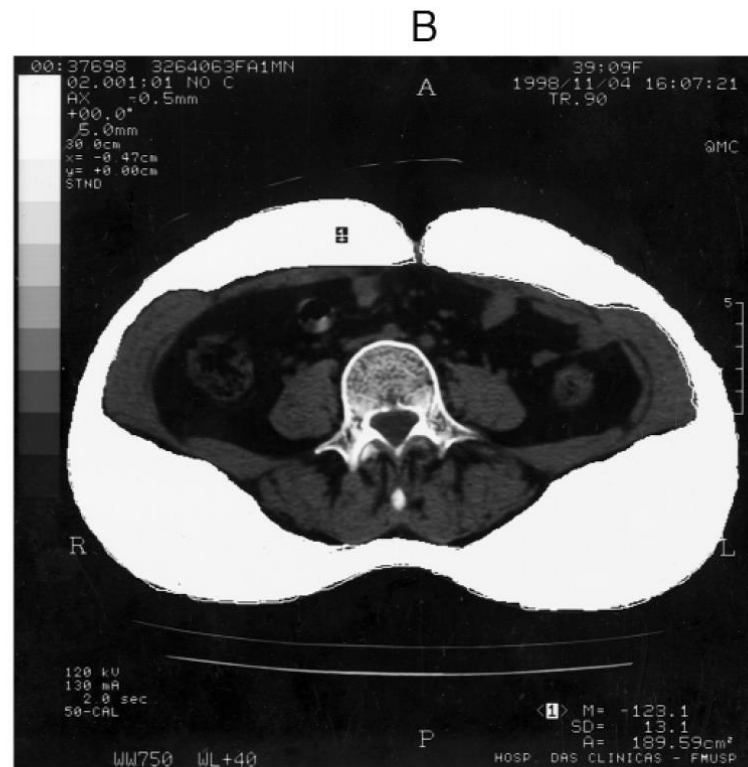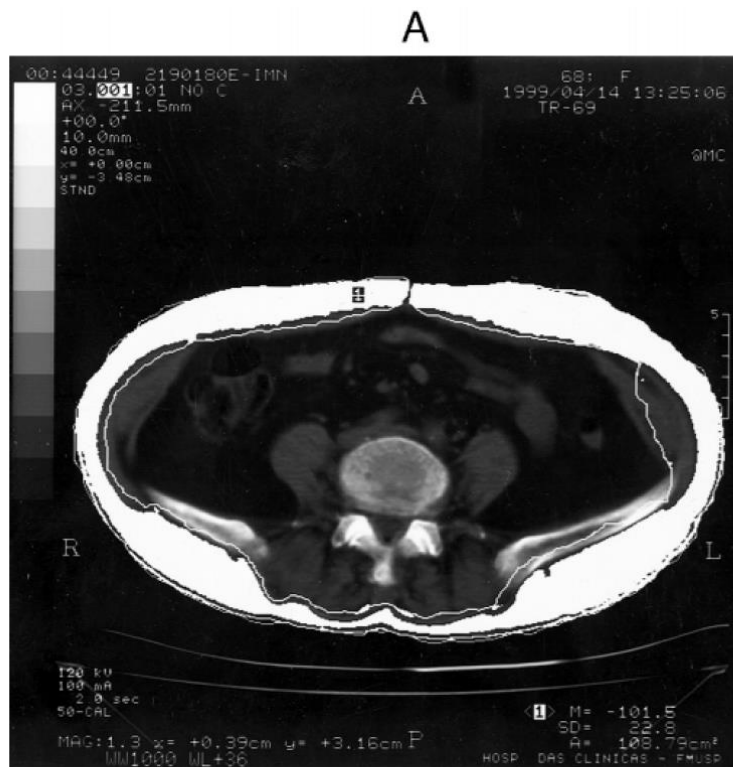
– Abdominal sagittal diameter*
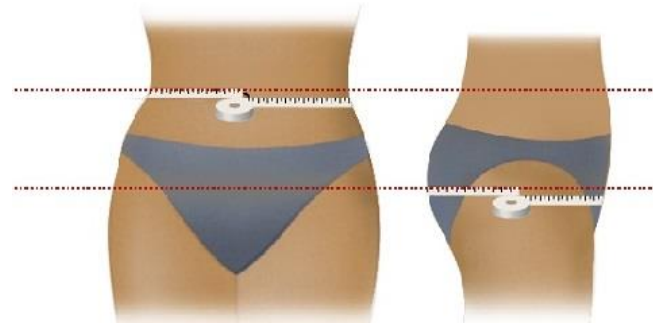
Waist circumference (cm)		
Category	Men	Women
Normal value	≤ 94	≤ 80
Necessity to decrease body mass	95–102	81–90
Medical assistance with decreasing of body mass necessary	> 102	> 90

WHR: for women $\quad < 0.80$

$\quad\quad$ for men $\quad\quad < 1.00$

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Imaging techniques

– Computed tomography (CT)

A   B

– L4 – L5 region

– V/S ratio

– V/S≥0.4 (V group)

– V/S<0.4 (SC group)

Computed tomography showing cross-sectional abdominal areas at umbilicus level in two patients demonstrating variation in fat distribution. A, Visceral type (49-yr-old female, 23.1 of BMI, visceral fat area: 146 cm^2; subcutaneous fat area, 115 cm^2; V/S ratio, 1.27). B, Subcutaneous type (40-yr-old female, 24.0 of BMI, visceral fat area: 60 cm^2; subcutaneous fat area, 190 cm^2; V/S ratio, 0.31).

Abdominal sagittal diameter*

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Imaging techniques

– Computed tomography (CT)

– Magnetic resonance imaging (MRI)

– Ultrasound (US)*

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Bioimpedance measuring

- Bioimpedance spectroscopy (BIS)

- Bioelectrical impedance analysis (BIA)

Indexes calculated from anthropometric parameters

- **Broca´s index (ideal body mass):**
  - ♂: height in cm - 100   or   (height in m)^2 × 23
  - ♀: (height in cm - 100) - 10 %   or   (height in m)^2 × 21

Obesity degree	% ideal body mass
mild	115–129
moderate	130–149
severe	150–199
morbid	> 200

- **Quetelet´s index or body mass index (BMI):**
  - $BMI = \dfrac{body\,weight\,(kg)}{height\,(m)^2}$

BMI (kg.m^{-2})		
Category	Men	Women
Underweight	< 20	< 19
Healthy	20–24,9	19–23,9
Overweight	25–29,9	24–28,9
Obesity	30–39,9	29–38,9
Morbid obesity	> 40	> 39

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