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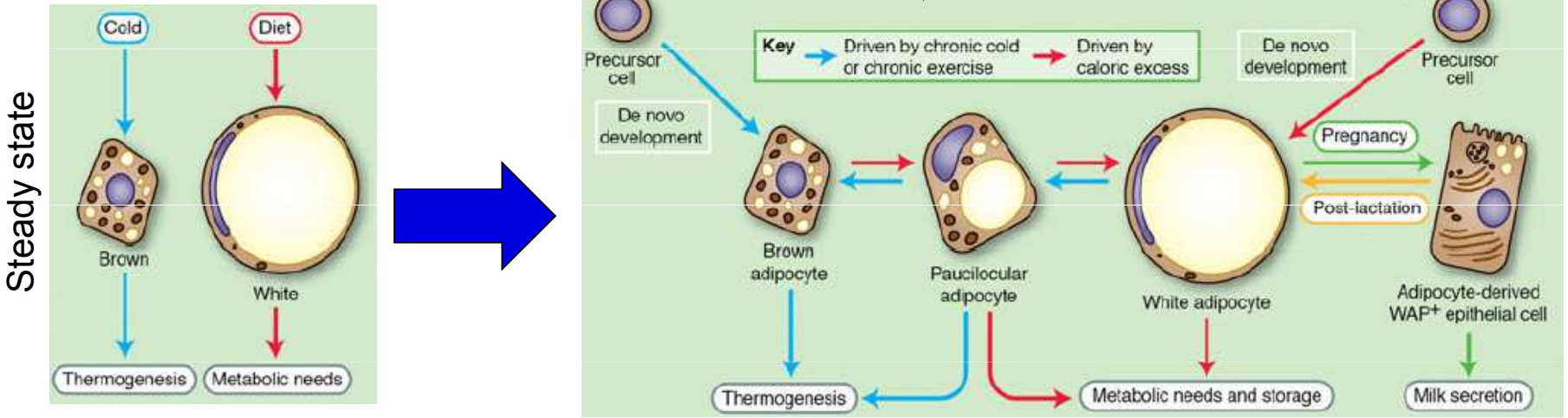
Evaluation of the nutritional state

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

Structure of adipose tissue

- Adipocytes
- Non-fat cells:
  - inflammatory cells (macrophages)
  - immune cells
  - preadipocytes
  - fibroblasts
- Connective tissue matrix
- Vascular tissue
- Neural tissue

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)

Adipocytes

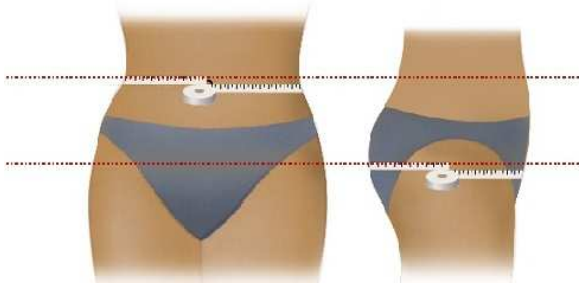
- New smaller adipocytes act as a buffers. They are more insulin-sensitive and have high avidity for FFAs and TGs uptake, preventing their deposition in non-adipose tissue (SCAT)
- Large adipocytes are insulinresistant, hyperlipolytic and resistant to anti-lipolytic effect of insulin (VAT)

Clinical and prognostic differences

- Metabolic risks
- Metabolic syndrome
- Vascular risk and cardiovascular events
- Prediction of mortality

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 < 0.80
for men < 1.00

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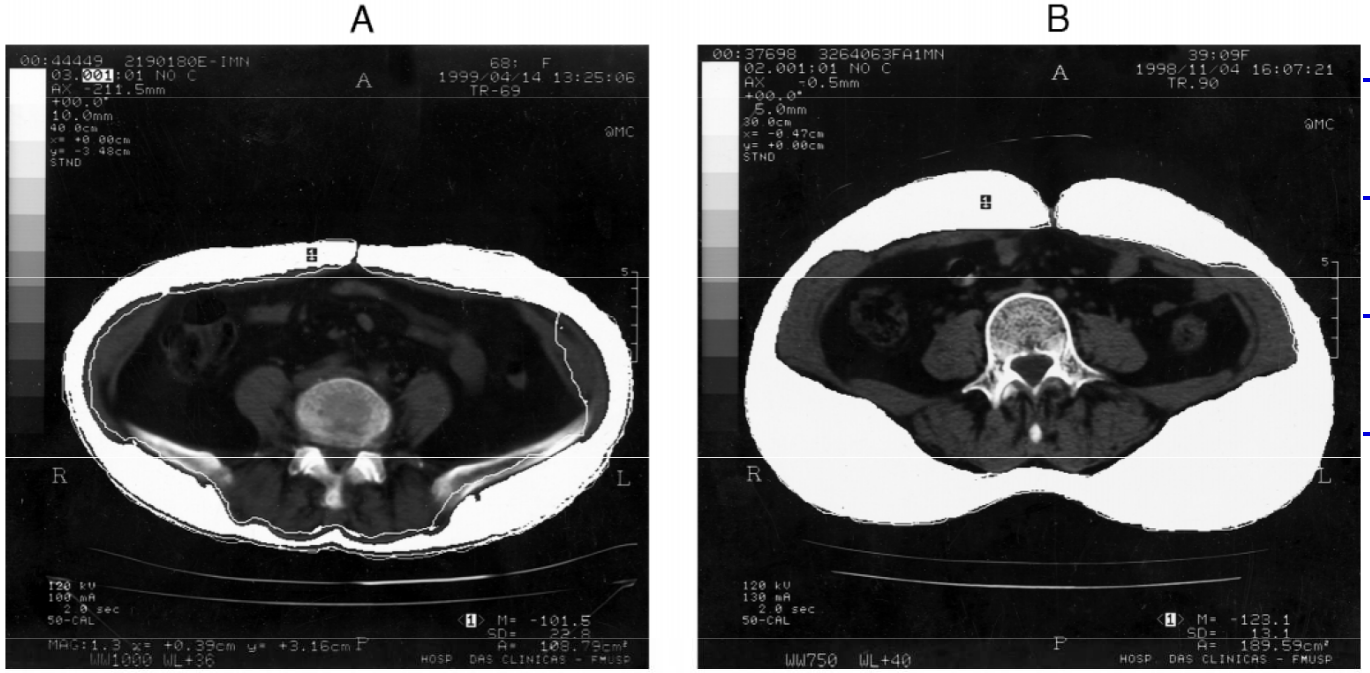
Imaging techniques

– Computed tomography (CT)



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).

– L4 – L5 region
– V/S ratio
– V/S≥0.4 (V group)
– V/S<0.4 (SC group)

*Abdominal sagittal diameter**

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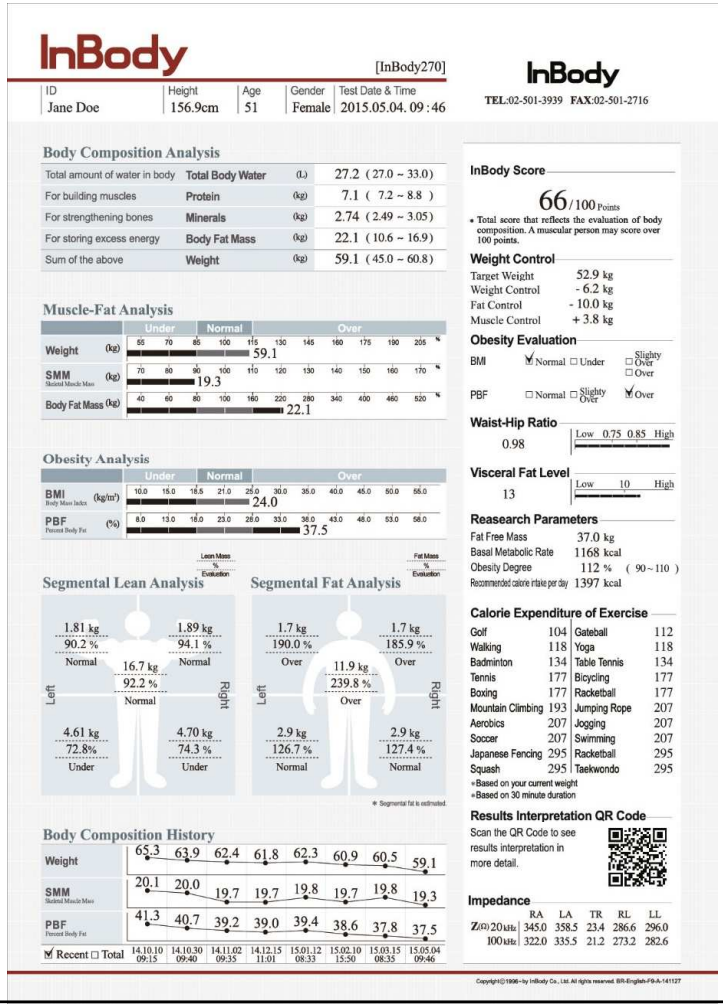
Imaging techniques

- Computed tomography (CT)
- Magnetic resonance imaging (MRI)
- Ultrasound (US)*

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 $(\text{height in m})^2 \times 23$
  - ♀ : (height in cm - 100) - 10 % or $(\text{height in m})^2 \times 21$

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

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

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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