

Exercice physique et diabète de type 2

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WORLDWIDE PREVALENCE OF DIABETES IN 2000 AND ESTIMATES FOR THE YEAR 2030 (IN MILLIONS)

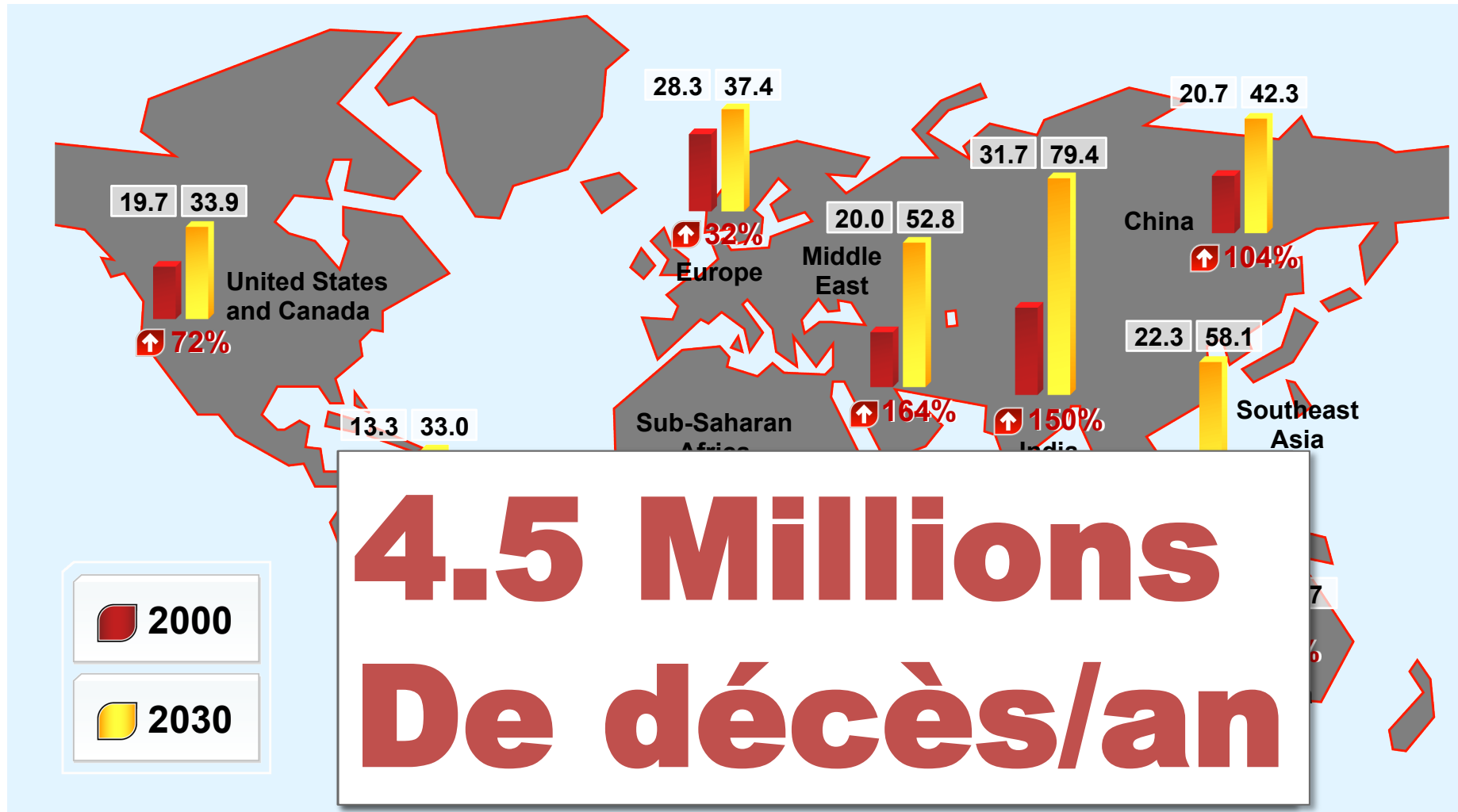
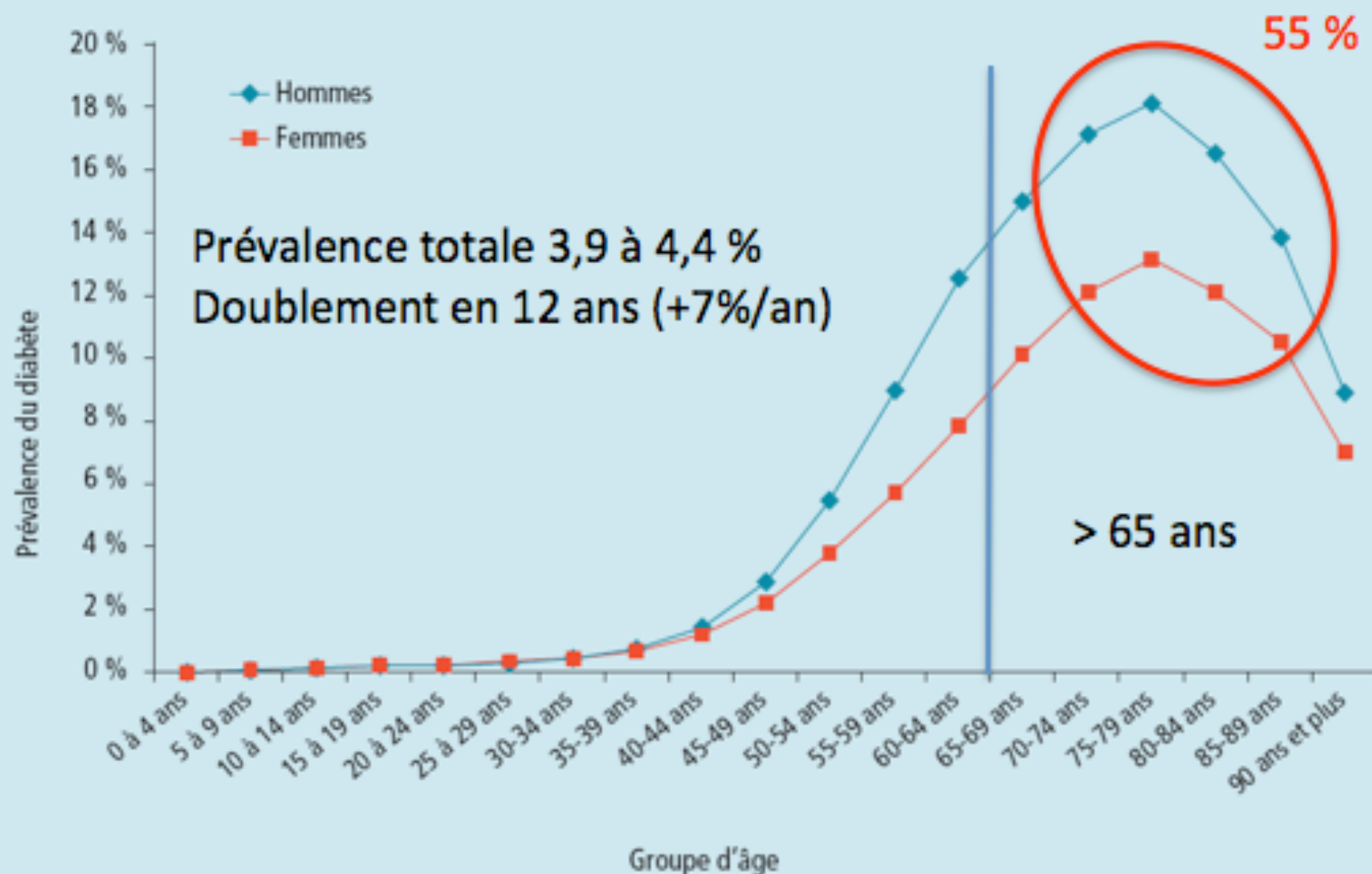
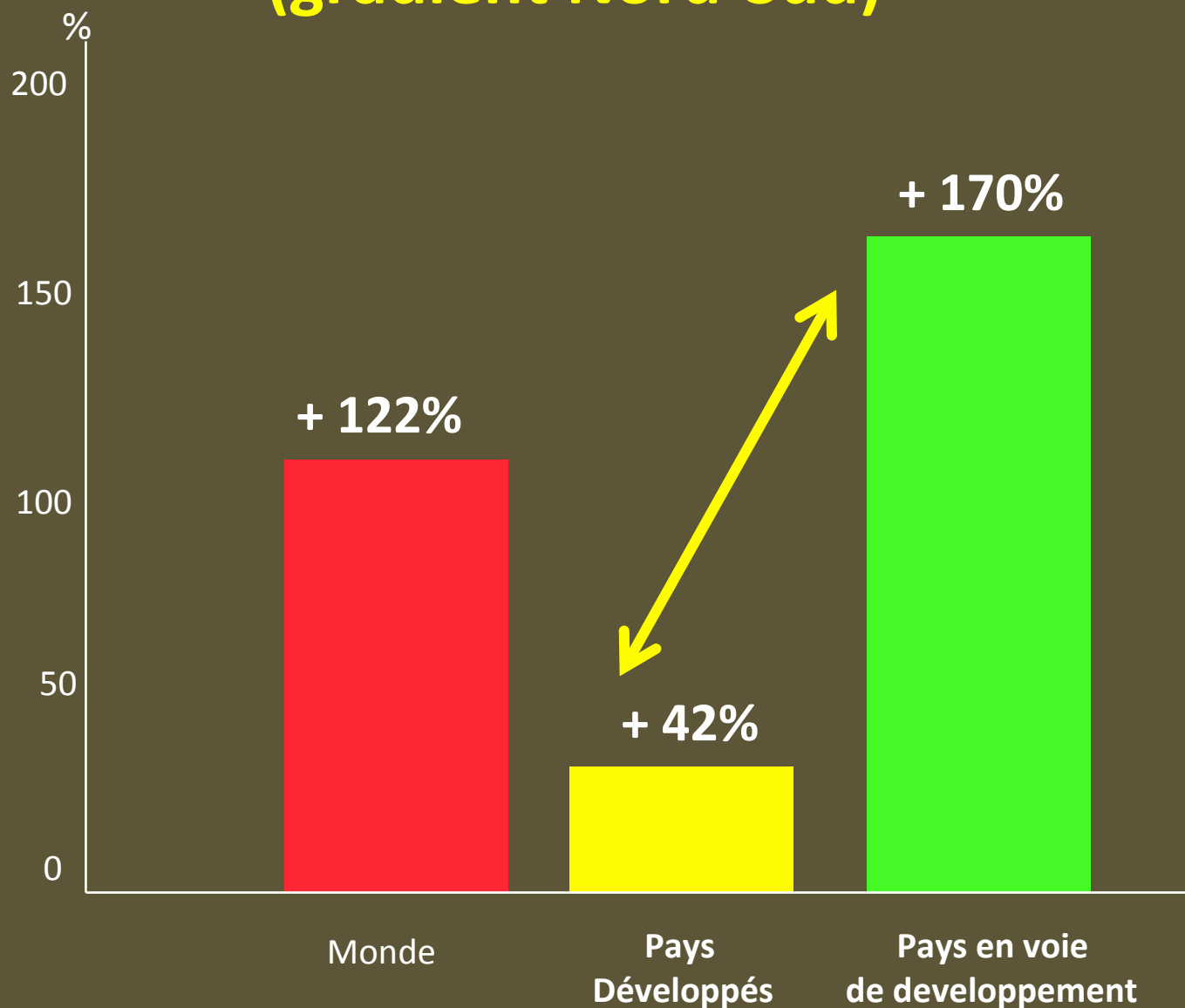


Figure 1 Prévalence du diabète traité selon l'âge et le sexe en 2007 (régime général d'assurance maladie, France) / *Figure 1 Treated diabetics prevalence rates, by age and gender in 2007 (general scheme of the French National Health Service, France)*

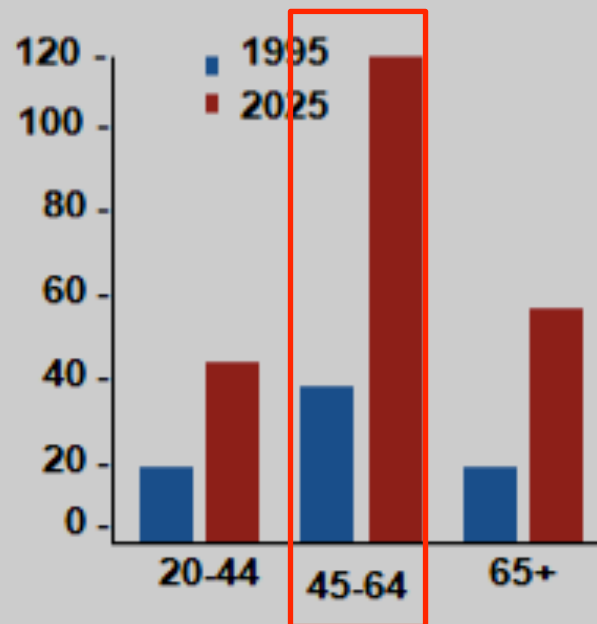


Progression du diabète entre 1995 et 2025 (gradient Nord-Sud)

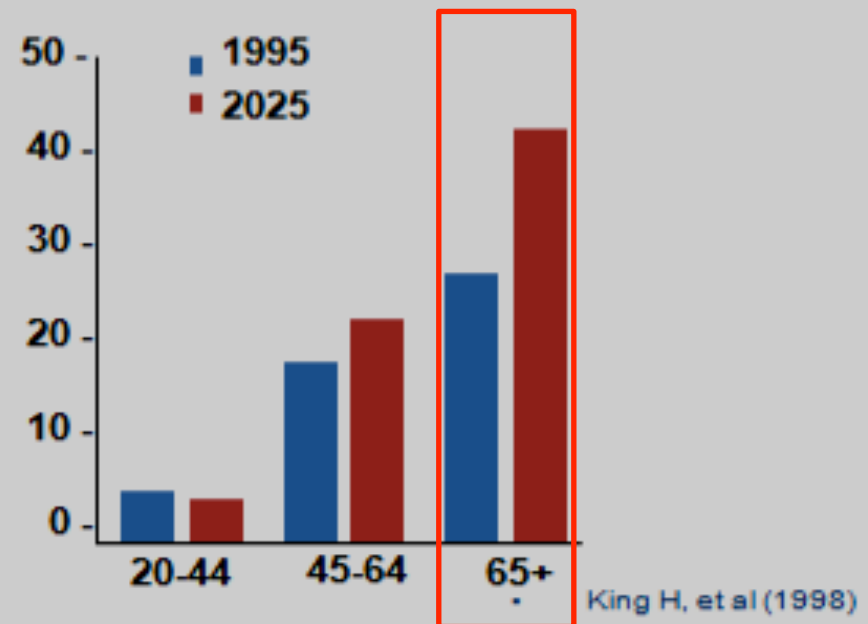


Des diabétiques de type 2 de plus en plus jeunes

Pays en voie de
Développement



Pays Développés



METABOLIC SYNDROME

What is Metabolic Syndrome?

Metabolic syndrome describes a group of conditions in which blood glucose, high blood pressure, high blood glucose (blood sugar), and an abnormal distribution of body fat (abdominal obesity) occur together in one person. When these risk factors occur together, the chance of developing cardiovascular disease, stroke, and diabetes is much greater than when these risk factors develop independently. According to the International Diabetes Federation, about 20% of Americans are affected by metabolic syndrome.

Metabolic Syndrome Risk Factors

To be diagnosed with metabolic syndrome, patients need to have at least three of the following risk factors:

Obesity

Obesity is defined as having too much body fat. A person is considered obese when his/her weight is 30% or more above their weight. Obesity increases health risks, including the risk of heart disease, stroke, and diabetes. People with an increased waist size are at a higher risk of having the other conditions associated with metabolic syndrome. The waist circumference measurement is taken at the widest part of the waist.



Metabolic Syndrome Risk Factor:
Waist circumference greater than:
Men: 40 inches (102 cm)
Women: 35 inches (89 cm)

High Blood Glucose

Sugar (glucose) is what supplies the body with energy. Normally, this sugar (glucose) is kept in the blood and used as energy. If sugar stays in the blood for too long, it can cause health problems called **high blood glucose**. Glucose is the blood sugar. It is the body's main source of energy, including the brain, muscles, and other tissues. The pancreas, an organ in the body, releases insulin to help the body use the sugar. If the pancreas doesn't release enough insulin, or if the body's cells don't respond to the insulin, blood glucose levels can rise. High blood glucose can lead to serious health problems, including heart disease, stroke, diabetes, and eye disease. High blood glucose levels can also lead to the development of type 2 diabetes.

Metabolic Syndrome Risk Factor:
Glucose of at least 126 mg/dL or greater

High Blood Pressure

Blood pressure is the force that helps the blood flow through the blood vessels. When the blood pressure is too high, it is called **high blood pressure**. High blood pressure damages blood vessels. If blood vessels are damaged, high blood pressure is an untreated problem, it can lead to heart disease and stroke. This is called **hypertension**, and it can affect the entire blood supply. Blood in the body.

Blood pressure is measured using two numbers. The first number, called **systolic pressure**, is measured when the heart contracts and the pressure is greatest. The second number is **diastolic pressure**. It is measured when the heart relaxes and the pressure is lowest.

Normal blood pressure is about 120/80 mmHg. High blood pressure is when the systolic pressure is 130 or higher, or the diastolic pressure is 80 or higher.

Metabolic Syndrome Risk Factor:
Blood pressure greater than 130/80 mmHg

Abnormal Cholesterol Profile (Dyslipidemia)

Cholesterol is a type of fat that your body needs. Cholesterol is found in the blood. It is used to build the cells in the body. There are "good" and "bad" types of cholesterol. Too much of the "bad" cholesterol (LDL) can lead to heart disease. "Good" cholesterol (HDL) can help protect your heart. Cholesterol is found in the blood. It is used to build the cells in the body. There are "good" and "bad" types of cholesterol. Too much of the "bad" cholesterol (LDL) can lead to heart disease. "Good" cholesterol (HDL) can help protect your heart.

Triglycerides
Triglycerides are a type of fat in the blood. They are used for energy. High levels of triglycerides can lead to heart disease. High levels of triglycerides can also lead to the development of type 2 diabetes.

Metabolic Syndrome Risk Factor:
Triglyceride level greater than 150 mg/dL

High Cholesterol

High cholesterol is a condition in which the blood contains too much cholesterol. High cholesterol can lead to heart disease. High cholesterol can also lead to the development of type 2 diabetes.

Metabolic Syndrome Risk Factor:
Total cholesterol level greater than 200 mg/dL

Medical Conditions Associated with Metabolic Syndrome

People with metabolic syndrome are at a higher risk of cardiovascular disease such as coronary heart disease and stroke than people who do not have the syndrome.

- 1. **Stroke**
The brain needs blood to function. If the blood flow to the brain is blocked, it can lead to a stroke. People with metabolic syndrome are at a higher risk of having a stroke than people who do not have the syndrome.
- 2. **Coronary Heart Disease**
Coronary heart disease is a condition in which the blood flow to the heart is blocked. People with metabolic syndrome are at a higher risk of having coronary heart disease than people who do not have the syndrome.
- 3. **Type 2 Diabetes**
Type 2 diabetes is a disease in which the body's cells do not respond properly to the hormone insulin. People with metabolic syndrome are at a higher risk of having type 2 diabetes than people who do not have the syndrome.

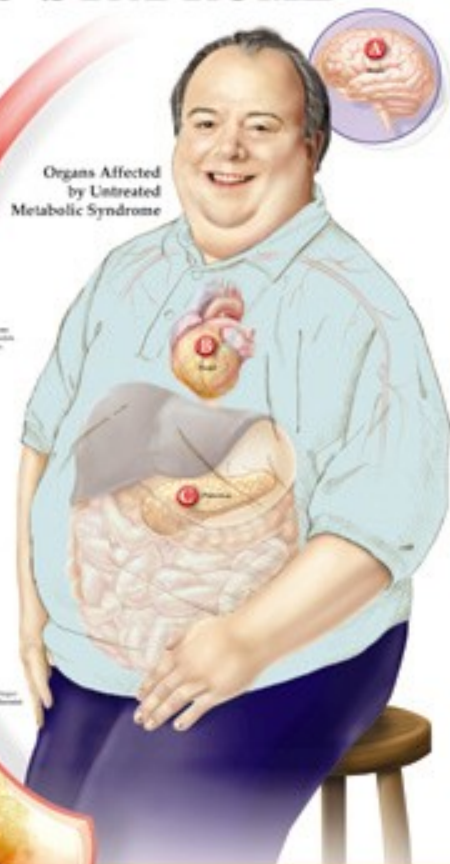
What Causes Metabolic Syndrome?

Scientists believe that metabolic syndrome is caused by a combination of factors, including genetics, lifestyle, and environment. People with metabolic syndrome often have a family history of the condition. They may also have a sedentary lifestyle, eat a diet high in calories, and be overweight. These factors can lead to the development of metabolic syndrome.

How is Metabolic Syndrome Treated?

Metabolic syndrome is a chronic condition that requires ongoing management. Treatment options usually include the following:

- 1. **Weight loss**
If you are obese, a weight loss of 5% to 10% of your body weight can help control blood sugar and blood pressure.
- 2. **Exercise**
Regular exercise can help control blood sugar and blood pressure. Aim for at least 150 minutes of moderate-intensity exercise per week.
- 3. **Healthy diet**
A diet low in calories, saturated fat, and sodium can help control blood sugar and blood pressure. Focus on fruits, vegetables, whole grains, and lean proteins.



Organs Affected by Untreated Metabolic Syndrome

Dépenses énergétiques réduites et surconsommation d'aliments riches en énergie



Travail rural



Pas seulement le travail mais les transports sans machine



La ville Africaine en 2011



Transition nutritionnelle et d'activité physique plus progressive



20 000 B.C.

2002

Palaeolithic sup. age

Neolithic age

19th century

21st century

Homo sapiens sapiens Cro-Magnon



Hunting-gathering
subsistence

High level of
physical activity

Processed
foods

↑ Animal fats
and glucides

↓ Dietary
fibres

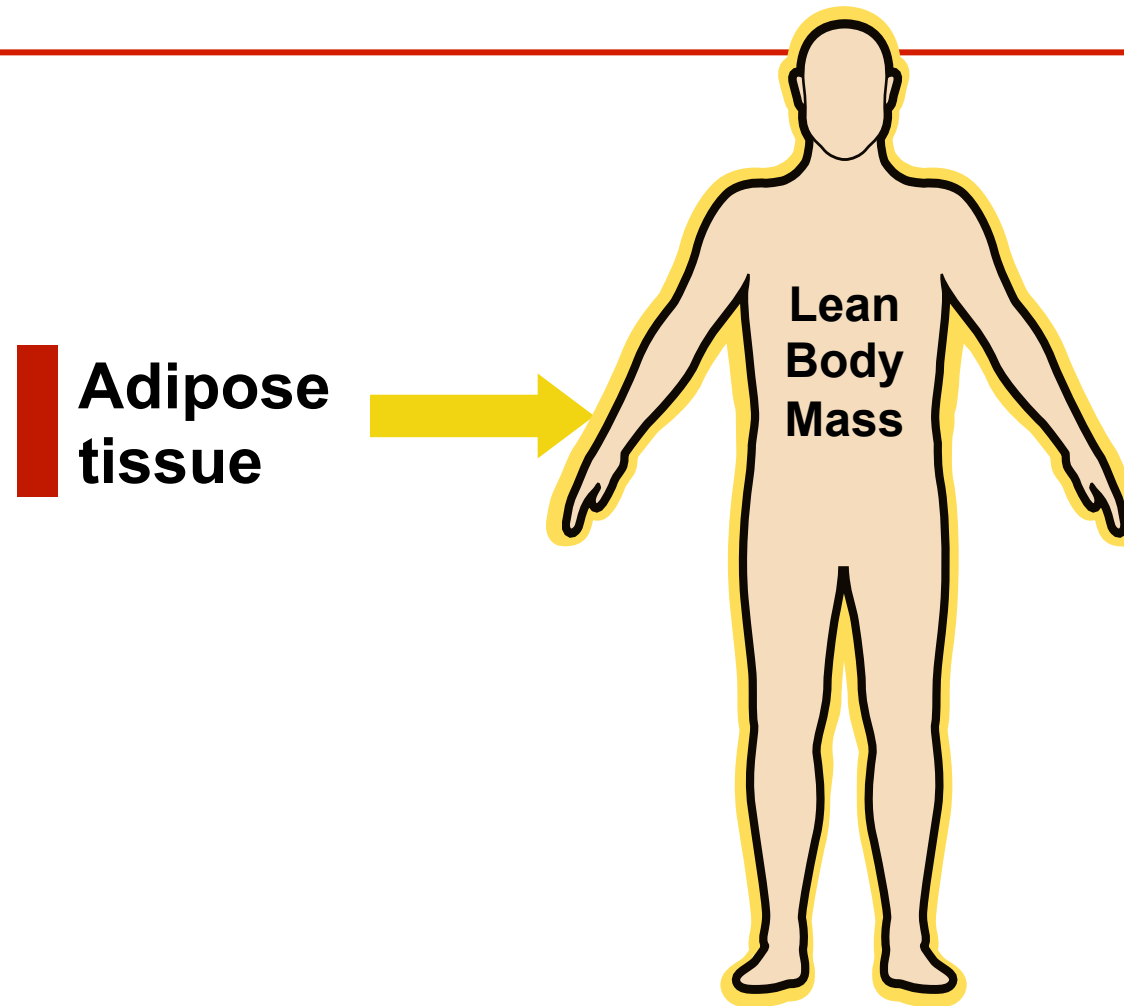
Sedentary
life



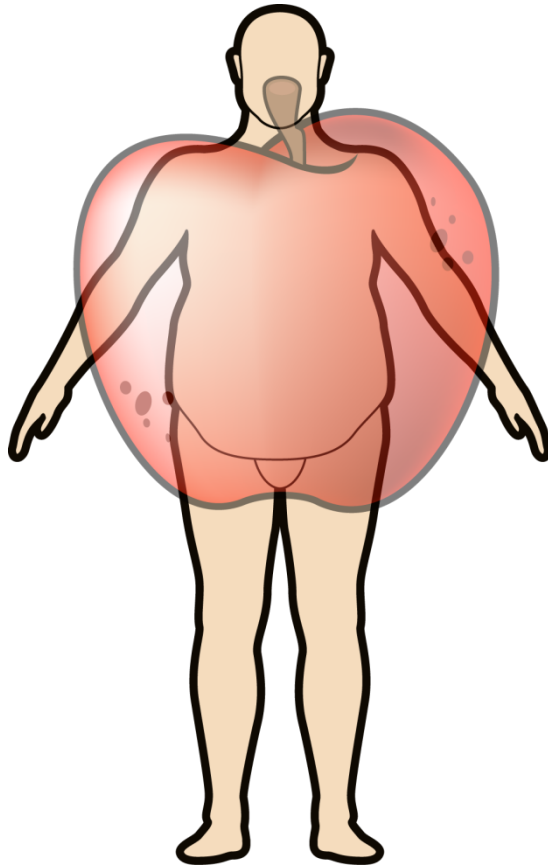
Thrifty genotype

Susceptibility genotype

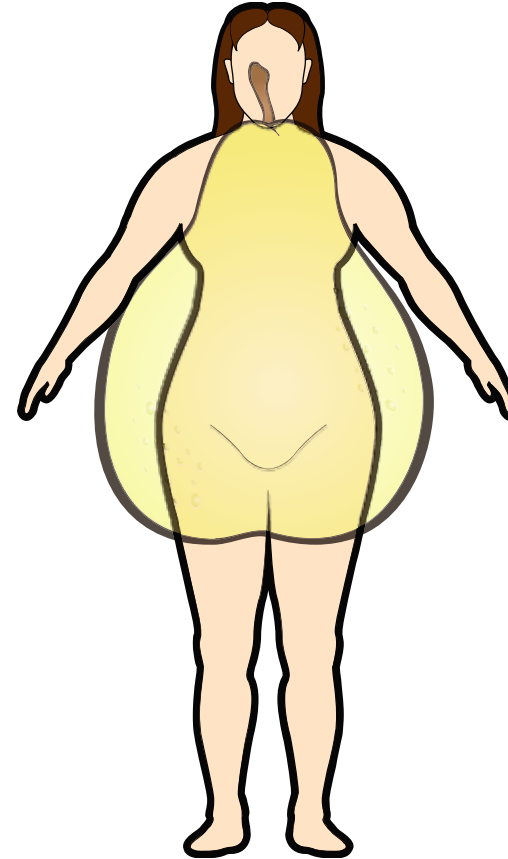
Fat and Lean Interactions



Android (Apple) vs. Gynoid (Pear) Obesity

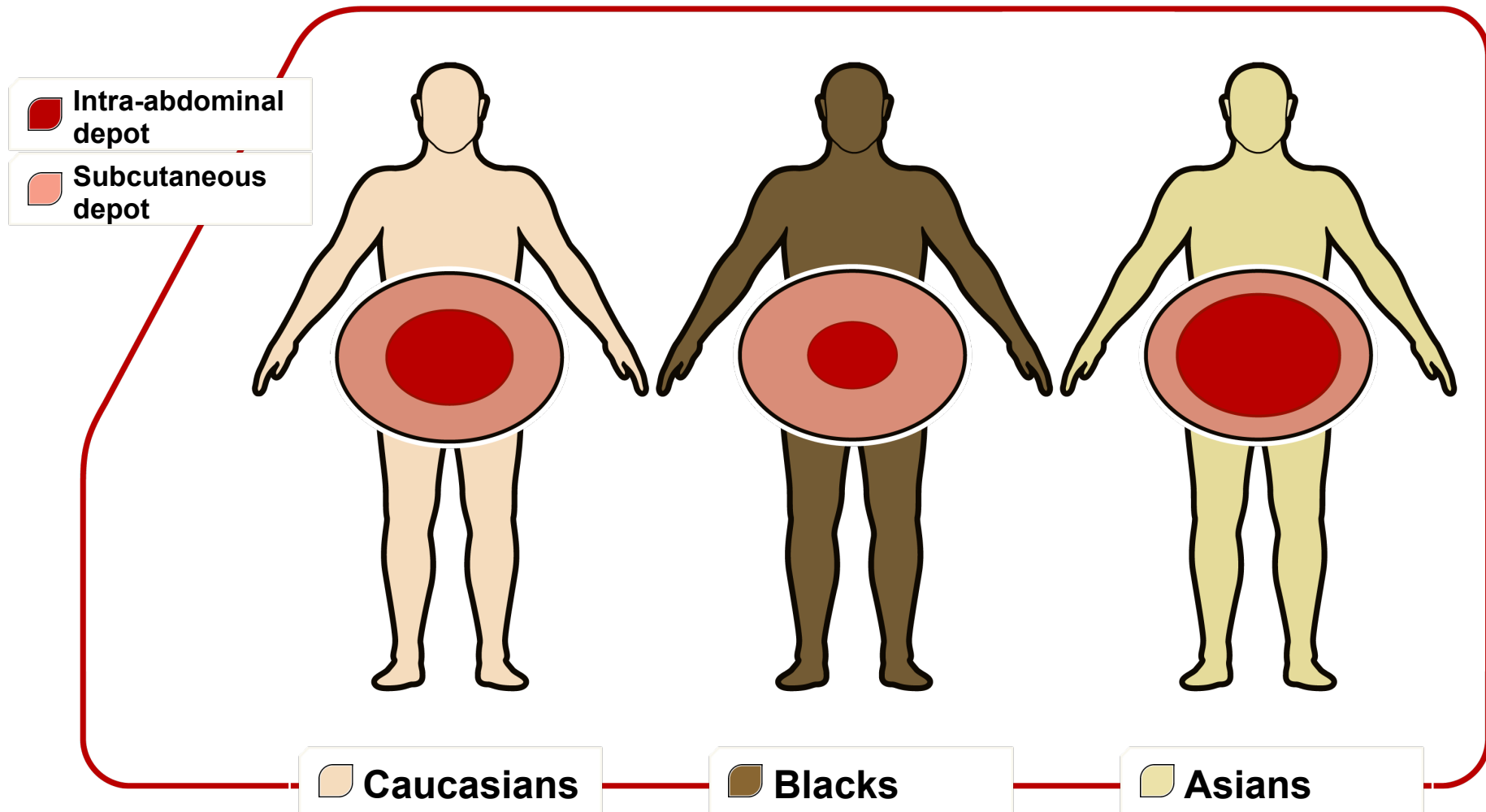


*A
Tribute
to a
Pioneer*



Jean Vague (1947)

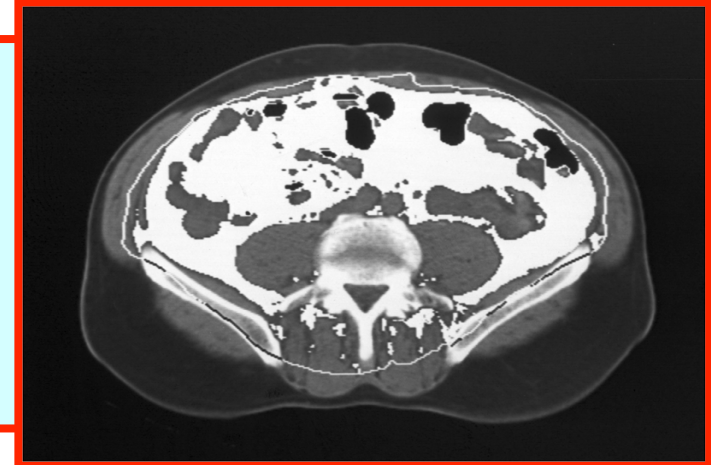
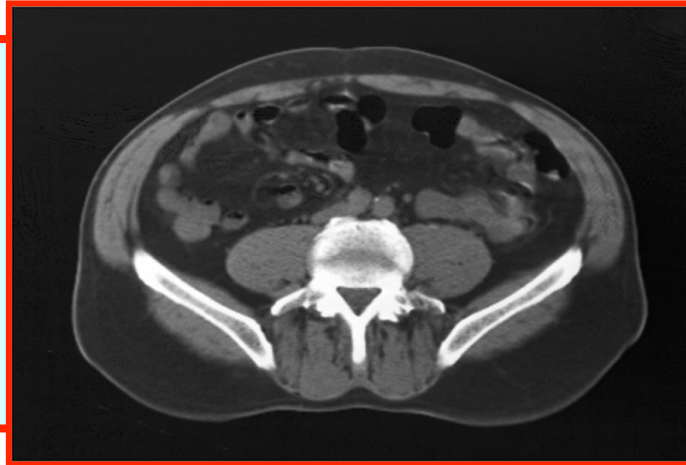
RELATIVE ACCUMULATION OF INTRA-ABDOMINAL VS. SUBCUTANEOUS DEPOT ACCORDING TO ETHNICITY



Intra-abdominal (Visceral) Fat Accumulation in Equally Overweight Men

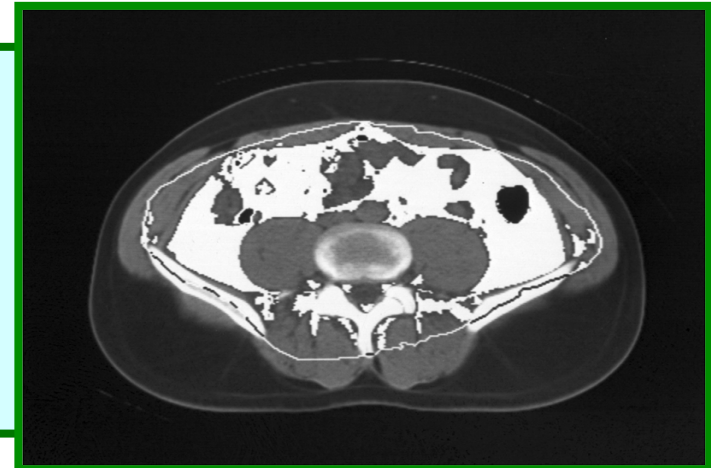
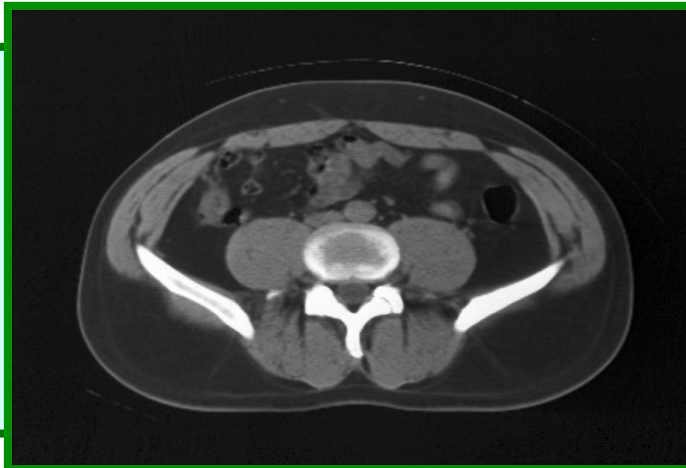
Fat mass:
19.8 kg

**Intra-
abdominal fat:**
155 cm²

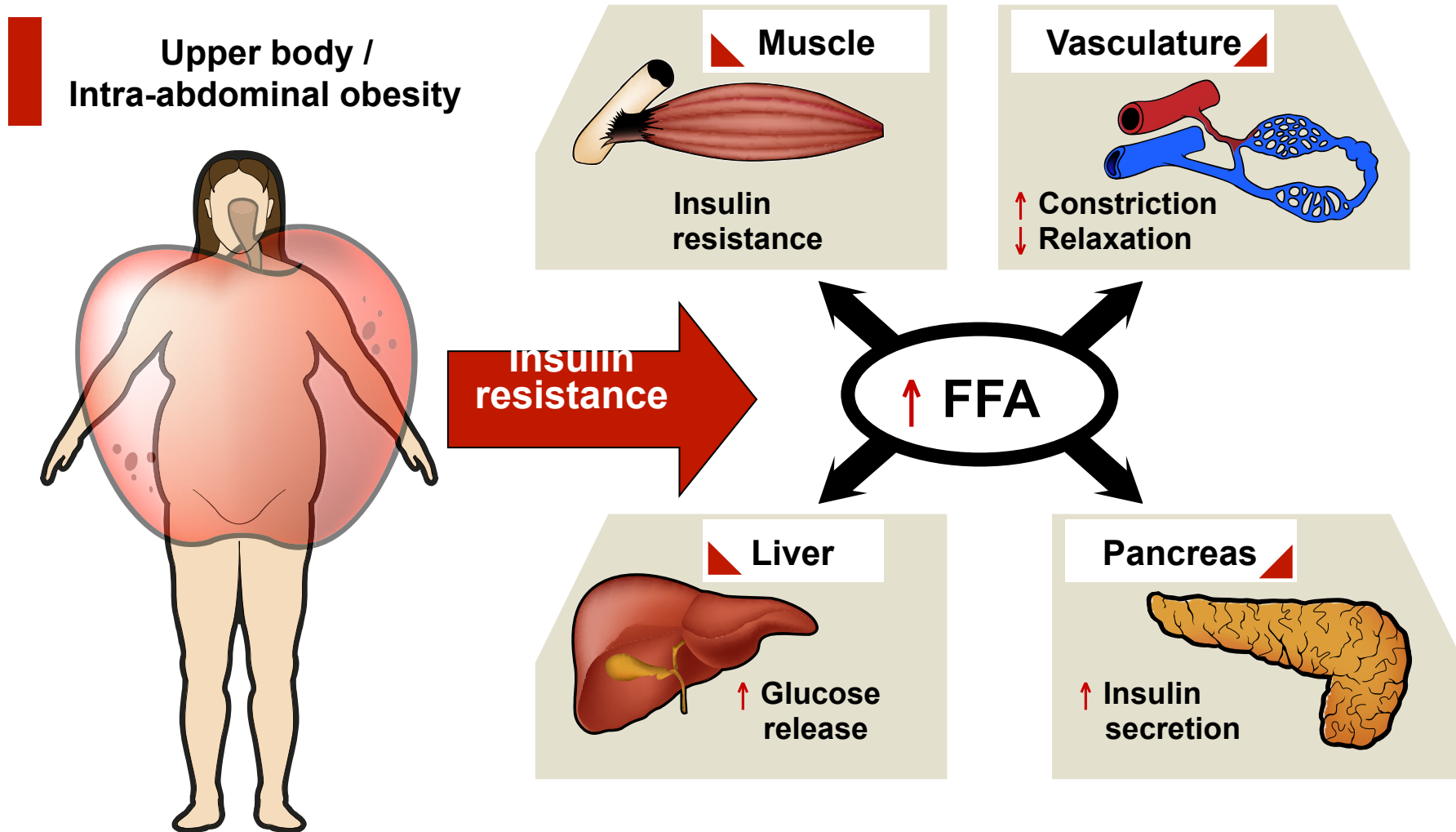


Fat mass:
19.8 kg

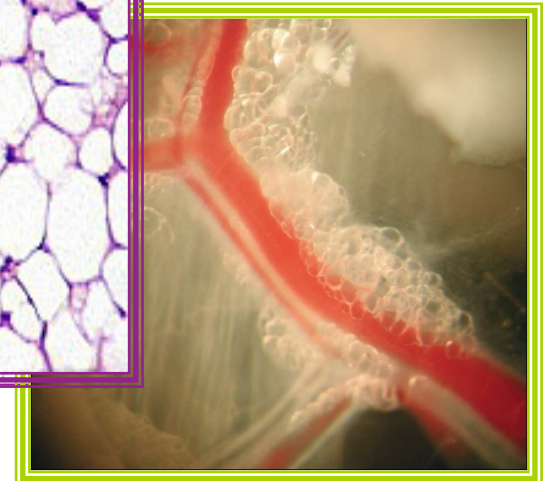
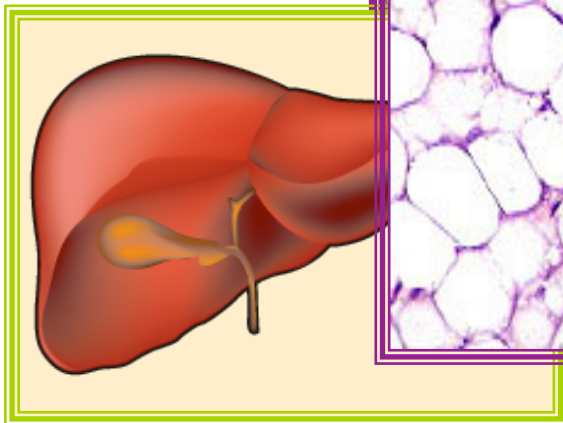
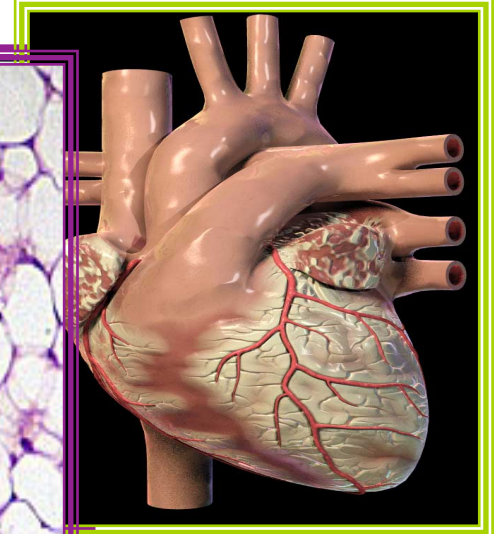
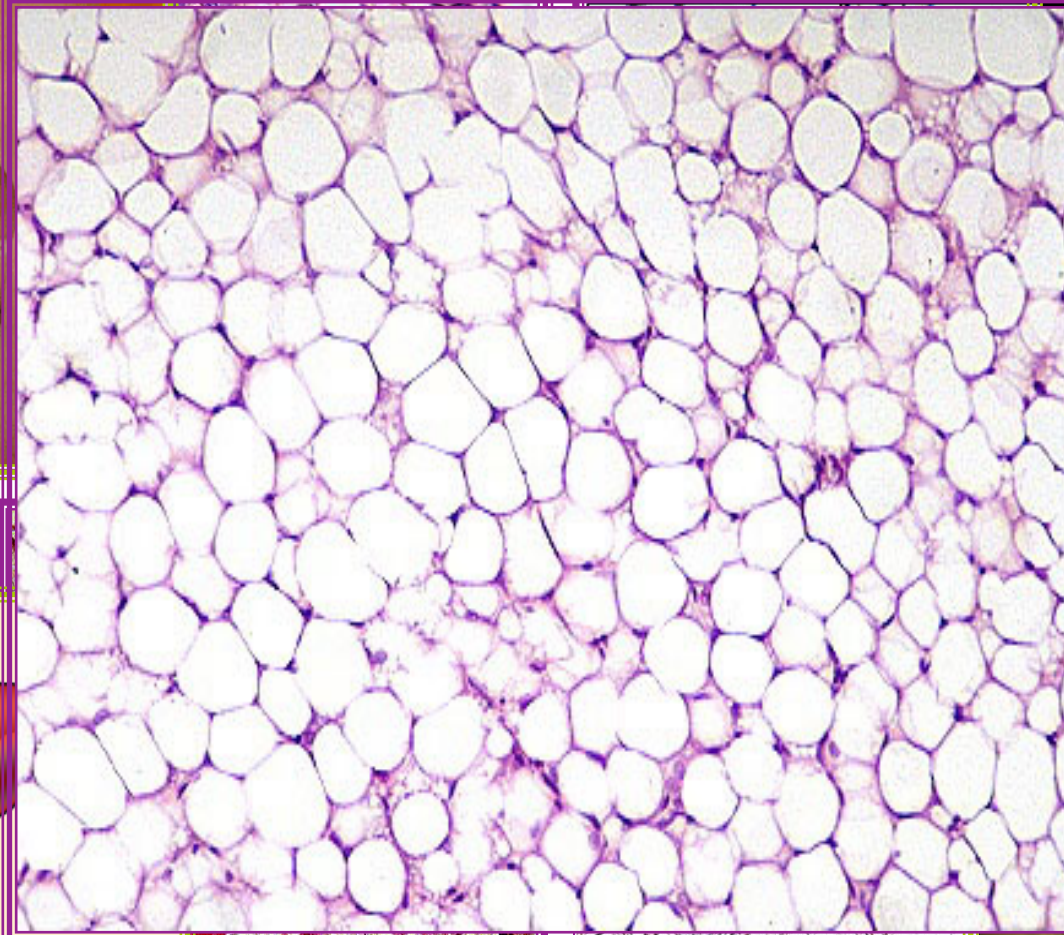
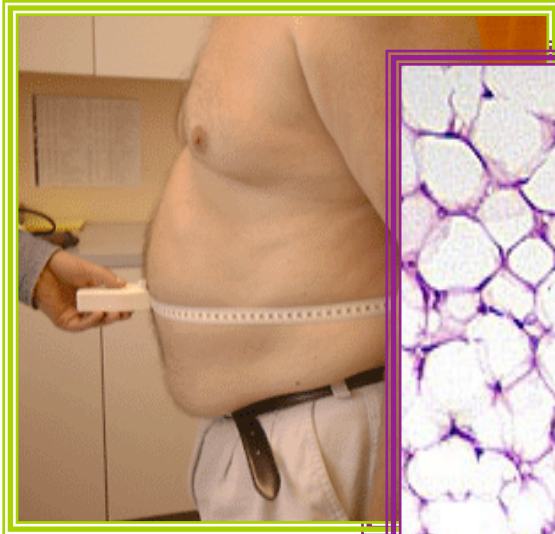
**Intra-
abdominal fat:**
96 cm²



Upper Body / Intra-abdominal (Visceral) Obesity and Insulin Resistance

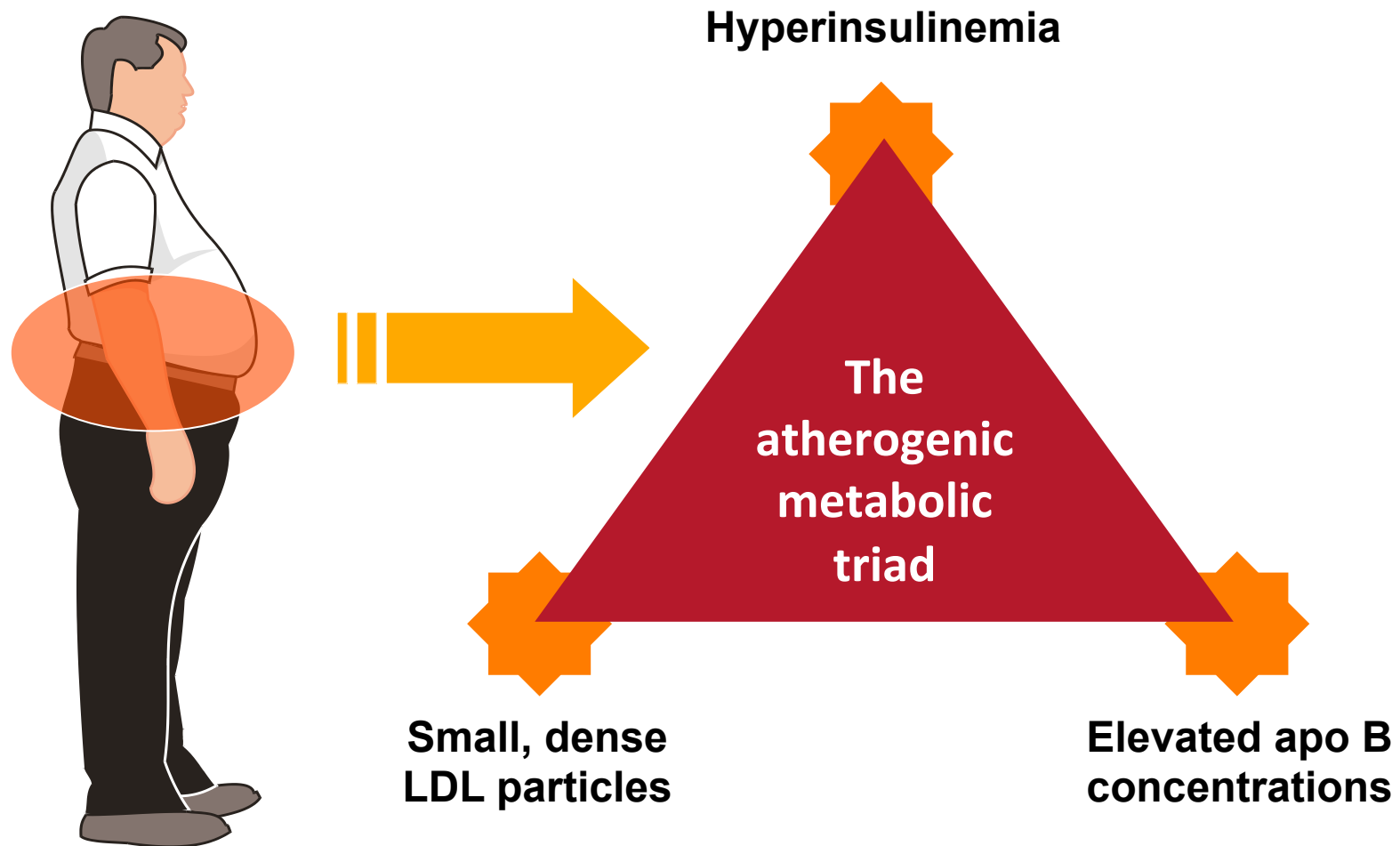


Adipose Tissue and Cardiometabolic Risk



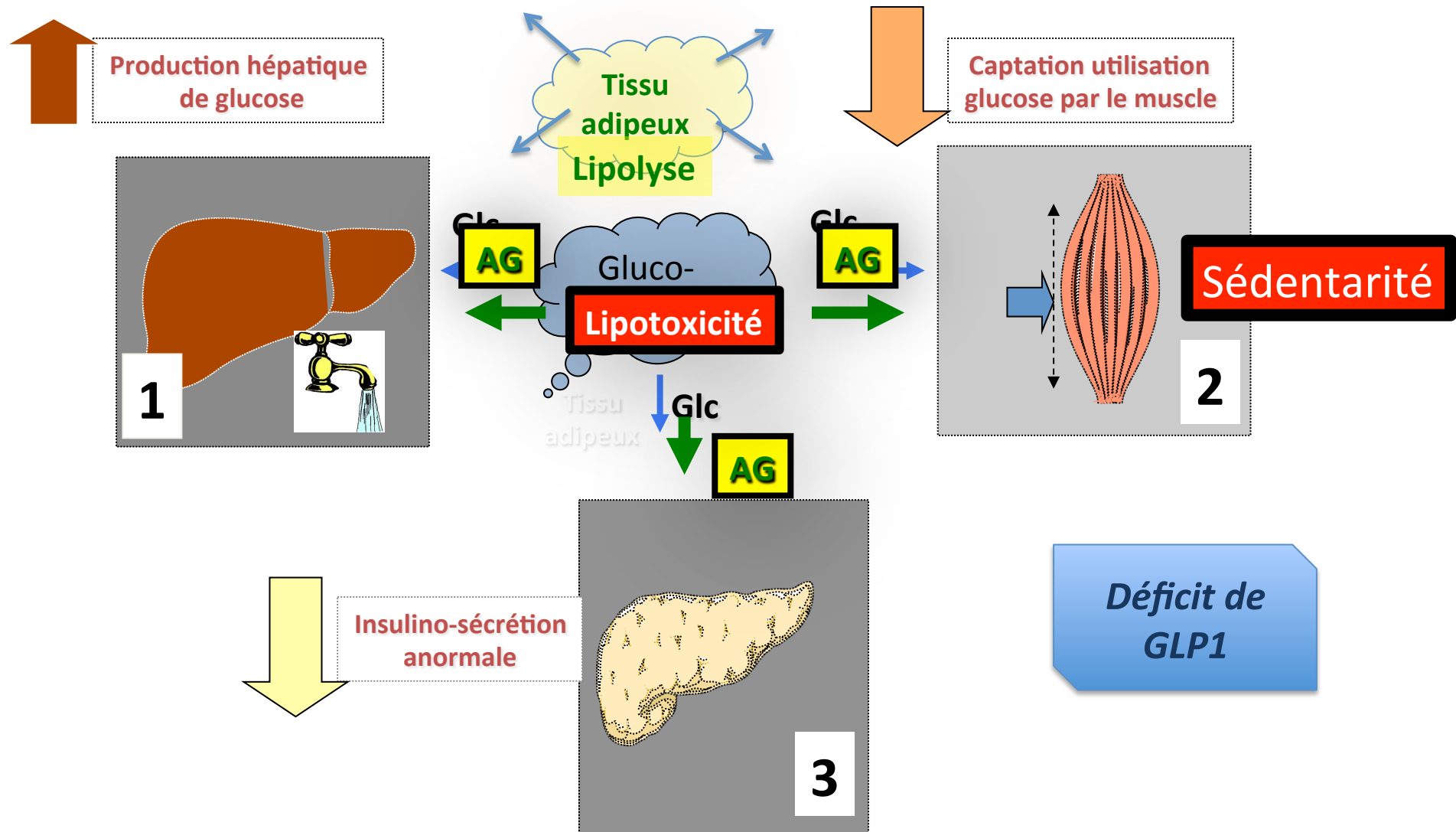
Adapted from Yudkin JS et al. Lancet 2005; 365: 1817-20
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The Atherogenic Metabolic Triad of Intra-abdominal (Visceral) Obesity



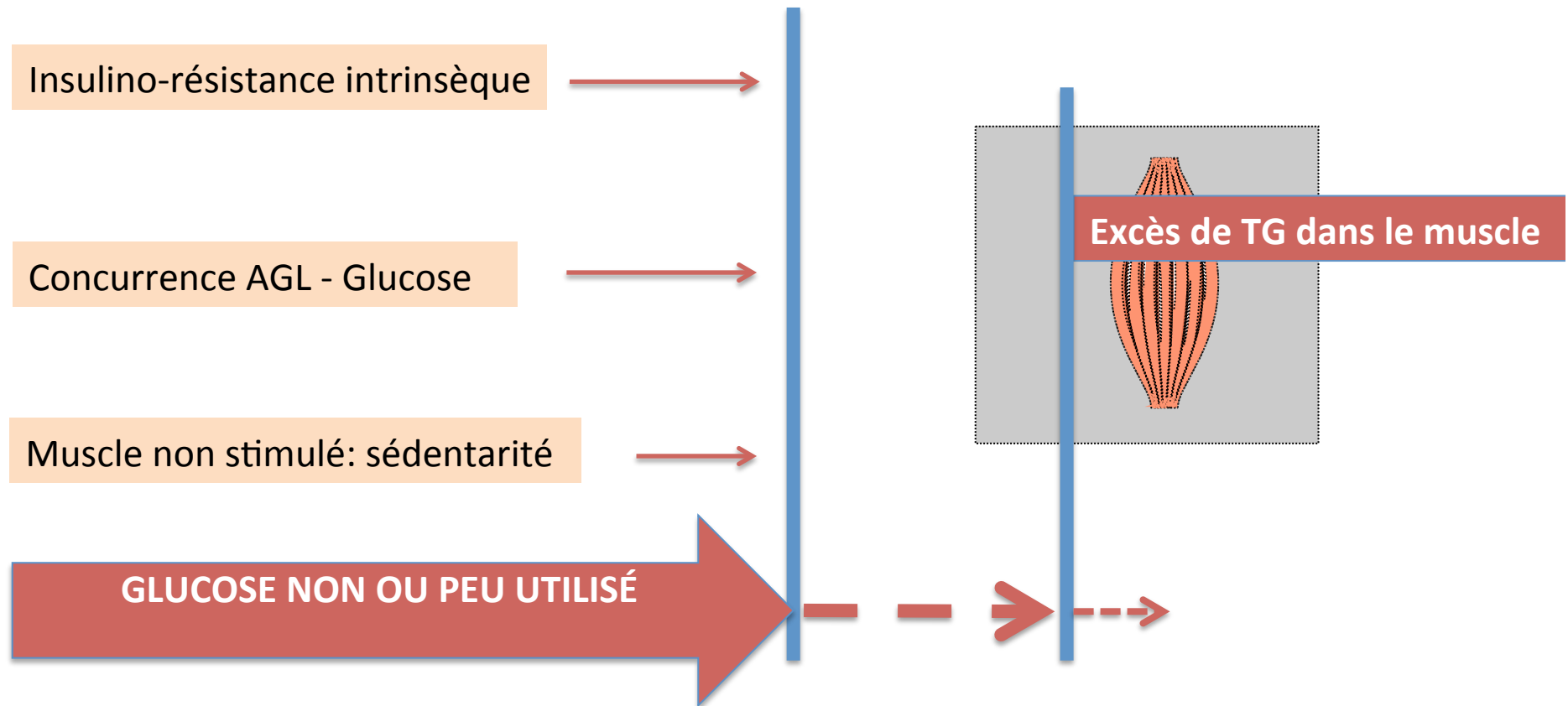
Beyond LDL cholesterol, blood pressure, type 2 diabetes...

Les grands troubles qui génèrent l' HYPERGLYCEMIE



Insulino-résistance

donc défaut de captation de glucose par le muscle



EXERCICE PHYSIQUE POUR MAIGRIR ?

Miracle Zinc:
The Simple Pill
That Saves Lives



People Power: How
Corazon Aquino
Changed the World



Julie & Julia: Meryl
Streep Has Fun
With French Food

TIME



The Myth About Exercise

Of course it's good for you,
but it won't make you
lose weight. Why it's
what you eat that
really counts.

BY JOHN CLOUD



Burning Calories

What it takes for a 70-kg, 30-year-old woman to work off a blueberry muffin



Skating (fast)

21
MIN.



Gardening

66
MIN.



Lifting weights

115
MIN.



Lawn-mowing

66
MIN.



Cycling (easy pace)

77
MIN.



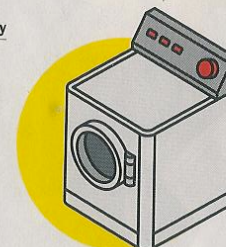
Vacuuming

92
MIN.



Jogging (8 km/h)

33
MIN.



Folding laundry

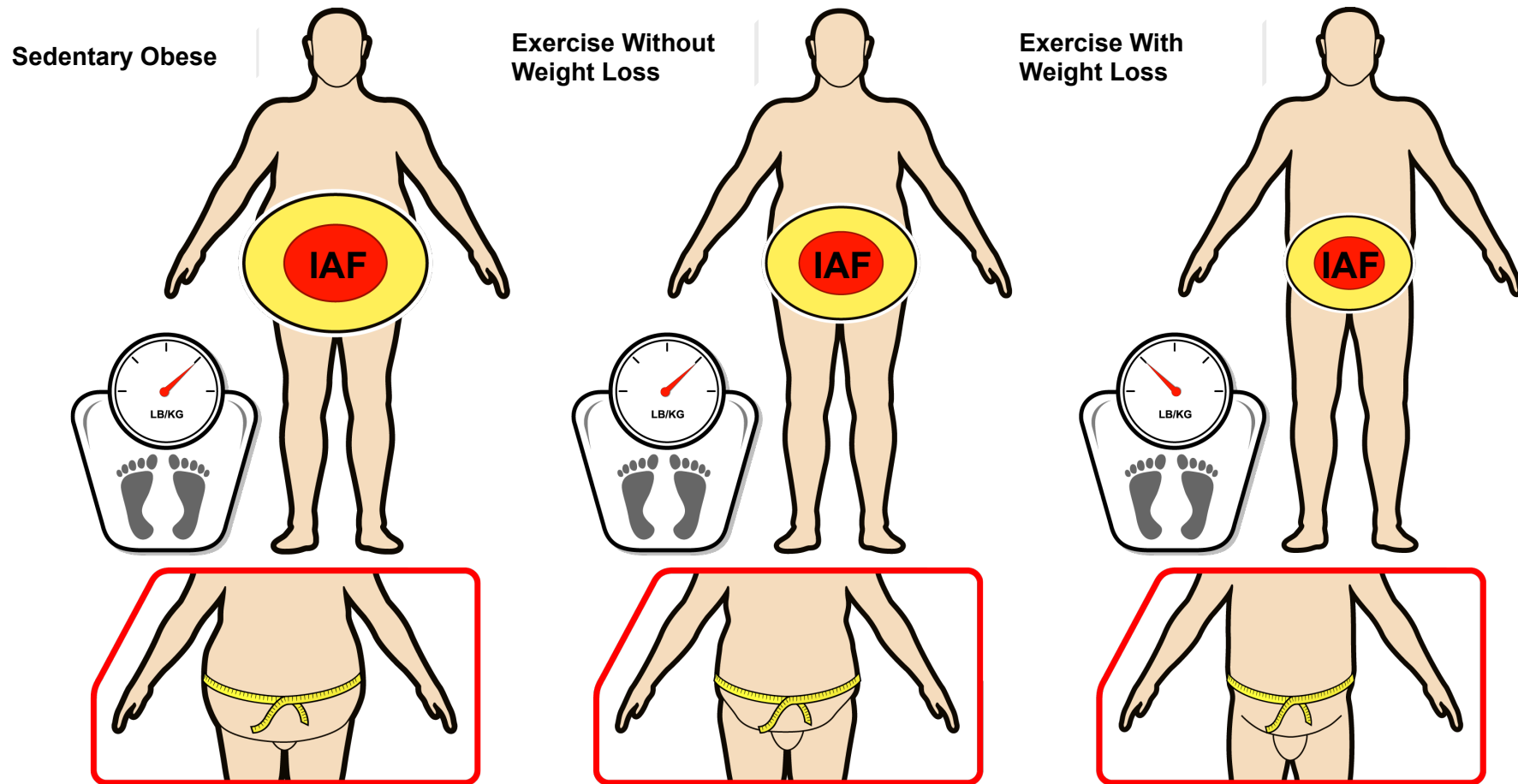
230
MIN.

Blueberry muffin
360 calories

Source: U.S. Department of Agriculture Center
for Nutrition Policy and Promotion

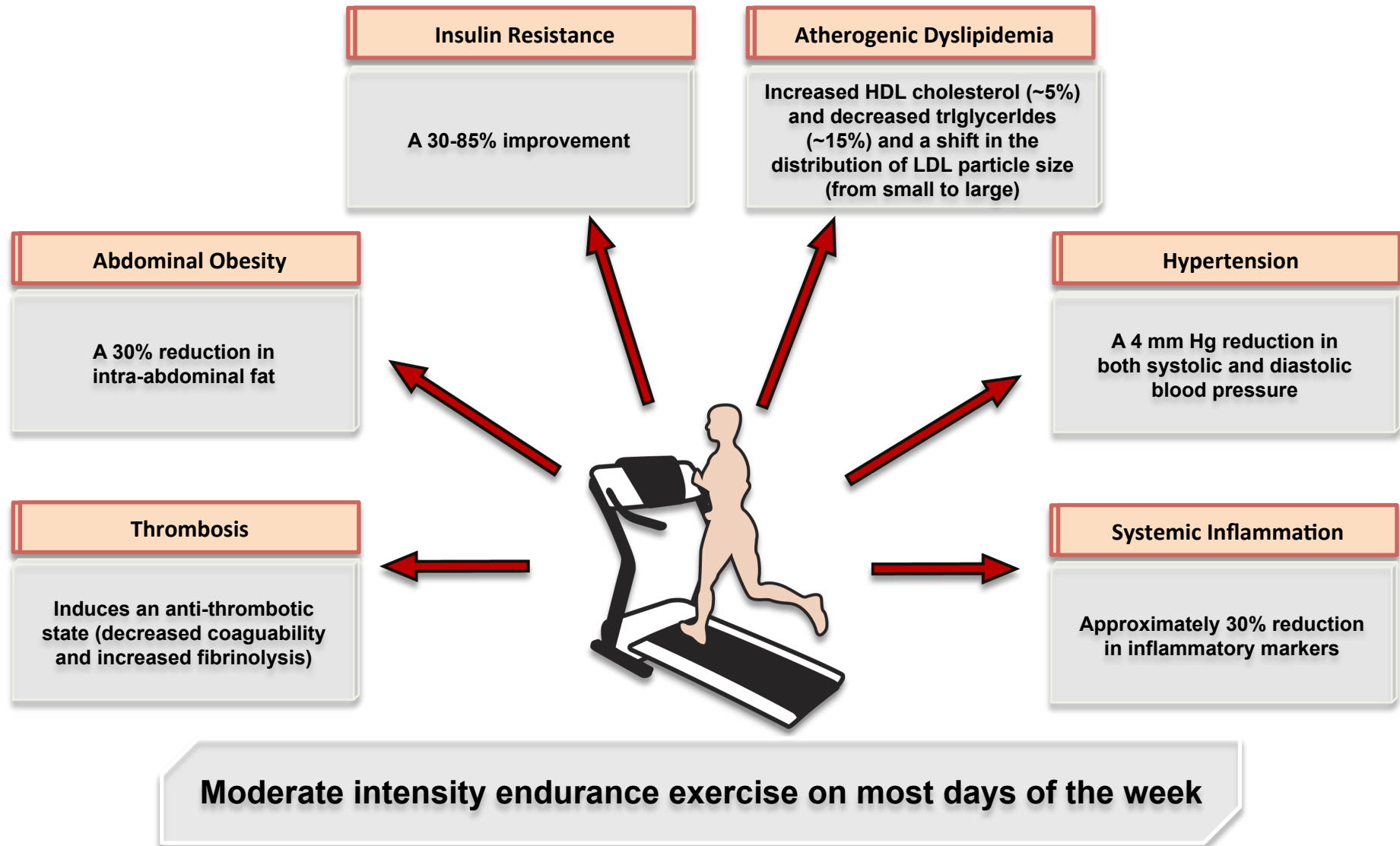
**EXERCICE PHYSIQUE POUR PERDRE DU
TISSU ADIPEUX ABDOMINAL ?**

EFFECTS OF EXERCISE WITH AND WITHOUT CONSEQUENT WEIGHT LOSS ON CHANGES IN INTRA-ABDOMINAL FAT (IAF)

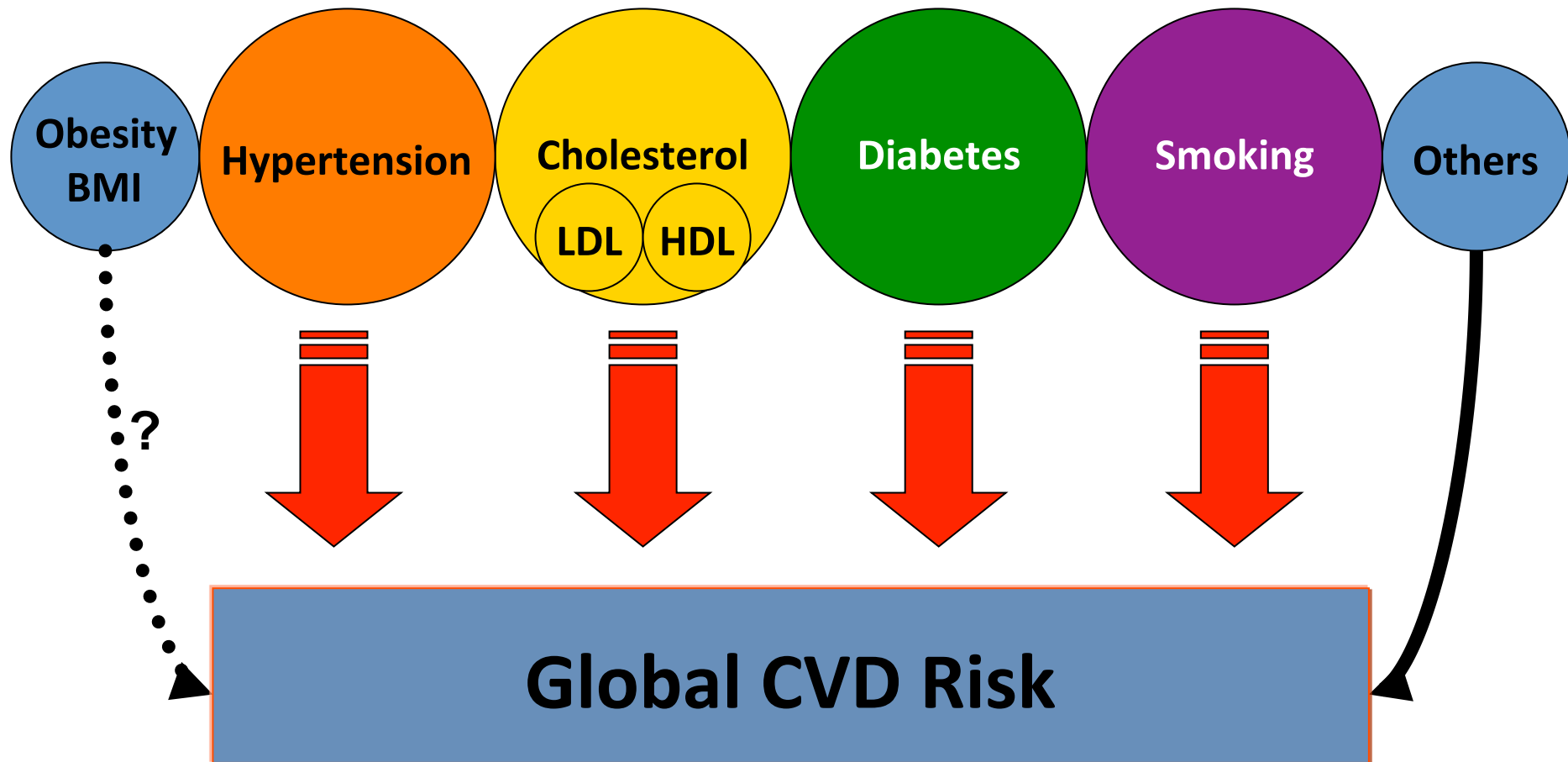


Exercise without weight loss is associated with reduction in intra-abdominal fat (10-20%) and a consequent reduction in waist circumference. However, exercise-induced weight loss leads to greater reductions in both intra-abdominal fat (30%) and waist circumference.

IMPROVEMENTS IN CARDIOMETABOLIC RISK FACTORS INDUCED BY REGULAR EXERCISE



Mb syndrome: physical exercise An defined Modifiable
Cardiovascular Disease (CVD) Risk Factor



BMI: body mass index

PREVENTION DT2 PAR EXERCICE

Etudes de prévention par l'exercice physique

Etude	Nombre de sujets (âge)	IMC (kg/m ²)	Critère inclusion	Durée moyenne étude	Type d'activité physique	Incidence du diabète à la fin de l'étude (réduction du RR de DT2 dans groupe E vs T)	Incidence cumulée du DT2 à long terme (groupe I vs T)
Pan et al. 1997 (Da Quing [Chine])	577 HF (45±9ans)	26	IG	6 ans	Endurance	T : 67,7% E : 46% (RR :-51%)	à 20 ans -43%
Tuomilehto et al. 2001 (FDPS [Finlande])	522 HF (40-64ans)	31	IG	3,2 ans	Endurance + Résistance	T : 23% E : 11% (RR :-58%)	à 7 ans -43%
Knowler et al. 2002 (DPPS [USA])	3224 HF (34±6ans)	34	IG	2,8 ans	Endurance	T : 19,8% E : 14,3% (RR :-58%)	à 10 ans -34%
Kosaka et al. 2005 ([Japon])	458 H (40-50ans)	24	IG	4 ans	Endurance	T : 9,3% E : 3% (RR :-67,4%)	
Ramachadran et al. 2006 (IDPP [Inde])	269 HF (46±6ans)	26	IG	3 ans	Endurance	T : 55% E : 39,5% (RR :-28,2%)	

DPP

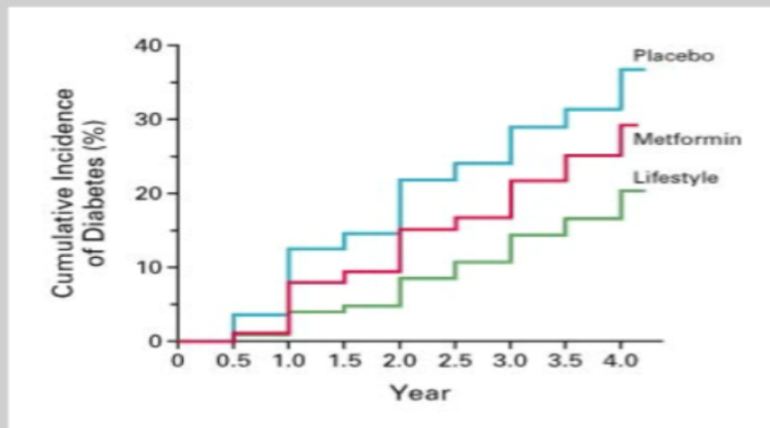


Figure 2. Cumulative Incidence of Diabetes According to Study Group.

The diagnosis of diabetes was based on the criteria of the American Diabetes Association.¹¹ The incidence of diabetes differed significantly among the three groups ($P < 0.001$ for each comparison).

DPP

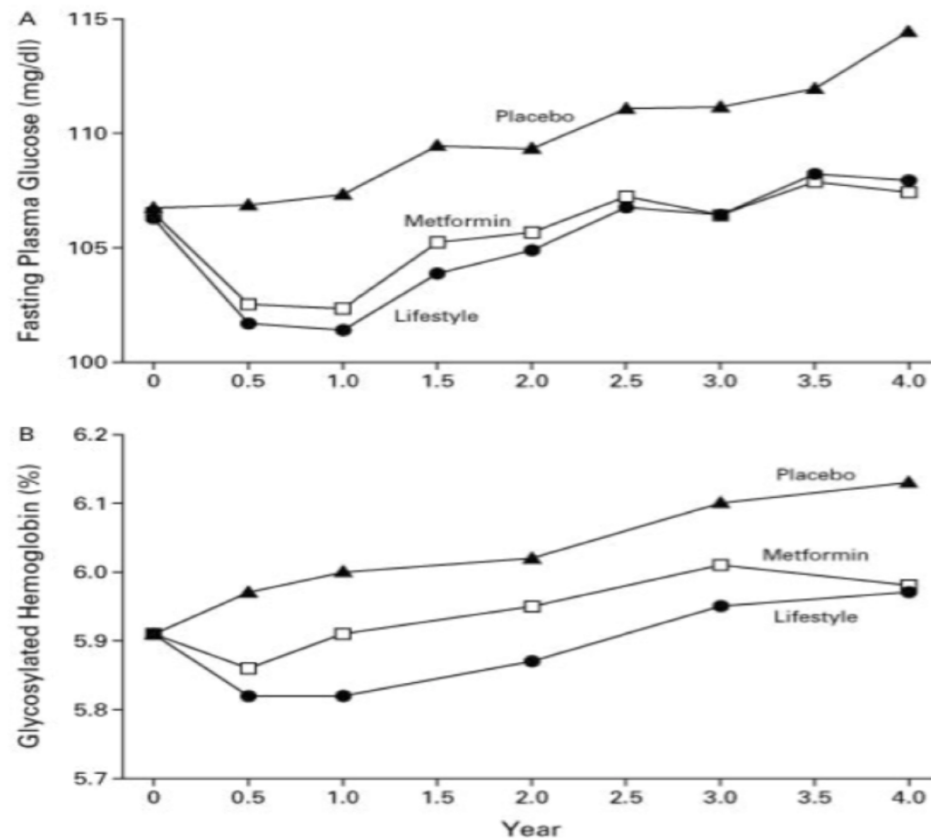


Figure 3. Fasting Plasma Glucose Concentrations (Panel A) and Glycosylated Hemoglobin Values (Panel B) According to Study Group.

The analysis included all participants, whether or not diabetes had been diagnosed. Changes in fasting glucose values over time in the three groups differed significantly ($P < 0.001$). Glycosylated hemoglobin values in the three groups differed significantly from 0.5 to 3 years ($P < 0.001$). To convert the values for glucose to millimoles per liter, multiply by 0.05551.

TRAITEMENT DES DT2 PAR EXERCICE

Effet AP sur les glycémies dans le DT2

- **Activité physique isolée: sans changement nutritionnelle méta analyse 14 études**
 - -0.6% d'HbA1c (0.3 à -0.9%)
 - Endurance – 0.73 % (- 1.06 à -0.4%) > 8000 sujets
 - Résistance – 0.56%
- **Structuré supervisé**
- >150 min/semaine -0.89%
 - Mieux que 150 min ou < 150 min – 0.36%

Autres bénéfices AP dans le DT2

- **Autres bénéfices:**
 - Diminution masse grasse péri-viscérale
 - Amélioration du profil lipidique
 - Tensionnel
 - Pas de niveau de preuve à ce jour sur la morbi-mortalité

Programme Look AHEAD

Étude en cours Look AHEAD (13.5 années) > 5000 sujets

- Objectif pondéral ambitieux – 7% à 1 an à maintenir ensuite
- 30 % de lipides
- Restrictif assez sévère 1200-1800 Kcal
- 175 min AP/semaine
- **Résultats à 4ans et demi vs groupe contrôle**
 - Bénéfice global
 - HbA1c
 - Nombre d'ADOs
 - Obj atteints pour le LDL TA
 - Maintien plus difficile avec le temps car très intensif au départ

Quid chez les DT2 avec complications

Activité physique et rétinopathie

- Risque hémorragique sur rétine fragile, proliférante
- Traiter la RD avant un sport
- RD de Valsalva
- Risque réel si poussées tensionnelles
- Mais autorisé même assez intensif et au minimum
 - Marche
 - Natation
 - Vélo d'appartement

Activité physique et néphropathie

- Poussée transitoire d'albuminurie sans signification pathologique
- Améliore la fonction rénale dans le diabète
- Lutte contre sarcopénie
- Chez le dialysé améliore la capacité oxydative, la QOL, le profil de RCV dont inflammatoire

En pratique on retiendra pour le DT2

1. **Réduire les graisses saturées en particulier**
2. **ECG effort préalable**
3. Viser à **limiter la sédentarité** (pas > à 7h par jour du lever au coucher)

4. **Accroître l'AP dans la vie quotidienne**

- Avoir une activité physique:
 - **Endurance** :
 - 3 jours / Semaine et pas plus de 2 jours consécutifs sans AP
 - > 150 min / semaine d'AP dite modérée avec au moins 10 min de suite (40-60% VO₂max)
 - **Résistance** : 2 fois par semaine

Hypoglycémiants et AP

- **Risque hypoglycémique:**
 - Insuline (variable selon la spécialité)
 - Sulfamides hypoglycémiants (Après-midi quelle que soit l'heure de prise)
- **Pas de risque hypoglycémique**
 - Metformine
 - Inhibiteurs des DPP4
 - Analogues du GLP1

L'activité physique est une
élément clé pour traiter les DT2

**SA RÉALISATION RESTE À METTRE EN
PLACE DE FAÇON ORGANISÉE ET
INNOVANTE**

SUJET MAJEUR DE L'ETP

Quid chez les DT2 avec complications

En conclusion, de nombreux arguments plaident pour un effet cardiovasculaire bénéfique de l'activité physique chez le sujet en bonne santé comme chez le DT2, en prévention primaire et en prévention tertiaire.

De plus, la capacité physique est reconnue aujourd'hui comme un facteur prédictif puissant et indépendant de mortalité. La consommation maximale d'oxygène, excellent témoin individuel de la capacité d'effort, peut être augmentée par l'activité physique. Tout gain de capacité fonctionnelle de 1 MET (3,5 ml/kg/min) s'accompagne d'une réduction de 12% de la mortalité chez les sujets en bonne santé comme chez les sujets DT2, que les sujets soient indemnes de toute pathologie cardiovasculaire ou ayant une pathologie cardiovasculaire (Myers et al. 2002).
