Physical activity and cancer prevention

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Cami sport&cancer

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Physical activity and cancer prevention

Physical activity and cancer risk

Primary prevention

Physical activity and cancer mortality in survivors

Tertiary prevention

Common mechanisms of action

What is physical activity (PA) ?

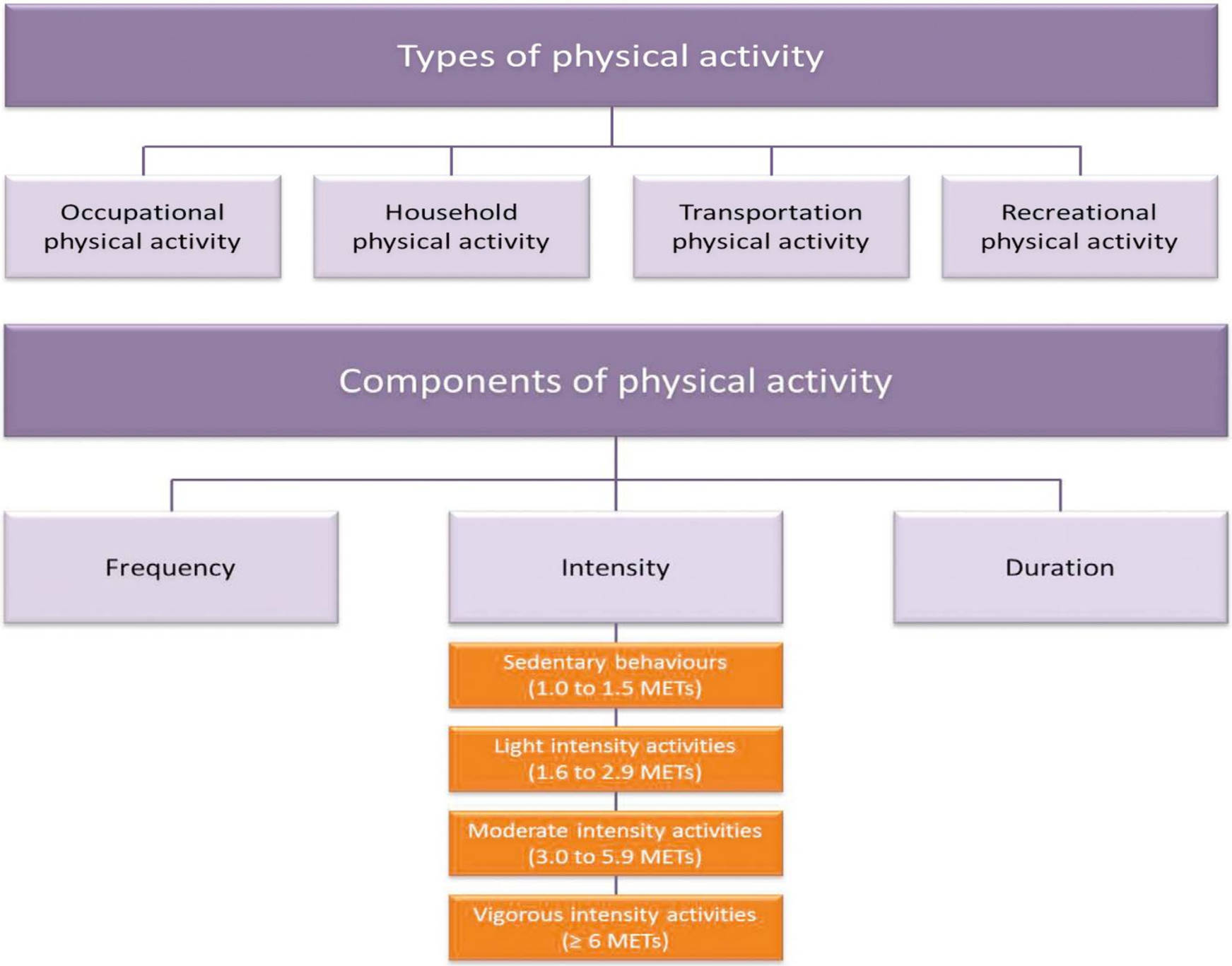
- PA : Movement of the body in relation with skeletal muscles that increases energy expenditure / basal level

- Physical exercise (PE) : planned, structured, repetitive to improve fitness

- PE : Isometric or static (no movement of the limb)
  Isotonic or dynamic (movement of the limb)

- PE : aerobic O2 for muscle Heart rate and energy used
  Anaerobic no O2 muscle size and strength

- Intensity rate of energy expenditure
  MET : 3.25 ml 02/Kg/min


Types of physical activity
Occupational physical activity
Household physical activity
Transportation physical activity
Recreational physical activity
Components of physical activity
Frequency
Intensity
Duration
Sedentary behaviours (1.0 to 1.5 METs)
Light intensity activities (1.6 to 2.9 METs)
Moderate intensity activities (3.0 to 5.9 METs)
Vigorous intensity activities (≥ 6 METs)

Primary prevention PA

Estimated associations between high versus low physical activity levels and incidence of specific cancers.

Cancer Type	Number of studies	Relative risk
Colon	21	0.74 (0.68-0.80)
Endometrial	20	0.82 (0.75-0.90)
Breast	31	0.88 (0.85-0.91)
prostate	24	0.94 (0.91-0.98)
stomach	18	0.90 (0.76-1.06)
ovary	9	0.89 (0.79-1.01)
kidney	19	0.89 (0.80-0.99)
lung	14	0.77 (0.73-0.81)
pancreas	5	0.72 (0.52-0.99)

Letzmann and al European code against cancer Cancer epidemiol 2015

PA and primary prevention of breast cancer

- **PA at different ages reduction in BC risk**

(Lynch BM and al 2011 PA and cancer spring verlag)

PA Adolescence	16 %
PA early adulthood	8 %
PA middle adulthood	15 %
PA > 50	17 %

- **PA adolescences**

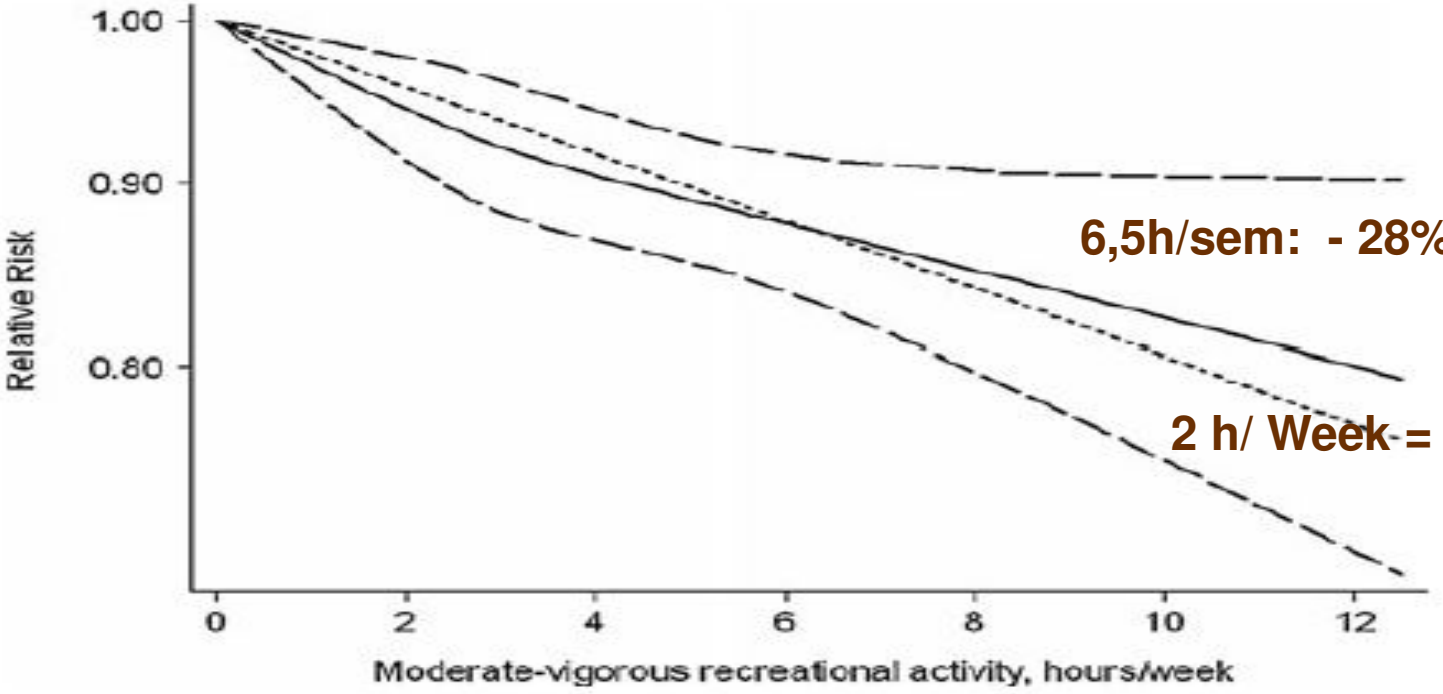
Relative Risk (RR) of Premenopausal Breast Cancer by Patterns of Total Physical Activity During Youth (12–22 years) and Adulthood (≥ 23 years) (Nurses' Health Study II)

Activity by Age group	Person/year	Number of BC	Multivariable RR
Low Youth / Low adulthood	59947	118	1.00
Low youth / high adulthood	13945	22	0.83 (0.53-1.32)
High youth / low adulthood	11874	13	0.63 (0.35-1.11)
High youth / high adulthood	69462	89	0.70 (0.53-0.93)

Maruti S et al J Natl Cancer Inst. 2008 May 21; 100

PA and primary prevention for breast cancer

Reduction of 20 %
Benefit of PA both for pre and postmenopausal BC
Benefit at different ages: Whole life PA
Dependency on exercise intensity and duration



Wu et al. Breast Cancer Res Treat 137: 869-82, 2013

31 prospective studies
63786 cases

RR 2-3h/sem : -7% ⟶ RR 6,5h/sem: -28%

Monninkhof *et al.* Epidemiology 18: 137-57, 2007

PA and primary prevention of gastric and colon cancer

- **Gastric cancer**

16 studies 11 111 cases

RR Most / least PA RR = 0.79 (0.71-0.87)

(Sinhgh S et al Cancer Prev Res 2013)

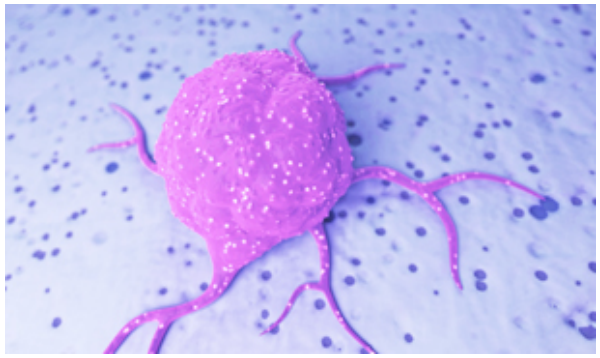
- **Colon cancer**

21 studies

Proximal colon RR most /least PA RR = 0.73 (0.66 -0.81)

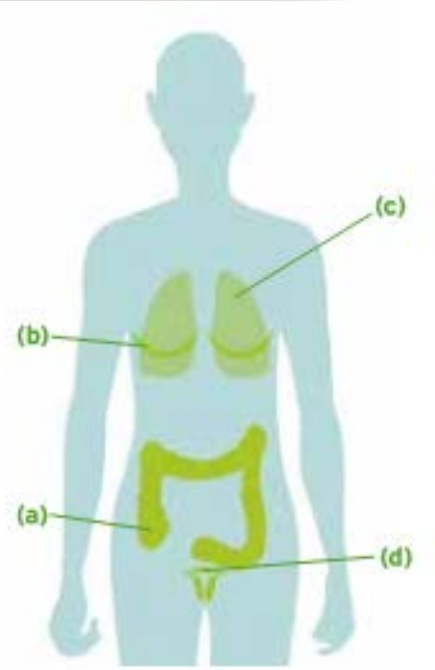
Proximal colon RR most /least PA RR = 0.74 (0.68 -0.80)

(Boyle T et al J Natl Cancer Inst 2012)



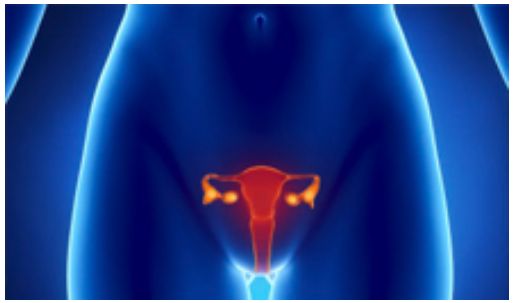
Breast

Colon



Lung cancer

-20-30%



Endometrial cancer

-20-30%

Effects of PA independent of the impact of the major respective cancer risk factors

(Sun JY et al, 2012; Keum N et al, 2014)

World Cancer Research Fund

American Institute for Cancer Research

RECOMMANDATION

PHYSICAL ACTIVITY

Be physically active as part of everyday life

PERSONNAL RECOMMANDATION

Be moderately physically active, equivalent to brisk walking, for at least 30 minutes every day

As fitness improves, aim for 60 minutes or more of moderate, or fore 30 minutes or more of vigorous, physical activity every day

Limit sedentary habits such as watching television

More is better

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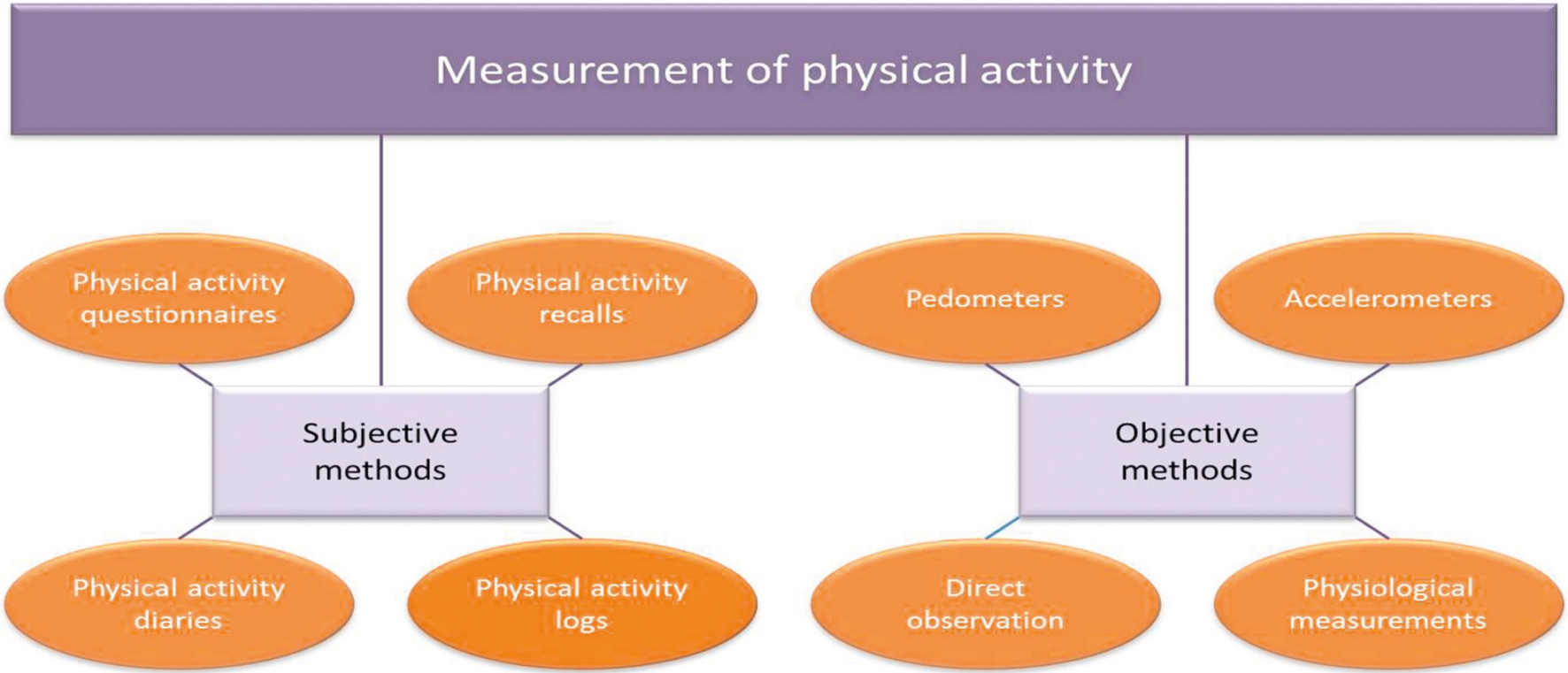
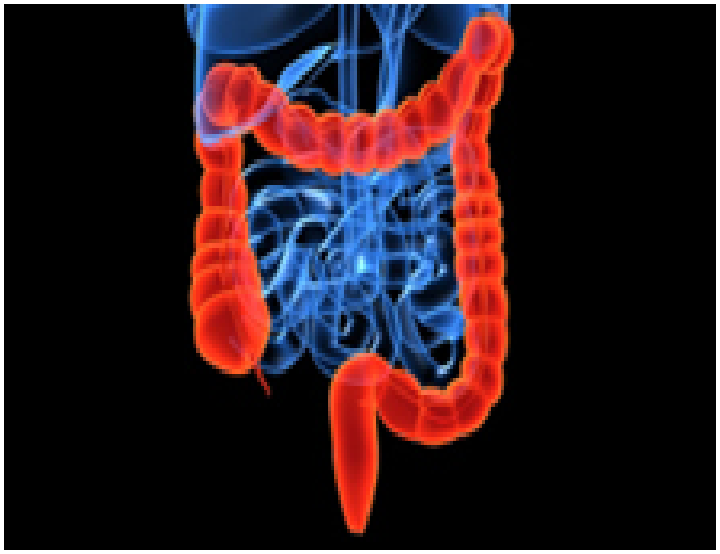
2008 Physical activity guidelines for Americans

- 150 min / Week moderate intensity PA
- 75 min / Week vigorous intensity PA
- Single session or separate sessions of 20 to 30 min each



PA and tertiary prevention



PA after therapy and breast cancer induced mortality

8 cohorts localised BC prospectively assessed benefits 5 and 10 years survival 4 - 6 %

Multivariate analysis

Study	Nber Ptes	MET-H	HR	IC	p
NHS	2 987	9	0,63	0,48-0,81	0,004
WHEL	1 490	9	0,56	0,31-0,98	0,04
CWLS	4 482	8	0,63	0,31-0,88	0,01
HEAL	933	9	0,33	0,15-0,73	0,046
WHI	4 643	9	0,61	0,35-0,99	0,049
LACE	1 970	> 6 h/sem	0,66	0,42-1,03	0,04
CTS	3539	> 3 h/sem	0,53	0,35-0,80	0,003
SBCSS	4 826	8,3	0,60	0,47-0,76	0,049

Meta analysis PA and BC Mortality

- Post diagnostic PA is associated with decreased all cause mortality
  HR = 0,59 (0,53-0,65) p < 0,00001

- Post diagnostic PA is associated with decreased BC specific mortality
  HR = 0,66 (0,57-0,77) p < 0,00001

E Ibrahim, A Al-Homaidh (2010) *Med Oncol* Apr 22

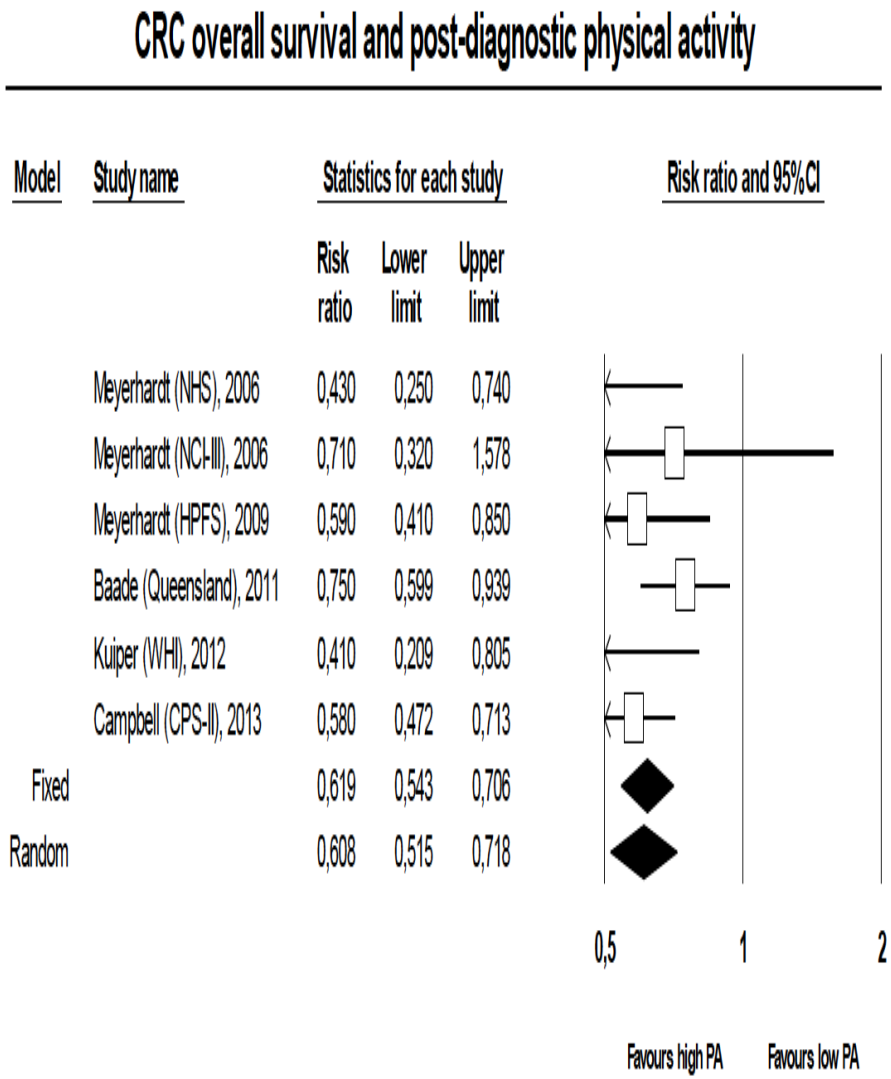
PA post therapy and breast cancer mortality

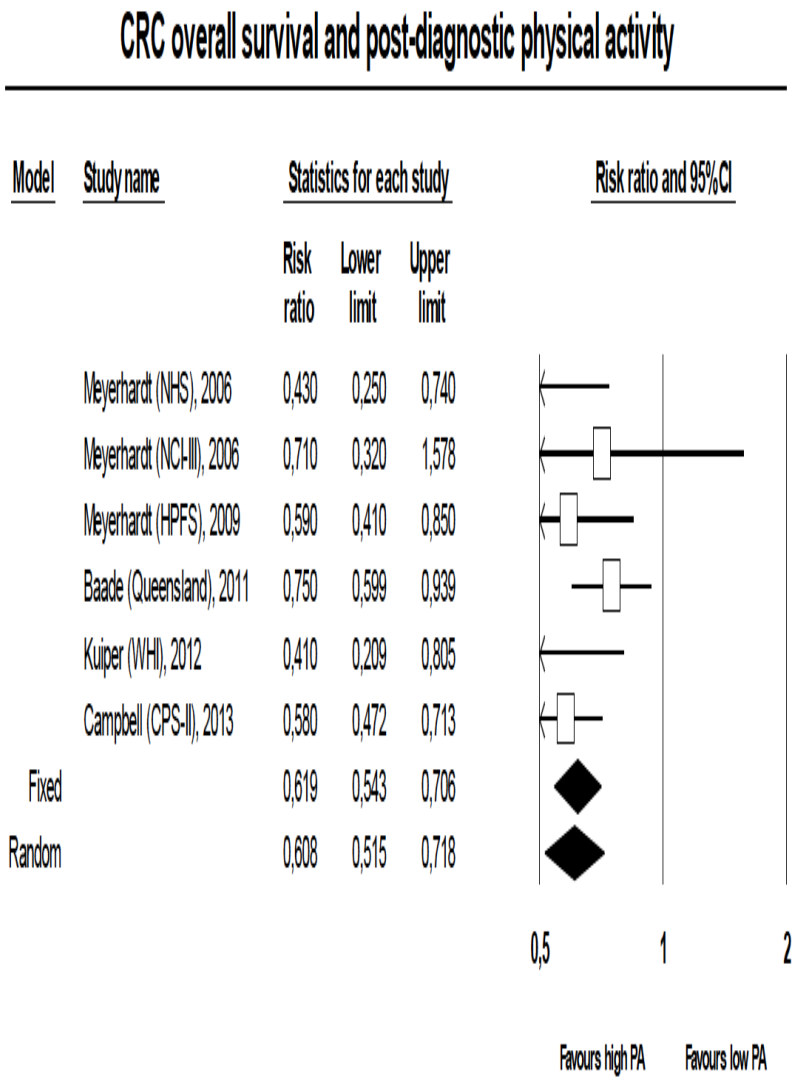
- Post-diagnostic PA levels is associated with a significant trend of decreased all-cause and breast cancer-specific mortality
- Benefit = 5 % survival 5 years
- Dose-response trend
- Threshold effect 9 MET /H / Week
- Mortality all cause and BC-specific increase among women who reduced their post diagnostic PA level.

Borch et al BMC Cancer 2015 15

Influence of physical activity on recurrence and survival of colorectal cancer patients : a Meta-analysis

T. Bouillet ASCO 2013

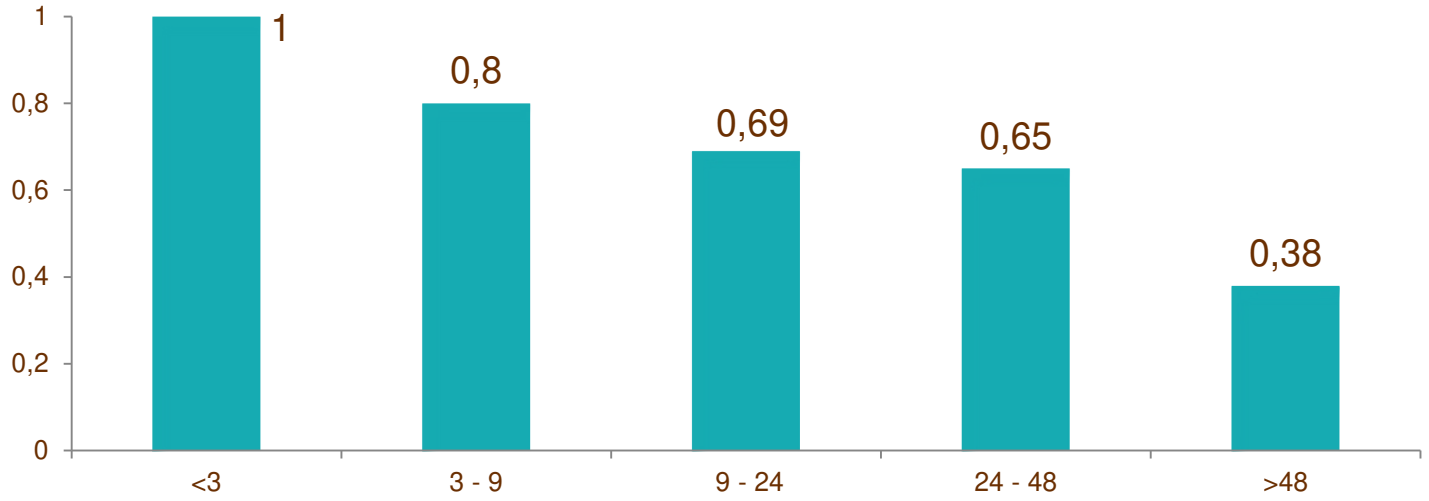




Influence of physical activity on recurrence and survival of prostate cancer patients

Studies	Num of pts	exercise	HR OS	HR CSS
NHS	2705	> 9 MET h / week	0.67 (0.56-0.82)	0.63 (0.43-1.00)
PSURE	1455	Brisk walking 3 hours/w	Relapse 0.43 (0.21-0.91)	
Friedenreich	830	> 26 vs < 4 MET H /W/Y	0.66 (0.49-0.88)	0.56 (0.35-0.90)

Recreational physical activity after diagnosis of prostate cancer is associated with a lower risk of Pca death with a dose response relation



E Richman et al Cancer Res 2011

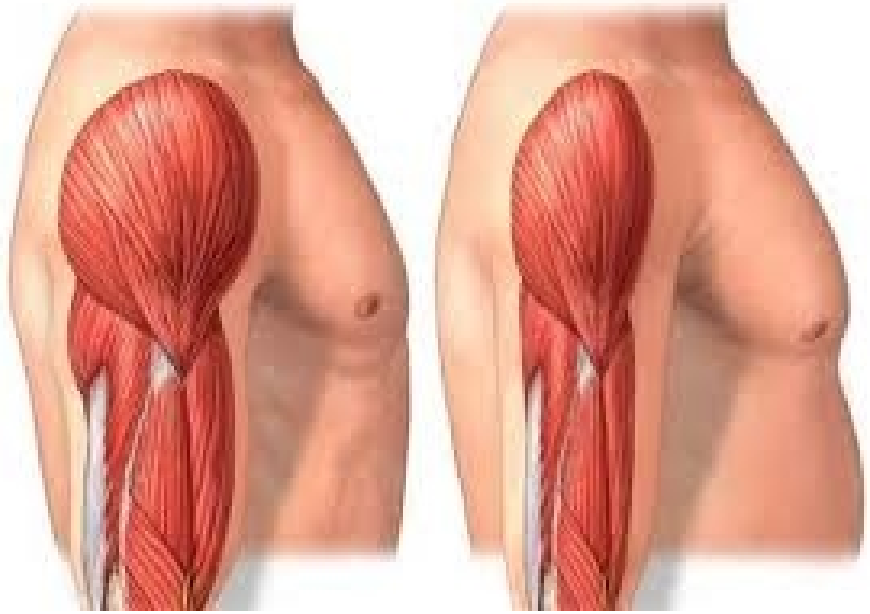
SC Kenfield et al *J Clin Oncol* 2011;29:726-732

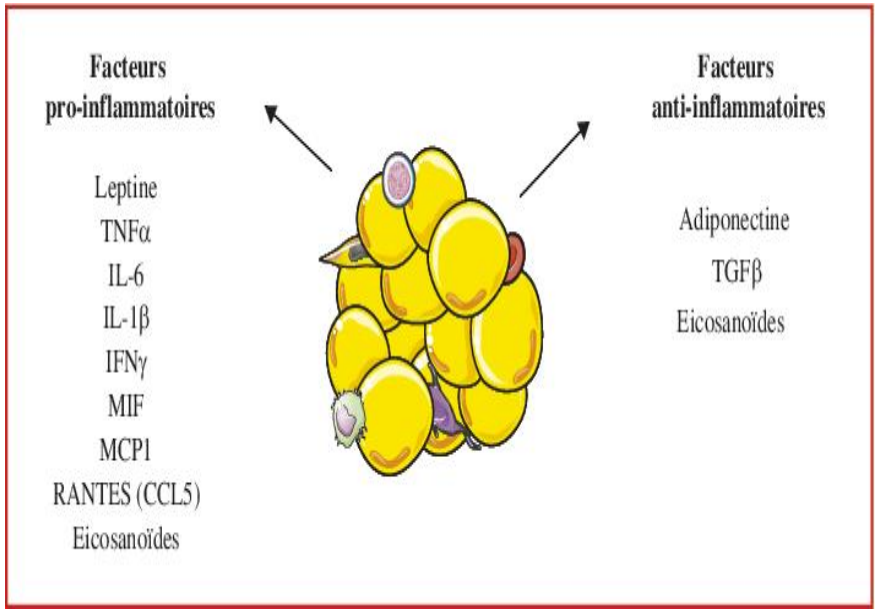
Friedenreich C Eur urology 2016

All in all

- Association between PA after diagnosis and overall and specific survival
- PA is associated with a sustained increase in both specific and overall survival (diabetes, cardiovascular diseases, degenerative neuro, osteoporosis...)
- Dose effect with a minimum threshold intensity and duration
- PA increases quality of life and physiological parameters (weight, muscle tone, bone, cardiorespiratory)
- PA reduces fatigue

PA and Cancer Prevention : Mechanisms

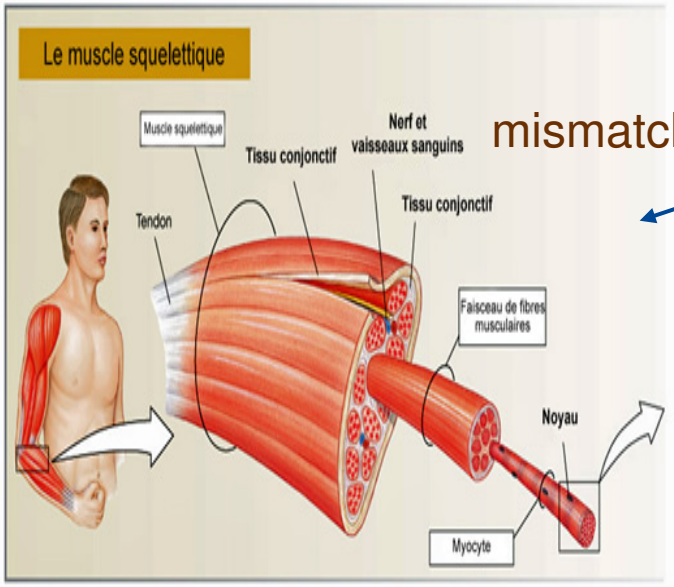




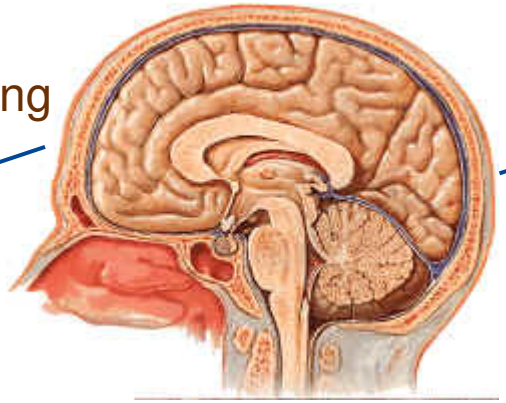
REDUCED CONSUMPTION OF GLUCOSE

CYTOKINE PRODUCTION

Trilogy (TMF) Tumor Muscles Fat cytokines



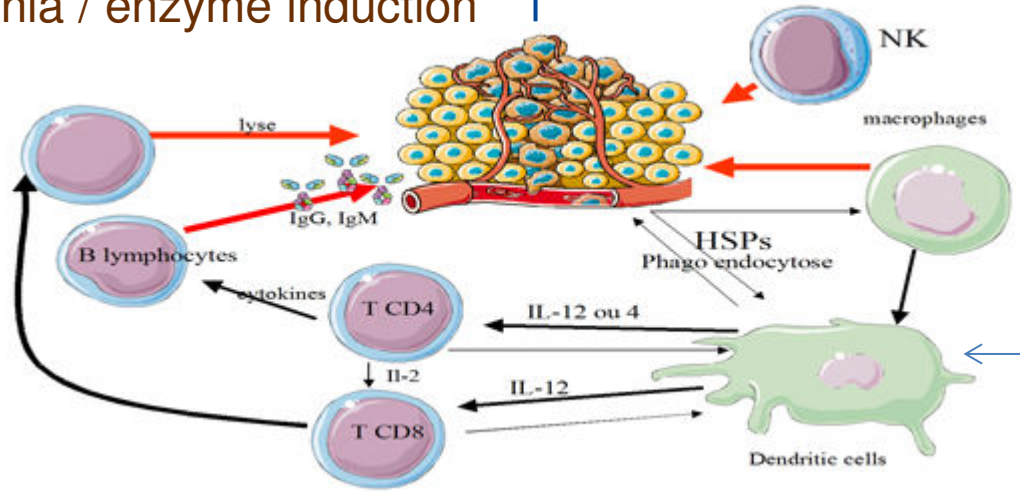
mismatching



behavior disorders
tiredness
muscle abnormalities
hormonal abnormalities

cytokines
Behavioural
disorders
tiredness

cytokines
Sarcopenia / enzyme induction



Fat Taken by:
AP decrease
cortisol
TNF α
Eating disorders

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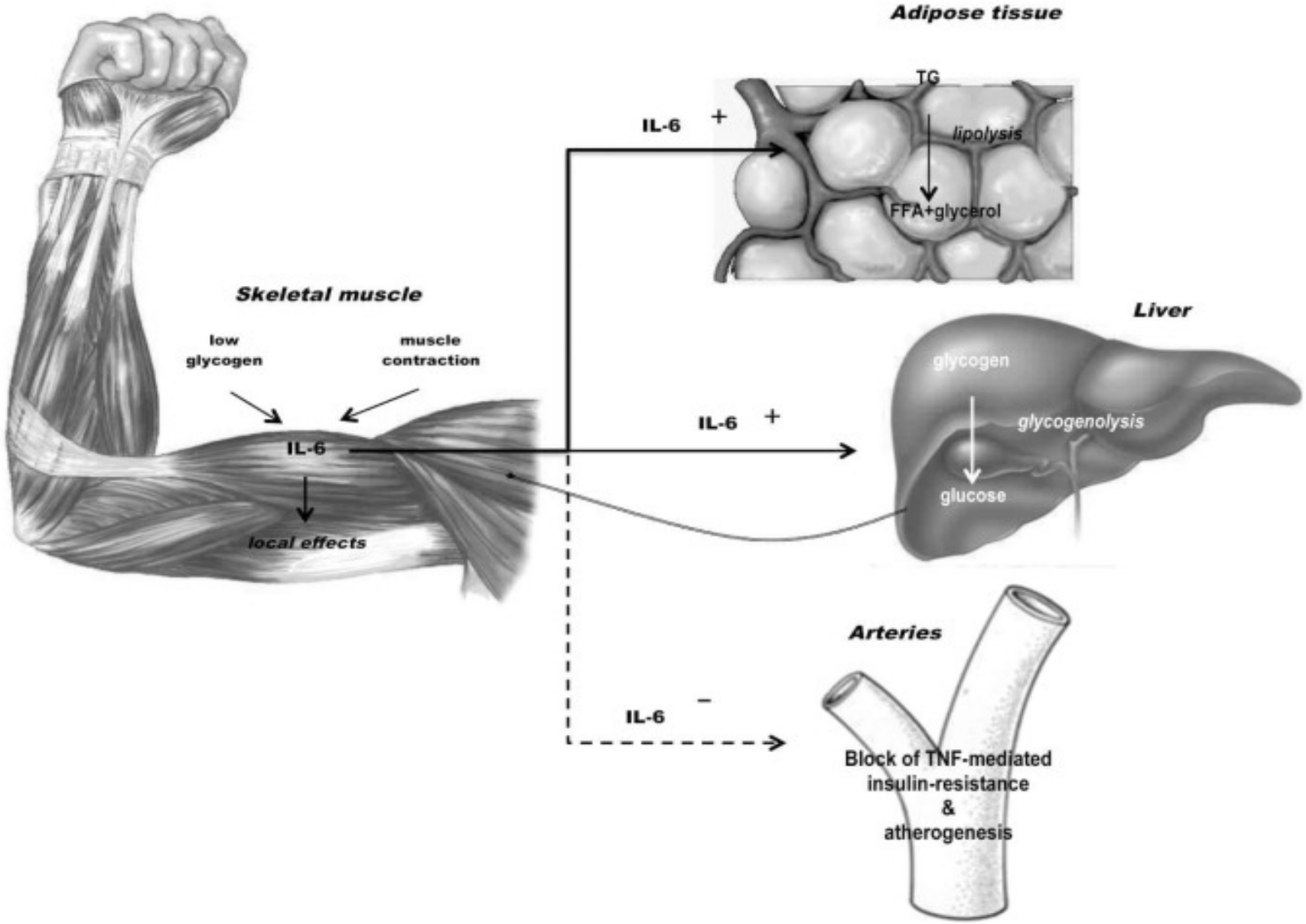
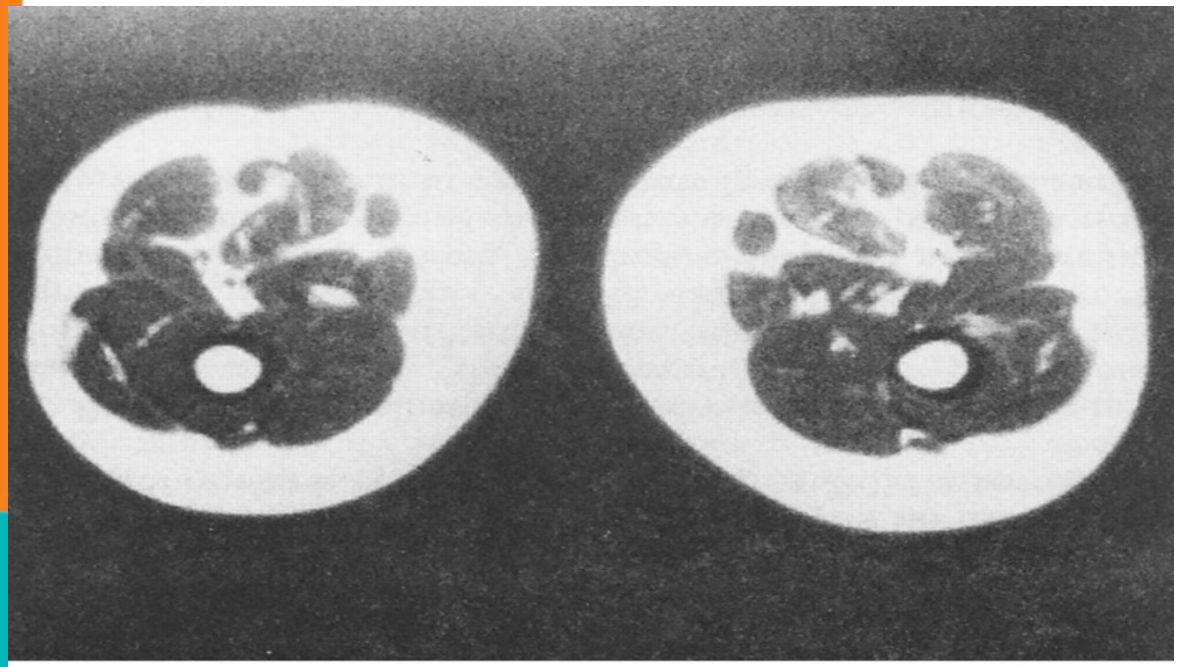
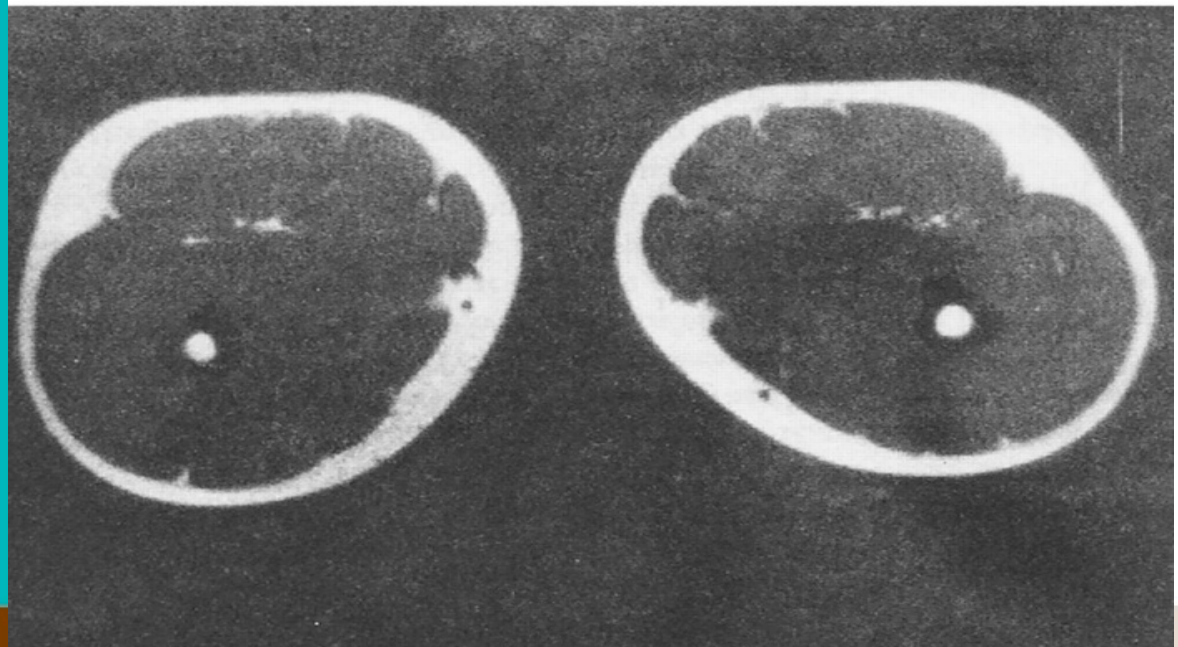
Muscles = endocrine tissues - Effects IL 6







SARCOPENIE

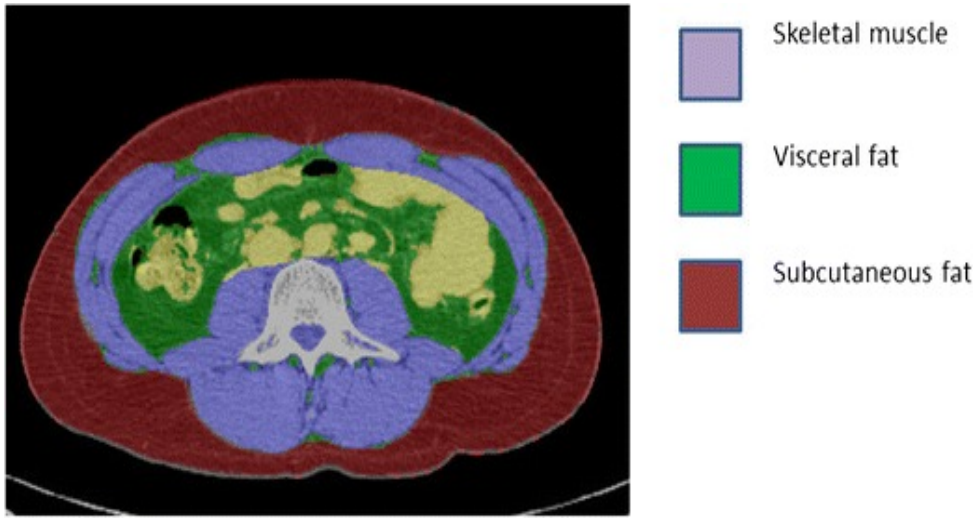
MESURE

TDM

Mesures graisse et muscles

Muscles : Volume et fonction

Hand grip

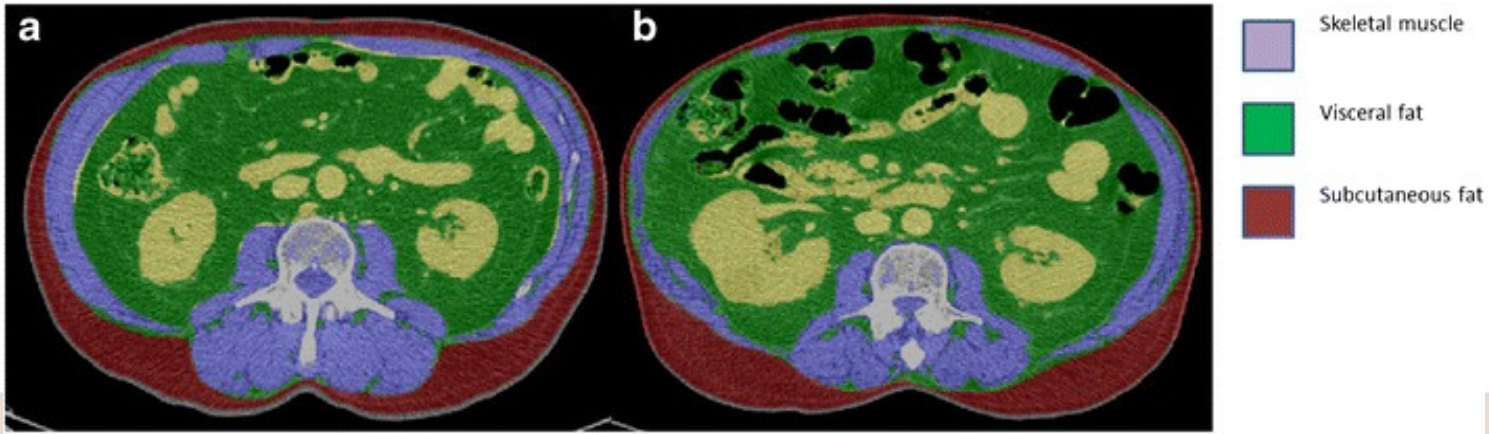


Graisse et muscle

Bioimpédance

TDM et IRM coupe L3 psoas vertébraux abdominaux

Graisse abdominale



Sarcopénie et complications post op

- Mesure masse musculaire en L3 en cm2

sur scanner pré opératoire / normalisation SC

Sarcopénie si :

< 385 mm2/m2 femme

< 545 mm2/m2 homme

100 pts résection colique pour cancer

- 15 % sarcopénique
- Risque de complication grade 3 ou plus

RR 5,41 (1,45-20,15) p 0.01

Jones KI et al colorec Dis 2014

Sarcopénie et complications de la chimiothérapie

89 pts chimio néo adjuvante pour T oeso gastrique
DLT = Réduction de posologie, report ou arret de chimio
DLT 41,6 % des cas
Multivariable sarcopénie associée DLT
RR 2,95 (1,23-7,09) p 0,015)

Tan BH et al EJSO 2015

229 pts colon stade III Fol Fox adjuvant
Sarcopénie associée accroissement toxicité grade 3-4
Univariable RR 1,69 (1,18-2,27)
Mutivariabe RR 1,56 (1,05-2,38)

Jung HW et al Support Care Cancer 2015

K Sein et sarcopénie impact sur survie

HEAL study 471 ptes suivi moyen de 9.2 ans

16 % sarcopéniques dont 38 % sont aussi obèses

Impact sarcopénie sur survie en situation adjuvante

Mortalité globale HR 2.86 (1.67 – 4.89)

Mortalité spécifique HR 1.95 (0.87 - 4.35)

Villasenor A J Cancer Surv 2012

Impact identique en situation métastatique

55 ptes métastatiques 25 % sarcopénie

TTP 101 jours (59-142) vs 173 j (126 -220) p=0.05

Prado CM Clin Cancer Res 2009

Sarcopénie prédictive de survie à 5 ans post résection cancer colique

220 pts cancer colique Stade I-III

25 % sarcopénique

- Survie globale et sans récidive à 5 ans plus faible si sarcopénie

	Muscles Nx	Sarcopénie	p
SG 5 ANS	85 %	68 %	0.015
SSR 5 ans	79 %	56 %	0.006

- Multivariable

Sarcopénie associée à une réduction survies

	RR	p	
SG 5 ans	2,27 (1,147-4.494)	0.019	
SSR 5 ans	2,176 (1,200-3,943)	0.010	

Miyamoto Y et al Ann Surg Oncol 2015

Muscle Dysfonction which consequences ?

Care and sarcopenia

Increased toxicity of chemotherapy and biotherapy (limiting care) breast, colon, kidney

(Jung HW Support Care cancer 2014 Prado C et al Clin Cancer Res 2009)

Partial hepatectomy on colon cancer

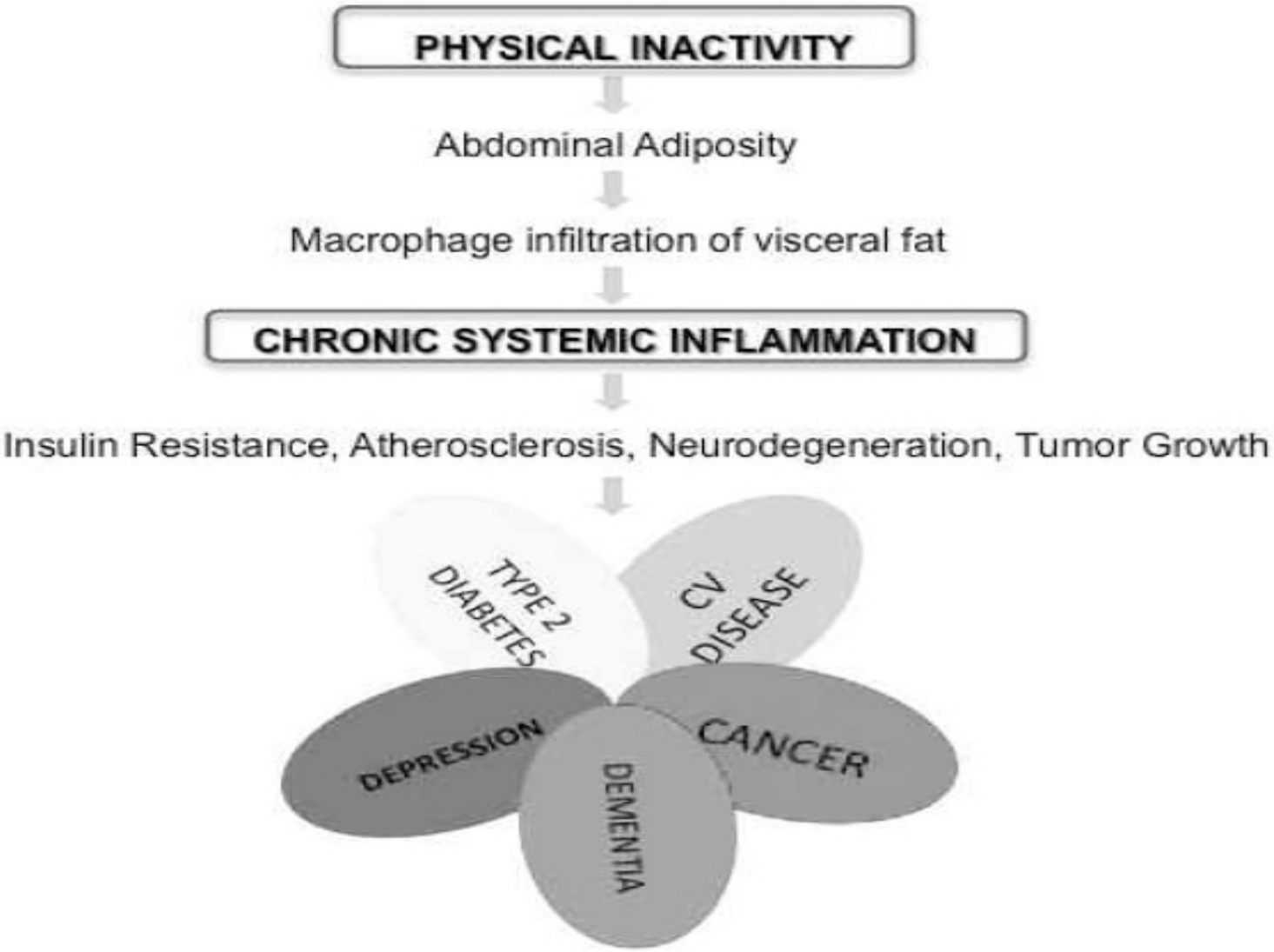
Severe complication rates OR = 3.12

Esophagectomy, increased length of stay if low muscle strength of hands (hand grip)

Christensen JF et al Ann oncology 2014

Impact on global and specific survival

Polypathologies and physical inactivity



Sport & physical activity (S PA) and fat - muscles

- Reduces visceral fat
- Increases muscle mass (0.8 kg muscle if PA during adjuvant chemotherapy for Breast C)

(Christiensen JF Ann Oncol 2014)

Different actions depending exercises type:

Aerobic increases respiratory cardio fitness increases muscle strength

(Courneya K J Clin Oncol 2007)

S PA effects on insulin resistance and cytokines

S PA REDUCES INSULIN RESISTANCE FROM 1st SESSION AND ON ≥ 72 HOURS

The effect in subsequent sessions require a steady increase efforts

Decrease fat and increase muscle mass

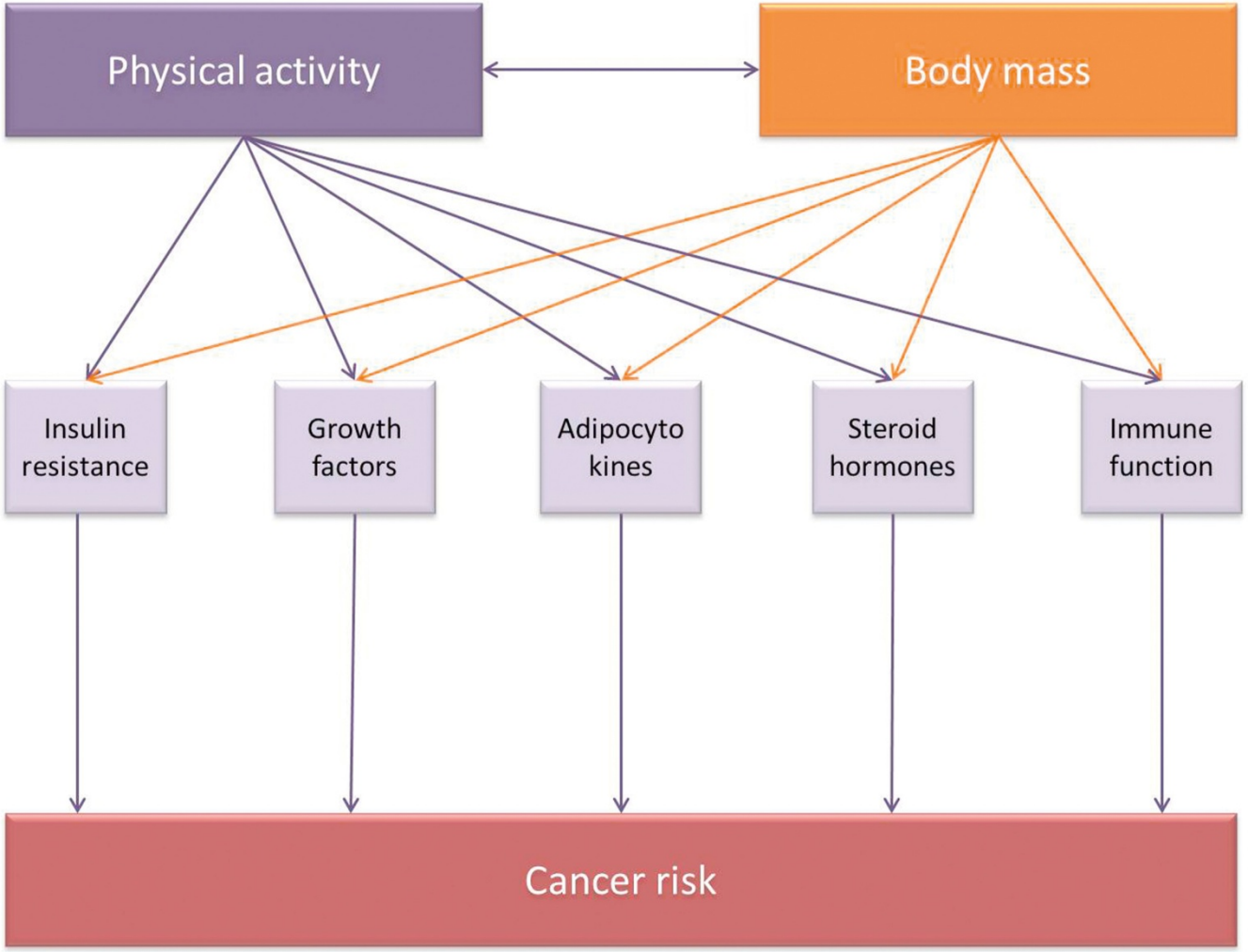
S PA REDUCES CYTOKINES of INFLAMMATORY TISSUE

S PA INCREASES ADIPONECTIN

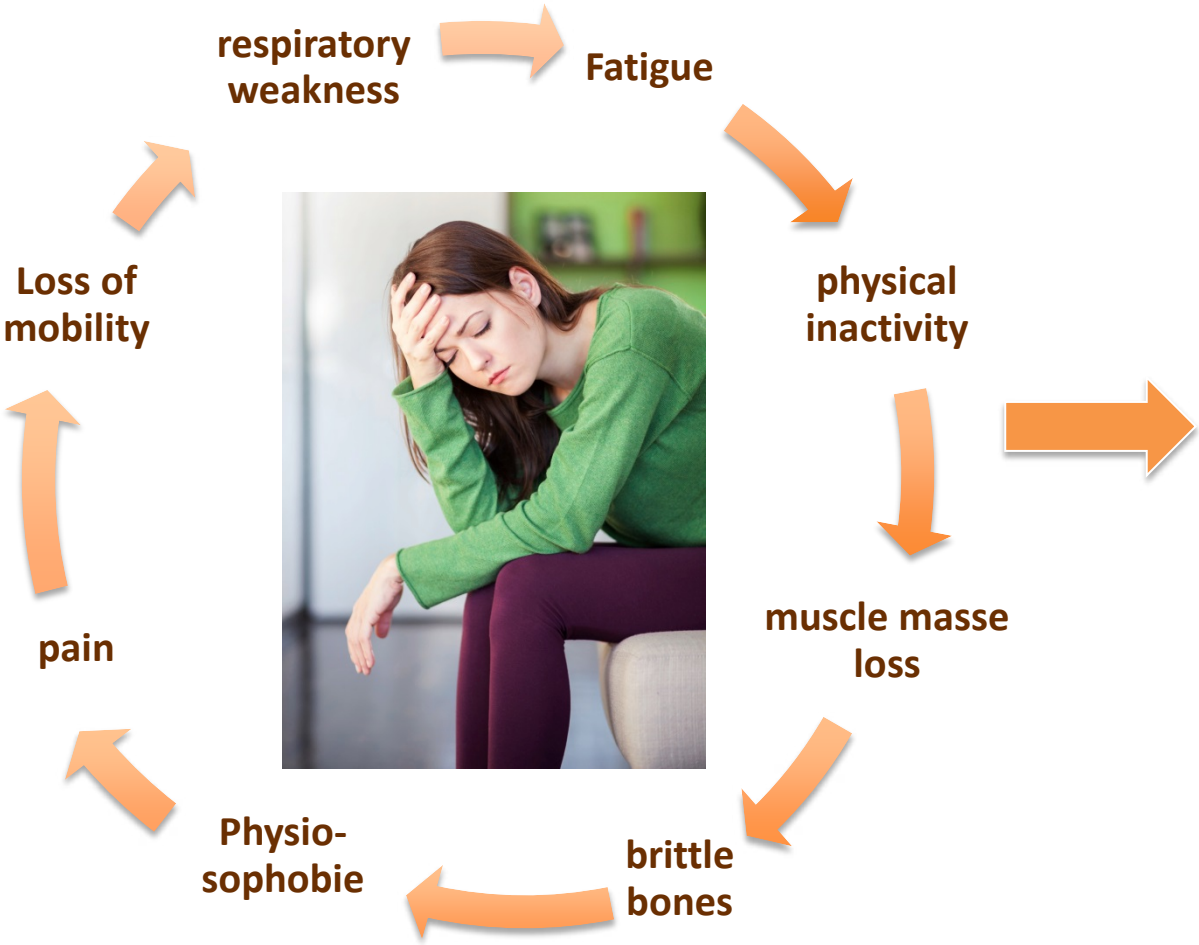
EFFETS = 72 HOURS EXPENDED BY SESSIONS DURATION

PRATICE > 6 MOIS

Golbidi S J Diab Res 2014 Nelson R et al Appl Physiol Nutr Metab 2014



Cancer treatments on the body : a vicious circle



- Increased toxicity risk
- handicap
- comorbidities
- Cancer cell proliferation
- Immune system down
- proinflammatory
- Altered sleep
- medication overuse

S PA and cancer : what advice?


- Early onset - Inflammation and sarcopenia exist from the Dg
- Sustained intensity, duration> 50 minutes, 3 times / week, duration effects Insulin
- Combined exercise endurance and aerobic
- Period> 6 months
- Structured courses (reported activities> real activities)

(Ekblom-Bak E Eur J Cardiovasc Prev Rehabil 2010)

Search pleasure and safety

Let's talk some sports talk ...

Sport is good for health!

Recommendations and references

AFSOS
Association Francophone pour les Soins Oncologiques de Support

SFMES

NCCN National Comprehensive Cancer Network®

CCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®)

Cancer-Related Fatigue

Version 1.2012

NCCN.org

American Cancer Society®

AMERICAN COLLEGE OF SPORTS MEDICINE • FOUNDED 1954 •

AMERICAN COLLEGE of SPORTS MEDICINE®

Cami sport&cancer

The meeting of three worlds :

the patients, medical and sports worlds

for

Three effects :

Fatigue, Quality of life,
Survival

World Cancer Research Fund International

Obesity, physical activity and cancer

There is a strong link between being overweight or obese & an **increased risk** of 9 cancers:

- Advanced prostate
- Ovarian
- Gallbladder
- Kidney
- Colorectal (bowel)
- Oesophageal*
- Postmenopausal breast
- Pancreatic
- Endometrial (womb)

There is a strong link between being physically active & a **decreased risk** of 3 cancers:

- Postmenopausal breast
- Colorectal (bowel)
- Endometrial (womb)

Top 10 countries* with the highest % of overweight or obese adults

- Mexico 71.3%
- United States 68.6%
- Chile 64.5%
- New Zealand 63.8%
- Australia 63.4%
- Israel 62.2%
- United Kingdom 61.9%
- Hungary 61.6%
- Ireland 61%
- Finland 59.2%
- Luxembourg 59.2%

1.6 billion adults worldwide are overweight or obese. This exceeds the population of China

Physical inactivity is the 4th leading cause of death worldwide

www.wcrf.org

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World Cancer Research Fund International

MAINTAIN A HEALTHY WEIGHT

MOVE MORE

EAT MORE VEG, FRUIT WHOLEGRAINS & PULSES

LIMIT SUGAR AND FAT

10 CANCER PREVENTION RECOMMENDATIONS

World Cancer Day 4 February 2015

LIMIT RED MEAT, AVOID PROCESSED MEAT

CUT DOWN ON ALCOHOL

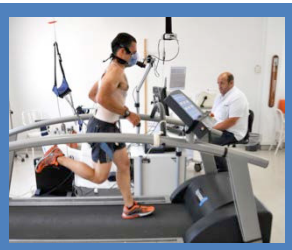
EAT LESS SALT

CANCER PREVENTION
Together We Can

FOR CANCER PREVENTION DON'T USE SUPPLEMENTS

BREASTFEED YOUR BABY

AFTER TREATMENT, CANCER SURVIVORS SHOULD FOLLOW THE CANCER PREVENTION RECOMMENDATIONS



Les spécialistes d'accord sur les bienfait du sport pour la santé

15 minutes d'activité physique par jour prolongent la vie de 3 ans*

L'activité physique régulière réduit de 50 % le risque d'hypertension artérielle, de plus de 60 % la récidive du cancer du sein et du côlon*

**Enquête « Découvrez le meilleur des médicaments » Santé-médecine.net et Journal des Femmes Santé 2012*

manger bouger
PROGRAMME NATIONAL NUTRITION SANTÉ

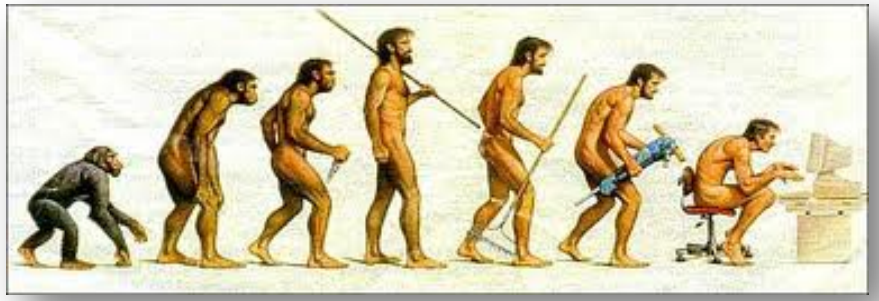
Les pouvoirs publics investissent dans des messages

Les PNNS : un programme de recherche et d'information grand public, près de 270M€ investis depuis sa création

Plan National Nutrition et Santé

PNNS 1 - 2001 à 2005	10 M€ / an
PNNS 2 - 2006 à 2010	47 M€ / 4 ans (~12 M€ / an)
PNNS 3 - 2011 à 2015	210 M€ / 4 ans (~52 M€ / an)

Partenariat avec l'INSERM, l'INRA et l'ANR
Evaluation en 2006 par l'OPEPS et l'INSERM
Evaluation en 2011 par l'IGAS et l'OQALI



…que tout le monde écoute et intègre

87 % des Français accueillent favorablement les messages sanitaires insérés dans les publicités alimentaires,

71 % les ont mémorisés*

**Enquête de l'impact des messages sanitaires PNNS réalisée par l'Inpes auprès de 1063 personnes*

Mais ça ne marche pas !!!

75 % des Français n'atteignent pas l'objectif santé des 10.000 pas quotidiens (80% en 2013)

Les freins à l'activité physique ou sportive sont d'ailleurs beaucoup moins souvent financiers que liés au manque de temps*

* Enquête Assureurs Prévention sur le niveau d'activité physique ou sportive et de sédentarité de la population française

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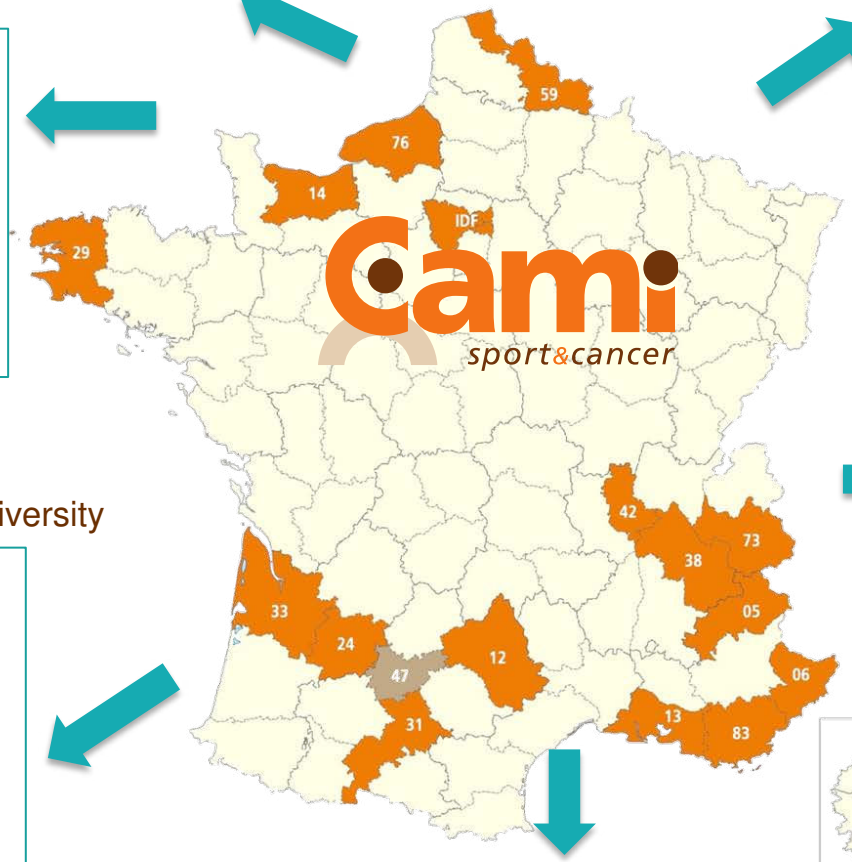
20 Neuilly s/ Seine
09 54 72 12 73 - info@sportetcancer.com
www.sportetcancer.com

A crossroads of collaborative networks

Scientific Societies: repositories

Sports Federations: sports clubs labeling

Care centers : “Sport & Cancer Poles”



University : ‘Sport et Cancer” University Diploma

Oncology Network: Sport and Cancer Project Support

Patients organizations : Patients’ projects

Patients at the heart of the CAMI's commitment

- **1600 patients** cared for per week
- **5000 hours** of classes per year
- **120 sessions** per week in class (oncology)
- **80 individual sessions** per week (hematology / pediatric oncology)
- **12-15 patients** per session



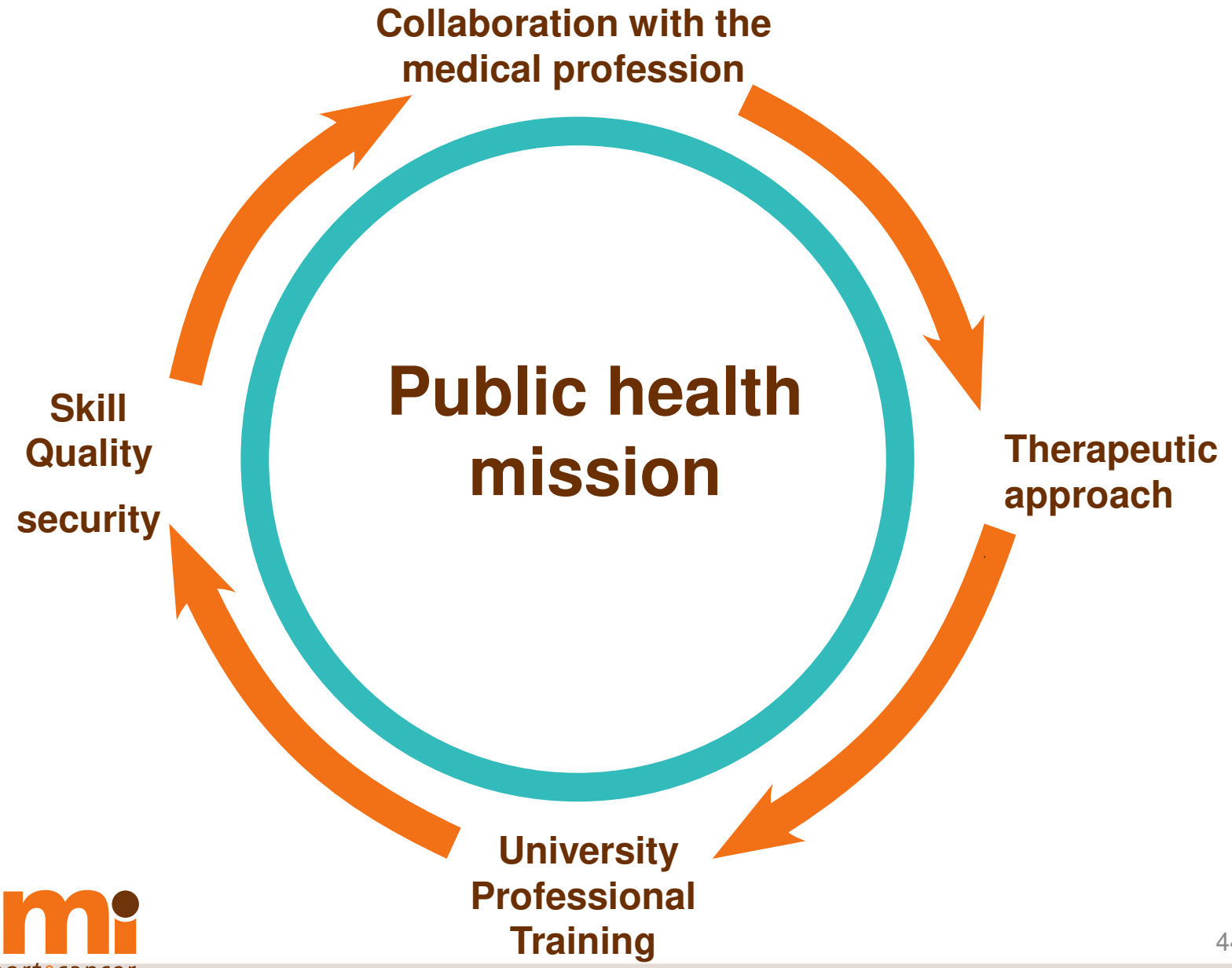



- **No time limit** during treatment
- Median Supported: 8 months / 2 times per week

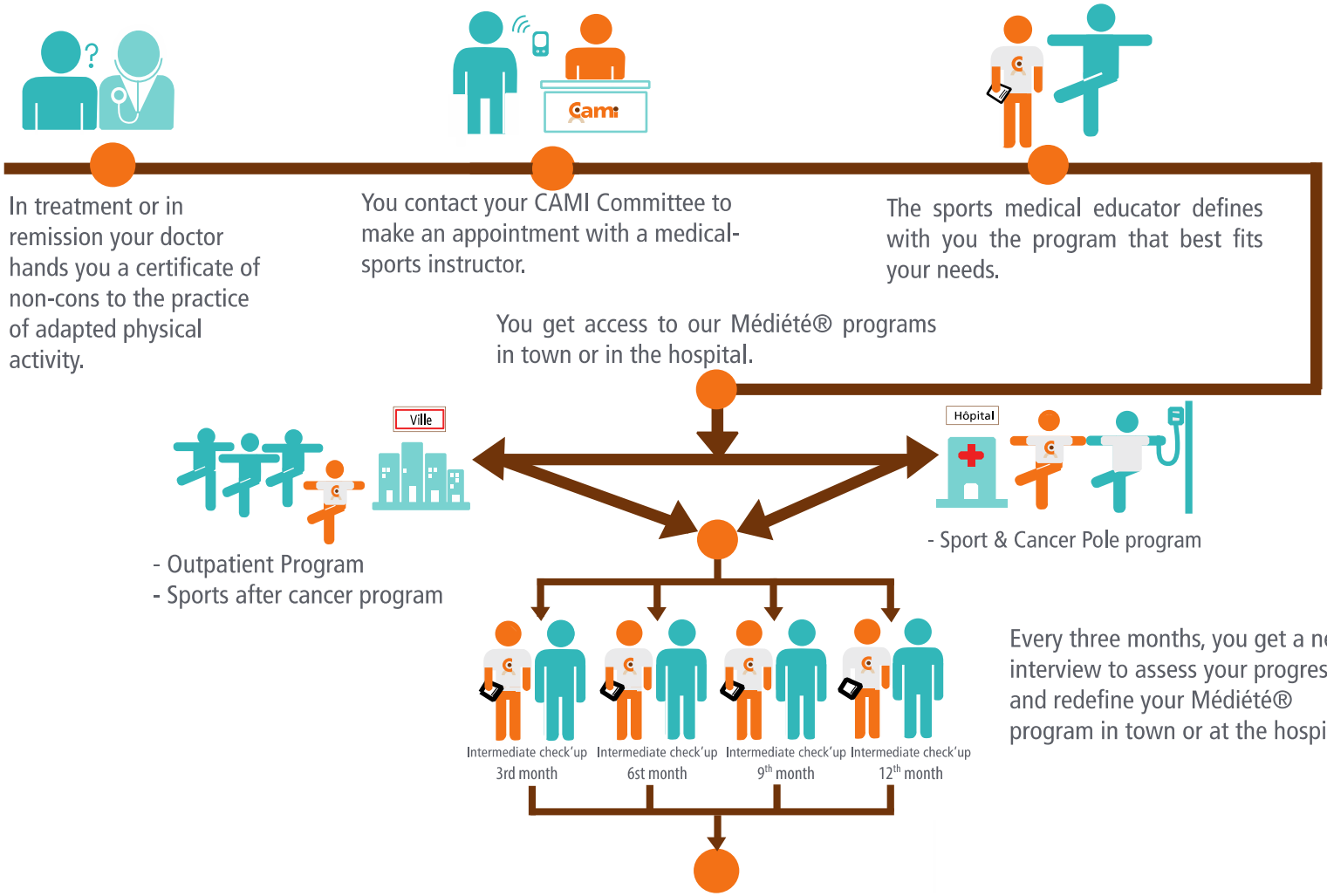
- **A deliberately minimal financial contribution**
  - Low financial contribution from patients for in town session
  - Solidarity Operation for the poor
  - Free programs within the Sport et Cancer Department

- **Cost for the CAMI of one session per patient in oncology in town : € 8**
- **cost for the CAMI of one session per patient oncology Pole: € 10**
- **Cost for the CAMI of a patient session in Hematology / Pediatric Oncology: € 30**

A unique intervention model



A proven device



In treatment or in remission your doctor hands you a certificate of non-cons to the practice of adapted physical activity.

You contact your CAMI Committee to make an appointment with a medical-sports instructor.

The sports medical educator defines with you the program that best fits your needs.

You get access to our Médiété® programs in town or in the hospital.

- Outpatient Program
- Sports after cancer program

- Sport & Cancer Pole program

Every three months, you get a new interview to assess your progress and redefine your Médiété® program in town or at the hospital.

We consider treatment changes, your general physical condition and your needs. You can leave CAMI at any time. You will be directed to other sports facilities through our exit check'out.

Foreword

APS en ONCOLOGIE UN MUST !!!

- COUPLE GRAISSE MUSCLE
- CYTOKINES CANCER INFLAMMATION GRAISSES
- INSULINO RESISTANCE
- COMPLICATIONS
- SURVIE
- URGENCES THERAPEUTIQUES
- SECURITE BONHEUR PRINCIPES FORMATIONS