Place de la viande dans les discours sur la santé

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Introduction

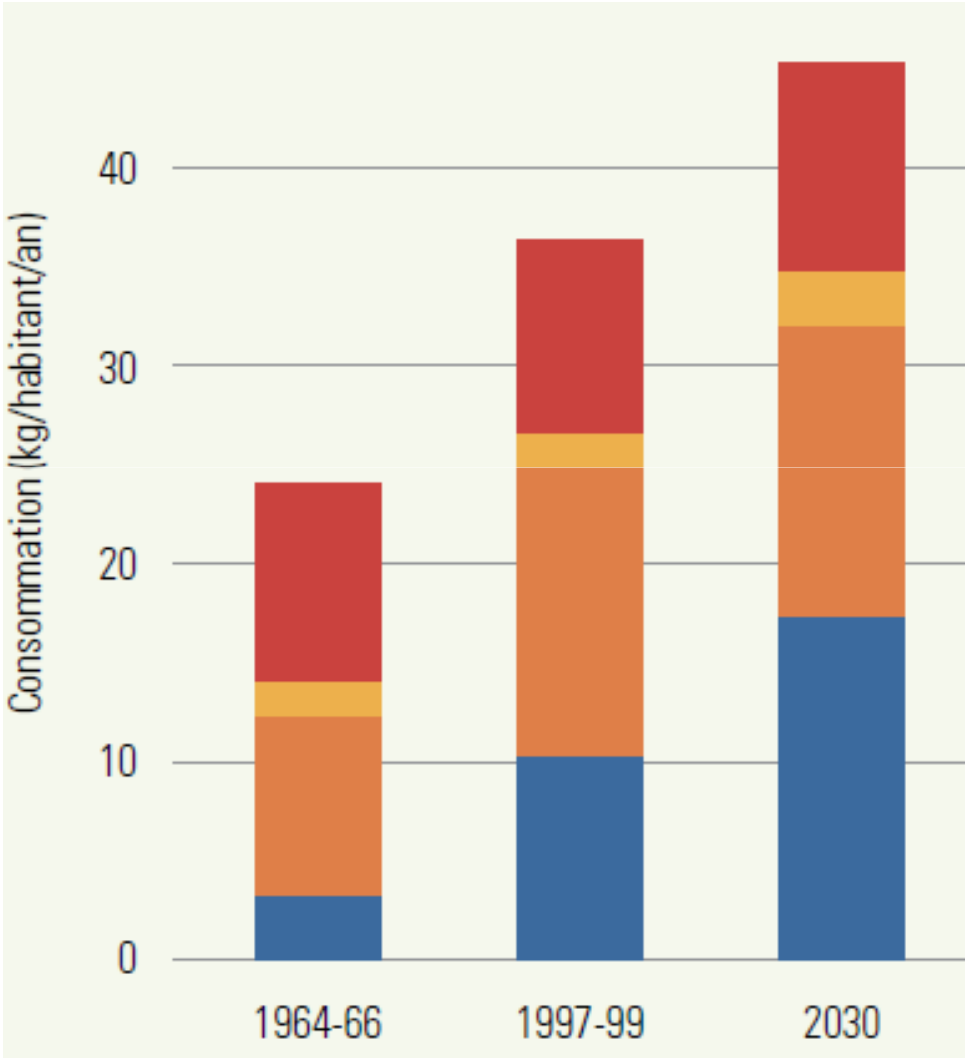
- La viande occupe une place relativement importante dans divers régimes alimentaires de l'homme
- C'est une source alimentaire de protéines, de lipides, de fer, de zinc, de sélénium et de vitamines du groupe B (B3, B6, B12).
- Quels atouts et quelles limites de la consommation de viande? Quelles relations avec la santé?

1- Consommation individuelle de viande dans le monde (kg/habitant/an)

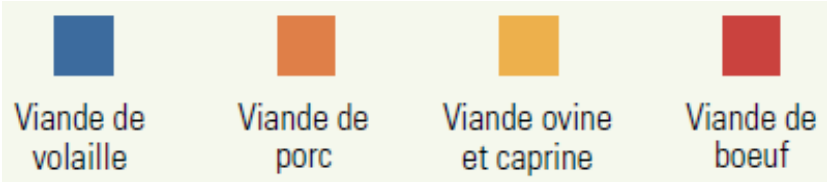
Monde	2000	2001	2002	2003
Porc	14,7	14,6	14,2	15,2
Volailles	11,3	11,6	11,9	12,0
Bovins	9,9	9,7	9,8	9,7
Ovins	1,9	1,8	1,9	1,9
Total	**37,8**	**38,0**	**38,7**	**38,7**

2003	États Unis	UE	Japon	Inde
Total	124,5	71,7	23,1	3,7

La production animale augmente pour satisfaire la demande croissante de viande. Source: FAO

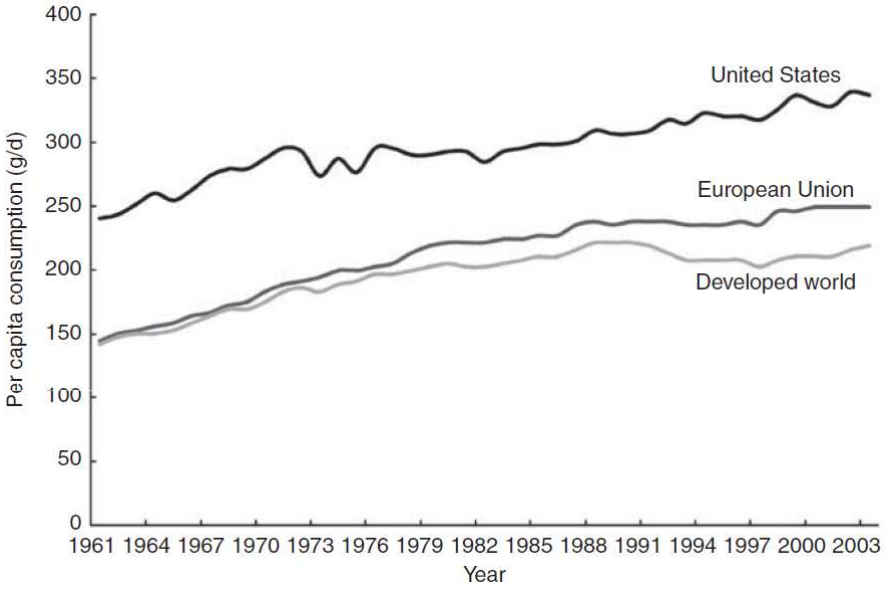


Consommation moyenne mondiale de viande par habitant, 1964-66 – 2030

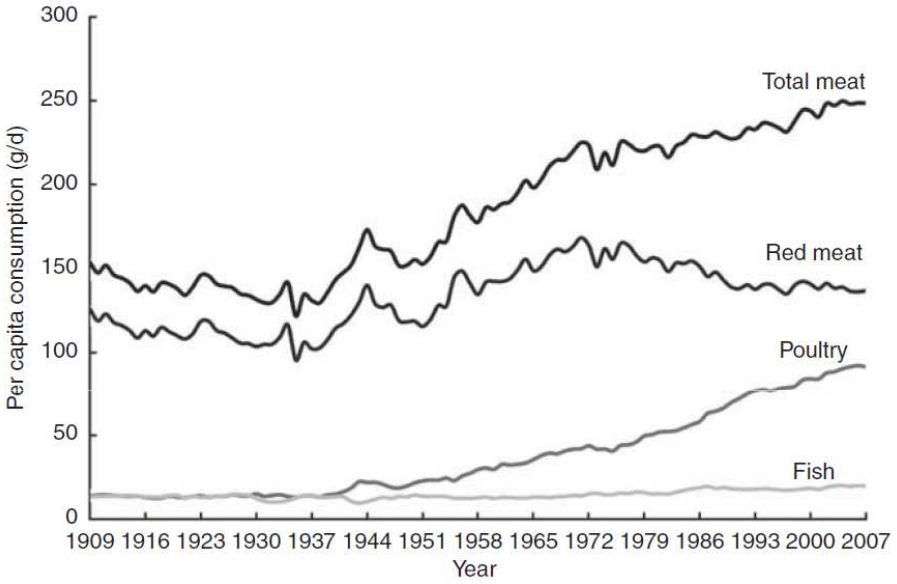


Trends in meat consumption.

Daniel et al, Public Health Nutr 2010 Nov 12:1-9



Total meat consumption in the USA, European Union and the developed world, 1961–2003 (FAO)



Total meat, red meat, poultry and fish consumption in the USA, 1909–2007 (US Department of Agriculture, Economic Research Service)

Mean daily intakes of total, red and processed meat (g/d) by men and women as measured in several European countries

Country	Total meat[a]		Red meat[b]		Processed meat[c]	
	Men	Women	Men	Women	Men	Women
Greece[d]	78.8	47.1	45.3	25.5	10	5.8
UK[d]	108.1	72.3	40	24.6	38.4	22.3
Italy[d]	140.1	86.1	57.8	40.8	33.5	19.6
Denmark[d]	141.1	88.3	69.6	44.1	51.9	25.3
Germany[d]	154.6	84.3	52.2	28.6	83.2	40.9
Netherlands[d]	155.6	92.7	63.8	41.1	72.4	37.9
Ireland[e]	167.9	106.6	63.9	37.5	30.9	19.9
Spain[d]	170.4	99.2	74	37.8	52.8	29.6

[a] Total meat: pork, beef, veal, lamb/mutton, poultry, game, rabbit, horse, goat, offal and processed meat.

[b] Red meat: beef, veal, pork and lamb/mutton.

[c] Processed meat: ham, bacon, processed meat cuts, minced meat and sausages.

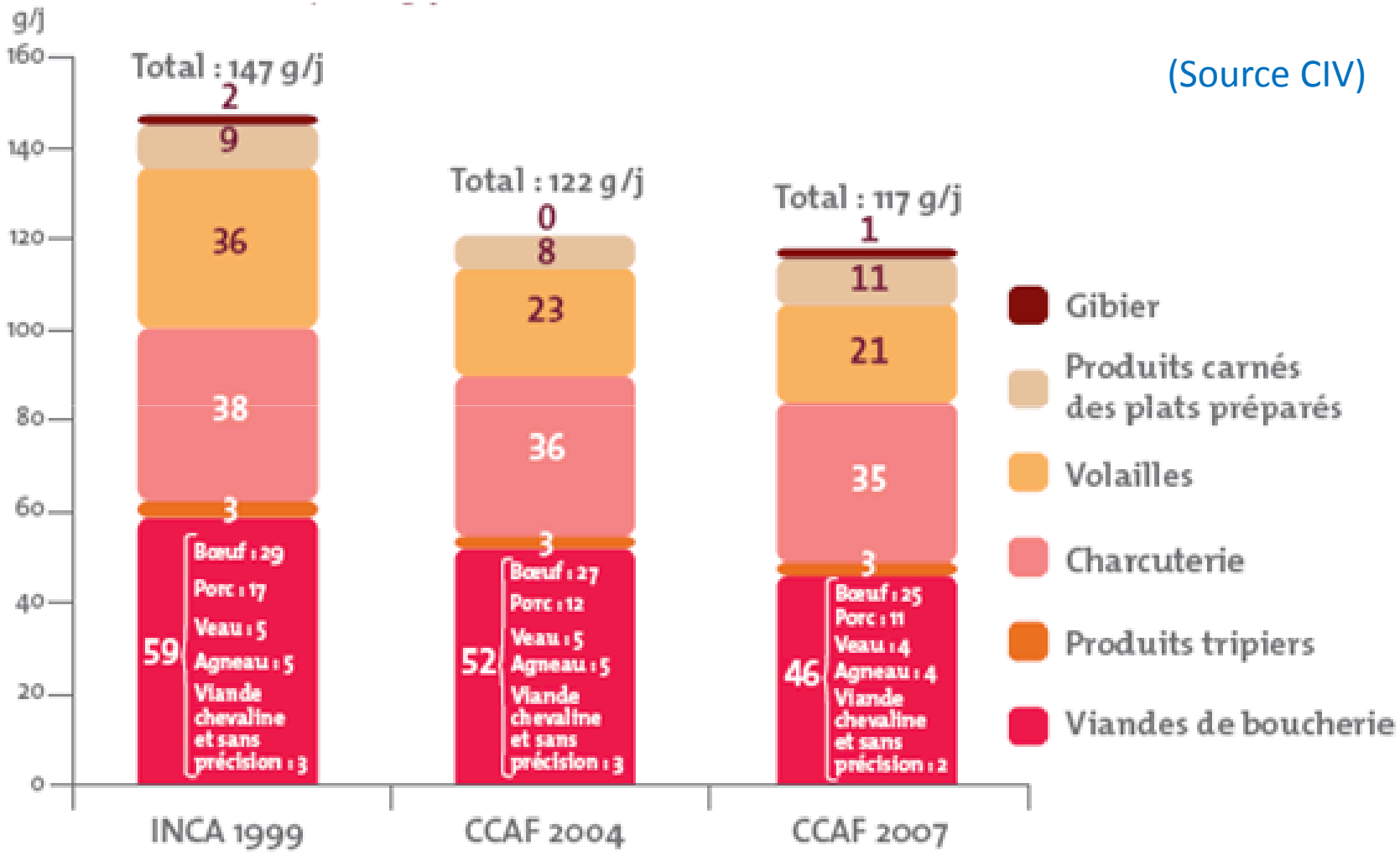
[d] *Source*: Linseisen et al. (2002).

[e] *Source*: Cosgrove et al. (2005).

McAfee et al. Red meat consumption: An overview of the risks and benefits. Meat Science 84 (2010) 1–13

Evolution de la consommation moyenne de produits carnés des adultes (15 ans et plus) (g/j) en France

(Source CIV)



Source : Enquêtes CRÉDOC-INCA 1999, CCAF 2004 et CCAF 2007

2- Atouts et limites nutritionnels de la viande?

- La teneur en matière sèche de la viande est de 25-35%
- Les protéines : Les protéines de la viande représentent en moyenne 20% MH et sont de très bonne qualité nutritionnelle
- Les lipides : La teneur en lipides varie de 2 à 15 g/100g MH
- les autres nutriments : fer, vitamines du groupe B, phosphore, vit A et D, zinc, sélénium

Viande et besoins nutritionnels de l'homme

- Besoin en énergie ~2000 kcal/j – glucides 55%, lipides 35%, protéines 10%
  - La viande apporte des protéines (5 kcal/g) et des lipides (9 kcal/g)
- Besoin en protéine – 0,83 g/kg/j – soit 50-60 g/j chez l'adulte
  - La viande apporte des protéines de qualité élevée
- Besoin en acides gras indispensables insaturés
  - la viande apporte une forte proportion d'acides gras saturés
- Besoin en vitamines et minéraux
  - La viande apporte fer, zinc, sélénium, vitamines du groupe B

Teneurs moyennes en protéines par famille d'aliments

Famille d'aliments	Teneur moyenne en protéines (g/100 g)
Produits animaux	
Volailles	28,17
Viandes	26,85
Fromages	20,41
Poissons et batraciens	19,13
Charcuteries et salaisons	16,26
Œufs et dérivés	12,35
Produits végétaux	
Graines oléagineuses et châtaigne	17,30
Légumes secs	9,02
Céréales et pâtes	7,81
Pommes de terre et apparentés	2,78
Légumes	1,83
Fruits	1,06

Les vitamines et minéraux

- Les viandes représentent la source alimentaire de *fer héminique:* fer ferreux (++), mieux absorbé que le fer ferrique (+++) des végétaux. Les abats, en particulier le foie, sont très riches en fer.
- Les viandes sont riches en vitamines du *groupe B* (B3, B6, B12). Les abats (principalement le foie) sont les plus riches; ils apportent aussi des vitamines A et D.

Viandes et besoins nutritionnels
Apports pour 100 g de viande

- 20 g de protéines soit 30% des besoins journaliers en protéine de l'homme adulte (besoin de ~ 60 g/j)

- vitamines B3 (4-6 mg), B6 (0,1-0,5 mg) et B12 (1-7 µg) soit 50 à 100% des besoins

- 2-4 mg de fer, 3-7 mg de zinc et 10-15 µg de sélénium soit 20-30% des besoins

Limites nutritionnelles à la consommation de viande?

Vitamines et minéraux

- Les viandes sont pauvres en calcium et riches en phosphore (en particulier les abats) et présentent un mauvais rapport Ca/P.
- Les viandes sont dépourvues en vitamines E et K

Les lipides :

- La teneur en lipides varie de 2 à 15 g/100g MH
- Les acides gras saturés représentent 35-55 % des acides gras totaux.
- les viandes, mêmes maigres sont sources de *cholestérol*

Les lipides de la viande

- La teneur en matières grasses des viandes varie de **2 à 15 %**
  - Les viandes *les plus maigres (< 10 %): lapin, cheval, veau, poulet et dinde (sans peau), l*es abats (foie, cœur, rognons), le gibier
  - Les viandes les plus grasses (10 à 15 %): certains morceaux de bœuf et de porc, l'agneau, le canard
- Les lipides des viandes sont principalement des acides gras *saturés* et *monoinsaturés*.
- Les volailles sont une bonne source d'acides gras mono et polyinsaturés

Composition lipidique de quelques aliments du groupe des viandes

Aliments	Lipides Totaux (g/100 g)	Acides gras (% des AG totaux)		
		Saturés	Mono-insaturés	Poly-insaturés
Agneau	15	53	41,9	5,1
Bœuf	8,5	45,7	50	4,3
Porc	12	41,2	48,9	9,9
Cheval	4,6	39,5	34,9	25,6
Oie	17,5	43,7	41,3	15
Poulet	4,0	35,1	48,6	16,2
Dinde	2,9	36,7	35,5	27,8
Thon au naturel	1,6	37,8	28,0	34,1
Sardine	9,0	34,2	31,6	34,2
Saumon	10,1	21,1	40	38,9
Hareng	14,6	23,1	32,1	44,8

Source : Répertoire Général des Aliments, Ciqual, 1995

Teneur en cholestérol des viandes, poissons et œufs

Aliments	Cholestérol (mg/100 g)
Viandes en général	65 à 80
Viandes de porc	100
Cervelles	2 000 à 2 200
Rognons	365 à 380
Foie	265 à 555
Cœur	150 à 170
Langue	110 à 140
Jaune d'œuf	1 480
Charcuteries	100 à 380
Crustacés (crevettes, homard)	140 à 182
Œuf de "lump", caviar	300
Coquillages (moules, coquille St Jacques)	50 à 70
Poissons (moyenne)	50 à 70

Toutes les viandes, mêmes maigres sont sources de *cholestérol*, en particulier les abats

3- Surconsommation de viande et facteurs de risque? Cancer

- Cancer colorectal – hypothèse d'augmentation modérée du risque (viande rouge)
- Autres cancers controversé - Cancer du sein - Cancer de la prostate
- Origine ?: Graisses, produits dérivés des protéines (amines, phénols, sulfure d'hydrogène), composés nitrosés, amines hétérocycliques, fer héminique, …

Diet and cancer prevention: Contributions from the European Prospective Investigation into Cancer and Nutrition (EPIC) study

Gonzalez, Riboli. European Journal of Cancer 46 (2010) 2555–2562

Tumour site		Results
Stomach	González CA. JNCI 2006[1]	Total meat calibrated HR = 2.03 (1.28–3.22) per 100 g/d increase Red meat: calibrated HR = 1.31 (0.89–1.94) per 50 g/d increase Processed meat: calibrated HR = 1.64 (1.07–2.51) per 50 g/d increase
Colorectal	Norat T. JNCI 2005[2]	Red and processed meat intake calibrated HR = 1.55 (1.19–2.02) per 100 g /d increase. Red meat calibrated HR = 1.49 (0.91–2.43) per 100 g/d increase Processed meat calibrated HR = 1.70 (1.05–2.76) per 100 g /d increase
	Pischon T. JNCI 2006	BMI men: HR = 1.55 (1.12–2.15) *p* trend 0.006 WHR women HR = 1.46 (1.06–2.0) *p* for trend 0.01 (highest versus lowest)
	Ferrari P. Int J Can 2007	Alcohol intake HR 1.08 (1.04–1.12) for 15 g/d increase

(WHR - Waist-hip ratio)

Summary of prospective, cohort and case–control studies investigating the associations between meat (red & processed) and risk of colon cancer

Colon cancer Non-significant findings

Colon cancer significant findings

Author (year)	Study, country	Subjects (*n*)	Sex (age range)	Type of meat studied	Cases vs. non-cases (*n*)	Significance (high vs. low quintiles)	Outcome examined	Relative risk/ hazard/odds ratios (C.I.)
Colon cancer, non-significant findings								
Kimura et al. (2007)	Fukoka Colorectal Cancer case–control Study, Japan	782[a]	m & f (20–74)	Red Processed	166 vs. 154 170 vs. 152	NS NS	Colorectal cancer risk	1.14 (0.81–1.61) 1.15 (0.83–1.6)
Shin et al. (2007)	Tennessee Colorectal Polyp case–control Study	1028[a]	m & f (40–75)	Red Processed	159 vs. 129 167 vs. 139	NS NS	Adenomatous & hyperplastic polyp risk	1.5 (0.9–2.6) 1.1 (0.7–0.8)
Robertson et al. (2005)	The Antioxidant & the Calcium Polyp Prevention clinical trials, USA	1794	m & f (< 80)	Red Processed	373 vs. 133 363 vs. 146	NS NS	Adenoma recurrence risk	0.97 (0.78–1.21) 1.15 (0.92–1.43)
Sinha et al. (2005)	Prostate, Lung, Colorectal and Ovarian (PLCO) Cancer screening trial case–control study, USA	3696[a]	m & f (55–74)	Red Processed	~	NS NS	Colorectal cancer risk	1.07 (0.92–1.24) 1.04 (0.9–1.19)
Chao et al. (2005)	Cancer Prevention II Nutrition cohort, USA	148,610	m & f (50–74)	Red Processed	210 vs. 164 26 vs. 153	NS NS	Colon cancer risk	1.15 (0.9–1.46) 1.13 (0.91–1.41)
Flood et al. (2003)	Breast Cancer Detection and Demonstration Project (BCDDP) cohort study, USA	45,496	f (35–80)	Red Processed	~	NS NS	Colorectal cancer risk	1.04 (0.77–1.41) 0.97 (0.73–1.28)
Colon cancer, significant findings								
Norat et al. (2005)	European Prospective Investigation into Cancer and Nutrition (EPIC), 10 European countries	478,040	m & f (35–70)	Red Processed	250 vs. 132 232 vs. 121	NS Sig	Colorectal cancer risk	1.49 (0.91–2.43) 1.70 (1.05–2.76)
English et al. (2004)	Melbourne Collaborative Cohort Study, Australia	37,112	m (27–75)	Red Processed	Unknown	NS Sig	Colorectal cancer risk	1.4 (1.0–1.9) 1.5 (1.1–2.0)
Wei et al. (2004)	NHS & Health Professionals follow-up study (HPFS), prospective cohort studies, USA	134,365	m & f (30–75)	Red Processed	155 vs. 31 81 vs. 15	NS Sig	Colon cancer risk	1.43 (1.00–2.05) 1.33 (1.04–1.7)
Cross et al. (2007)	NIH-AARP, USA	567,169	m & f (50–71)	Red Processed	935 vs. 255 932 vs. 251	Sig Sig	Colorectal cancer risk	1.24 (1.12–1.36) 1.2 (1.09–1.32)

McAfee et al. Red meat consumption: An overview of the risks and benefits. Meat Science 84 (2010) 1–13

Diet and cancer prevention: Contributions from the European Prospective Investigation into Cancer and Nutrition (EPIC) study

Tumour site		Results
Breast	Lahmann P. Int J Can 2004	BMI postmenopausal women non-user of HRT HR 1.36 (1.06–1.75) *p* for trend 0.002 highest versus lowest
	Tjonneland A. CC&C 2007	Alcohol intake HR = 1.03 (1.01–.05) per 10 g/d increase
	Sieri S. Am J Clin Nutr 2008	Saturated fat intake HR = 1.13 (1.00–1.27) *p* for trend 0.038. Highest versus lowest
Prostate	Allen N. CEB&P 2007	IGF-I serum concentration OR = 1.39 (1.02–.89) highest versus lowest third
	Allen N. BJC 2008	Dairy protein intake calibrated HR = 1.32 (1.01–.72) *p* for trend 0.04 for an increase of 35 g/d Dairy calcium intake calibrated HR = 1.07 (1.00–.14) *p* for trend 0.04 for an increase of 0.3 g/d

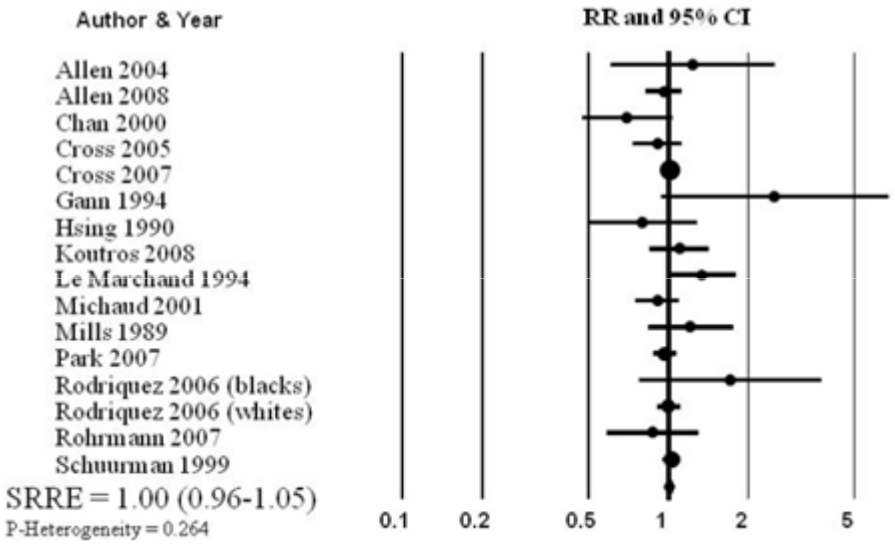
HRT – Hormone replacement therapy

Gonzalez, Riboli. European Journal of Cancer 46 (2010) 2555–2562

A review and meta-analysis of prospective studies of red and processed meat intake and **prostate cancer**

Alexander et al. Nutrition Journal 2010, 9:50

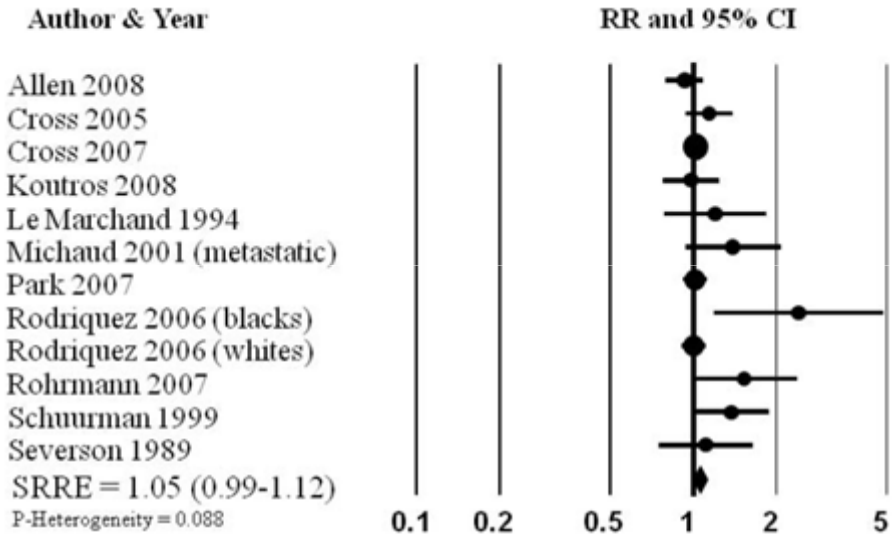
Meta-analysis of prospective studies of red meat intake and prostate cancer



Analyses of high vs. low red meat intake and 100 g increment dose-response regression produced similar results; both SRREs were 1.0.

	SRRE (95% CI)	P- Heterogeneity
Red Meat		
100 g increment (total prostate cancer)*	1.00 (0.95-1.05)	0.007
100 g increment (advanced cancer)*	0.97 (0.91-1.02)	0.571

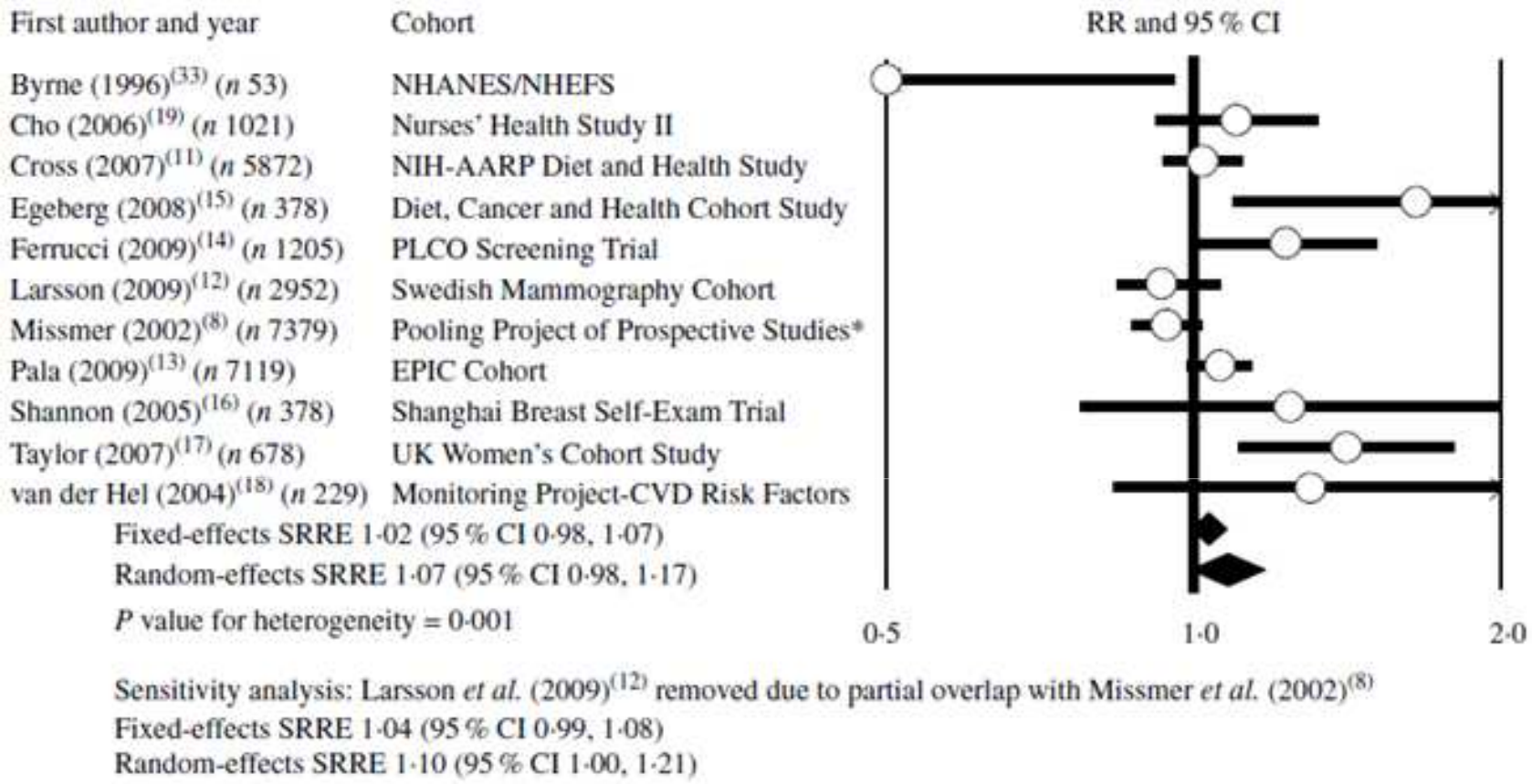
Meta-analysis of prospective studies of processed meat intake and prostate cancer



Summary associations for processed meat were slightly stronger in magnitude compared with red meat

	SRRE (95% CI)	P- Heterogeneity
Processed Meat		
30 g increment (total prostate cancer)	1.02 (1.00-1.04)	0.274
30 g increment (advanced cancer)	1.01 (0.90-1.14)	0.020

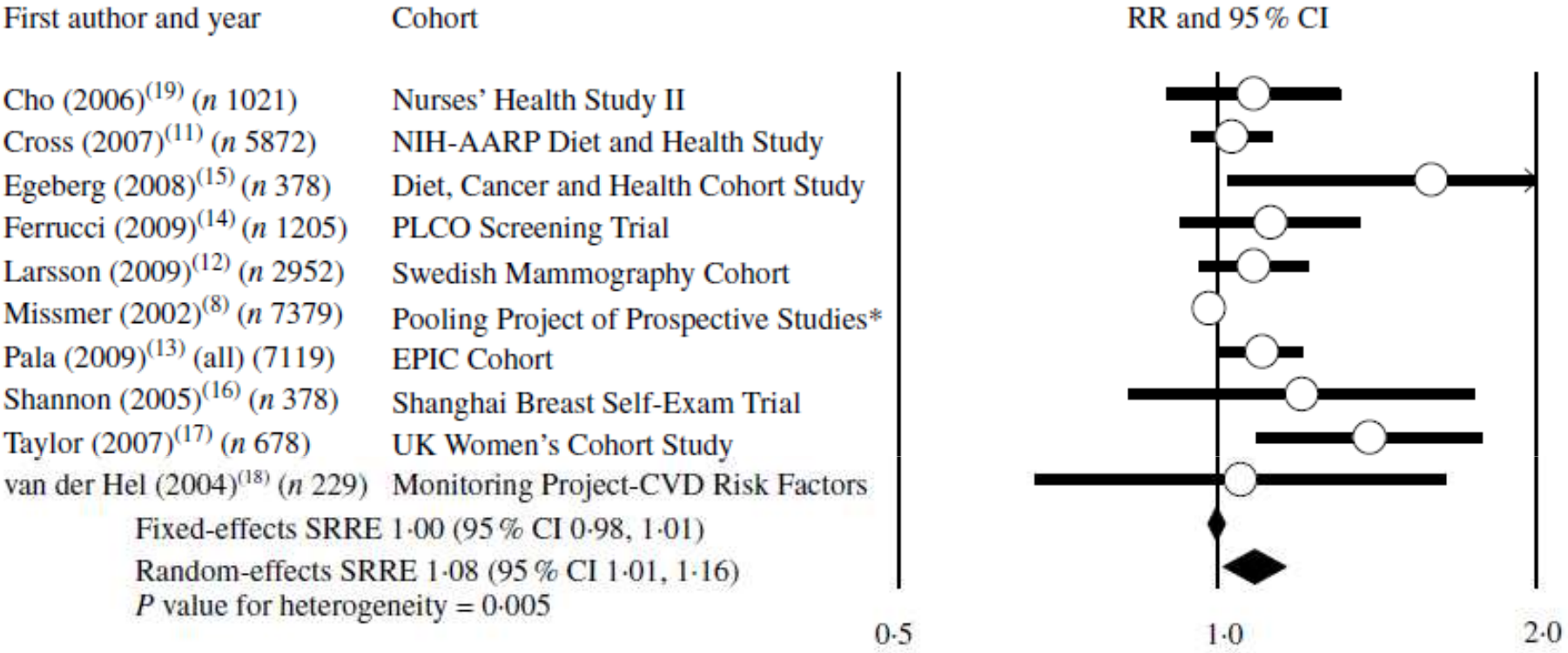
Meta-analysis of prospective studies of red meat and **breast cancer**



No significant association between the highest category of red meat intake compared with the lowest category of intake and breast cancer
(SRRE for fixed-effects model 1·02; 95% CI 0·98, 1·07; P value for heterogeneity 0·001)

Alexander et al. A review and meta-analysis of red and processed meat consumption and breast cancer. Nutrition Research Reviews (2010), 23, 349–365

Meta-analysis of prospective studies of processed meat and **breast cancer**



Sensitivity analysis: Larsson *et al.* (2009)[12] removed due to partial overlap with Missmer *et al.* (2002)[8]
Fixed-effects SRRE 0·99 (95 % CI 0·97, 1·01)
Random-effects SRRE 1·08 (95 % CI 1·00, 1·17)

No association in the fixed-effects meta-analysis of processed meat intake and breast cancer (SRRE 1·00; 95% CI 0·98, 1·01; P value for heterogeneity ¼ 0.005)

Alexander et al. A review and meta-analysis of red and processed meat consumption and breast cancer. Nutrition Research Reviews (2010), 23, 349–365

4- Alimentation et santé – le régime Mediterranean

- **The Mediterranean diet pattern (MDP) was observed in the olive-growing areas of the Mediterranean region during the early 1960s**
- A high consumption of olive oil, legumes, unrefined cereals, fruit, and vegetables; a moderate consumption of dairy products, mostly as cheese and yogurt; moderate wine consumption; a moderate-to high consumption of fish; and a low consumption of meat and meat products
- MDP linked to a reduction in overall mortality, in the incidence or mortality from cardiovascular diseases and from cancer, and in the incidence of type 2 diabetes, hypertension, and metabolic syndrome

Romaguera et al. Mediterranean dietary patterns and prospective weight change in participants of the EPIC-PANACEA projec t. Am J Clin Nutr 2010;92:912–21.

Summary of prospective, cohort and case – control studies investigating the associations between meat (red and processed) and risk of CVD

Author (year)	Subjects (*n*)	Sex (age range)	Type of meat studied	Cases vs. non-cases (*n*)	Significance (high vs. low quintiles)	Outcome examined	Relative risk/ hazard/odds ratios (C.I.)
Cardiovascular disease, non-significant findings for red meat							
Hu et al. (1999a)	121,700	f (30–55)	Red meat	~	NS	CHD risk	1.09 (0.91–1.3)
Key et al. (1998)	76,172	m & f (16–89)	Non-vegetarians vs. vegetarians	625 vs. 1530	NS	Ischaemic heart disease mortality	0.76 (0.62–0.94)
Cardiovascular disease, significant findings for red meat							
Azadbakht and Esmaillzadeh (2008)	482	f (40–60)	Red meat	39 vs. 22	Sig	Metabolic syndrome risk	2.15 (1.18–4.01)
Kontogianni et al. (2008)	848[a]	m & f	Red meat	~	Sig	Acute coronary syndrome risk	4.79 (~)
Heidemann et al. (2008)	121,700	f (34–59)	Western dietary pattern	254 vs. 208	Sig	CVD mortality	1.22 (1.01–1.48)
Keleman et al. (2005)	29,017	f	Red meat	739	Sig	CHD mortality	1.44 (1.06–1.94)
Steffen et al. (2005)	5115	m & f (18–30)	Red & processed meat	246 vs. 139	Sig	Elevated blood pressure	1.39 (1.05–1.82)
Fraser (1999)	34,192	m & f (>25)	Beef	~	Sig	Ischaemic heart disease risk	2.31 (1.11–4.28)

McAfee et al. Red meat consumption: An overview of the risks and benefits. Meat Science 84 (2010) 1–13

Meat consumption and prospective weight change in participant of the EPIC-PANACEA study

Meat intake may be related to weight gain because of its high energy and fat content.

Objective and Design:

To assess the association between consumption of total meat, red meat, poultry, and processed meat and weight gain after 5 y of follow-up, in the large European population cohort EPIC-PANACEA.

A total of 103,455 men and 270,348 women aged 25–70 y recruited between 1992 and 2000 in 10 European countries.

Results, conclusion:

- Total meat consumption positively associated with weight gain in men and women, normal-weight and overweight subjects, smokers and nonsmokers. Positive associations for red and processed meat, poultry.
- **With adjustment for estimated energy intake, an increase in meat intake of 250 g/d (eg, one steak at 450 kcal) would lead to a 2-kg higher weight gain after 5 y (95% CI: 1.5, 2.7 kg).**

EPIC-PANACEA : European Prospective Investigation into Cancer and Nutrition–Physical Activity, Nutrition, Alcohol, Cessation of Smoking, Eating Out of Home and Obesity

Vergnaud et al, Am J Clin Nutr 2010;92:398–407

Association between red meat consumption and metabolic syndrome (MetS) in a Mediterranean population at high cardiovascular risk: Cross-sectional and 1-year follow-up assessment.

Babio et al, Nutrition, Metabolism & Cardiovascular Diseases (2010) xx, 1-8

	RM&PM intake, g – mean ± SD				
	Q1	Q2	Q3	Q4	*P* for
	n = 180	*n* = 173	*n* = 187	*n* = 177	trend
baseline	35.9 ± 14.5	66.0 ± 7.2	91.6 ± 8.4	150.6 ± 35.9	<0.001
	n = 174	*n* = 188	*n* = 174	*n* = 181	trend
1-year follow-up	29.1 ± 11.7	55.5 ± 6.1	78.2 ± 8.3	126.6 ± 29.3	<0.001
Metabolic syndrome	*n* = 79	*n* = 66	*n* = 65	*n* = 60	
Incidence, *n* (%)	16 (20.3)	15 (22.7)	24 (36.9)	20 (33.3)	0.025
	1	1.1 (0.5–2.7)	2.7 (1.3–7.2)	2.7 (1.1–6.8)	0.009
Central obesity	*n* = 41	*n* = 35	*n* = 43	*n* = 53	
Incidence, *n* (%)	6 (14.6)	9 (25.7)	6 (14.0)	15 (28.3)	0.230
	1	8.4 (1.6–5.2)	1.9 (0.4–9.8)	8.1 (1.4–46.0)	0.077

Higher red meat consumption is associated with a significantly higher prevalence and incidence of MetS and central obesity

Associations (pooled estimates and 95% CI) between intake of total and subgroups of protein (per 150 kcal) and subsequent yearly changes in weight from a random effects meta-analysis across centres

	Weight changes (g per year)		
	Men	*Women*	*All*
Per 150 kcal	*Estimate (95% CI)*	*Estimate (95% CI)*	*Estimate (95% CI)*
Total protein	28.9 (−0.8 to 58.6)	77.5 (35.3 to 119.7)	52.9 (25.9 to 79.9)
Animal	30.0 (−8.4 to 68.4)	82.4 (40.8 to 124.0)	56.2 (26.9 to 85.6)
Plant	−8.4 (−92.9 to 76.2)	39.4 (−17.0 to 95.8)	17.7 (−32.6 to 68.0)
Unknown	31.5 (−39.0 to 101.9)	47.9 (−17.1 to 112.8)	39.6 (−7.6 to 86.8)
Protein from			
Red/processed meat	40.4 (−10.5 to 91.4)	116.9 (86.9 to 147.0)	81.0 (46.8 to 115.3)
Poultry	72.3 (−14.1 to 158.6)	160.9 (82.1 to 239.7)	114.9 (49.8 to 180.0)
Fish	−5.8 (−70.5 to 59.0)	89.6 (1.5 to 177.8)	40.8 (−16.9 to 98.5)
Dairy	6.5 (−52.8 to 65.8)	23.0 (−37.4 to 83.3)	13.2 (−26.2 to 52.7)

Halkjær et al. Intake of total, animal and plant protein and subsequent changes in weight or waist circumference in European men and women: the Diogenes project. International Journal of Obesity (2010) 1–10.

Generalised linear model for the associations between BMI and animal and plant protein intakes in the sex–age-specific strata (n=3054)

	Coefficients		95% CI			
BMI (kg/m^2)	β	SE	Lower bound	Upper bound	Wald χ^2	*P*
Males (*n* 1535)						
Intercept	26	0·323	25	26	6420	<0·001
Animal protein	0·013	0·004	0·005	0·021	11·0	0·001
Plant protein	−0·036	0·009	−0·054	−0·018	15·7	<0·001
Females (*n* 1519)						
Intercept	26	0·347	25	26	5648	<0·001
Plant protein	−0·046	0·014	−0·073	−0·018	10·6	0·001

Lin et al. Plant and animal protein intake and its association with overweight and obesity among the Belgian population. British Journal of Nutrition (2010), 1-11

Conclusion

- La viande est une source majeure de protéine alimentaire de haute valeur biologique, de fer, de zinc, de sélénium et de vitamines du groupe B (B3, B6, B12).
- Les graisses saturées et le cholestérol sont une limite à la consommation de certaines viandes ou de certains morceaux
- Les conséquences de la surconsommation de viande comme facteur de risque de cancer colorectal et du syndrome métabolique doivent être précisées dans le cadre de l'étude des régimes et de surconsommations fortes