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Programme d'excellence de la Region wallonne

# Teneurs en fibres de légumes cultivés en Wallonie

Véry Wéron, 12/6/2016

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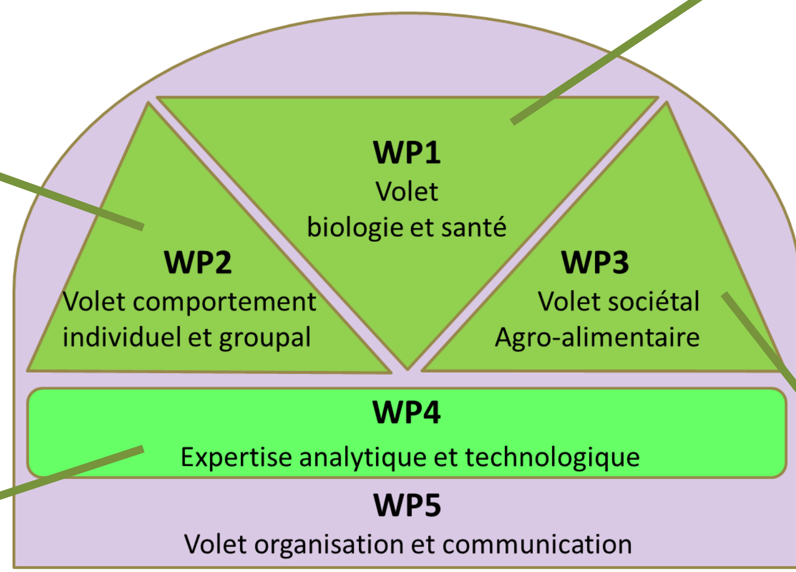
Gembloux Agro-Bio Tech

# Objectif unique

## Proposer une approche novatrice en nutrition humaine, visant à promouvoir les aliments d'origine végétale issus de l'agriculture wallonne caractérisés par une richesse en nutriments coliques

Outils/pistes pour modifier le comportement alimentaire en faveur des légumes riches en nutriments coliques

Mécanismes impliqués dans les effets bénéfiques des légumes riches en nutriments coliques sur la santé (clinique et pré-clinique)



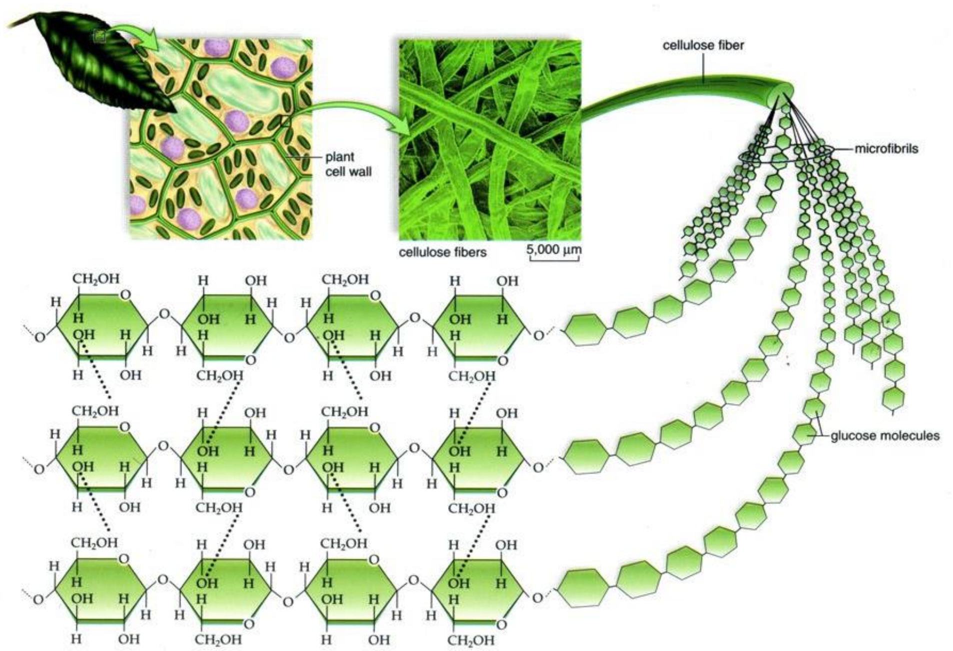

Outils utilisés dans les 3 autres WPs

Pistes pour modifier le système alimentaire en faveur des légumes riches en nutriments coliques

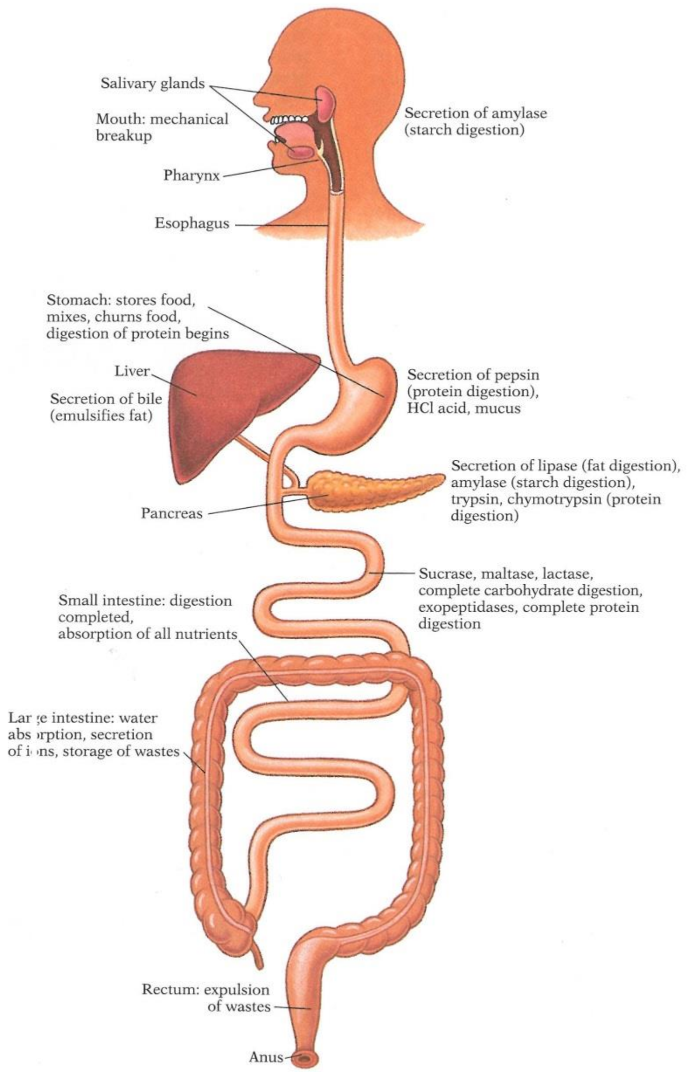
# Qu'est-ce qu'une fibre alimentaire?

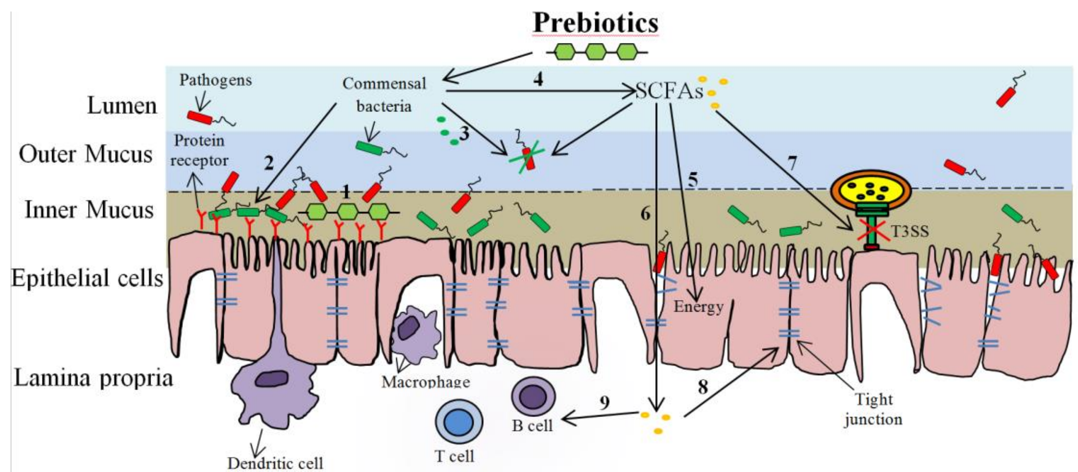
- Fibres alimentaires = polymère de sucres
  - Amidon, cellulose, inuline, arabino-xylanes, pectines, etc., en fonction des briques de sucres (glucose, fructose, xylose, arabinose) et de leurs liaisons

a. Starch




# Et chez l'Homme?




Source d'énergie
Equilibre dans l'écophysiologie intestinale
Modulation métabolique

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Cell

# Microbiota-Generated Metabolites Promote Metabolic Benefits via Gut-Brain Neural Circuits

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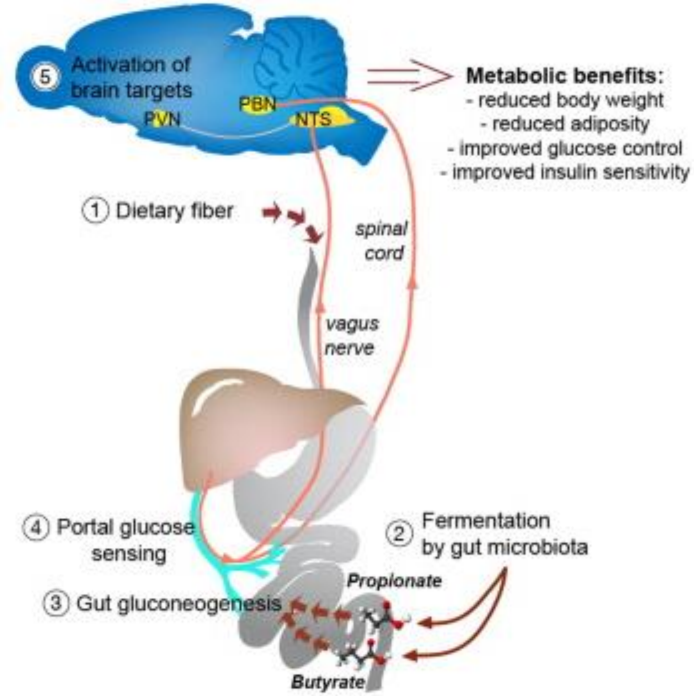


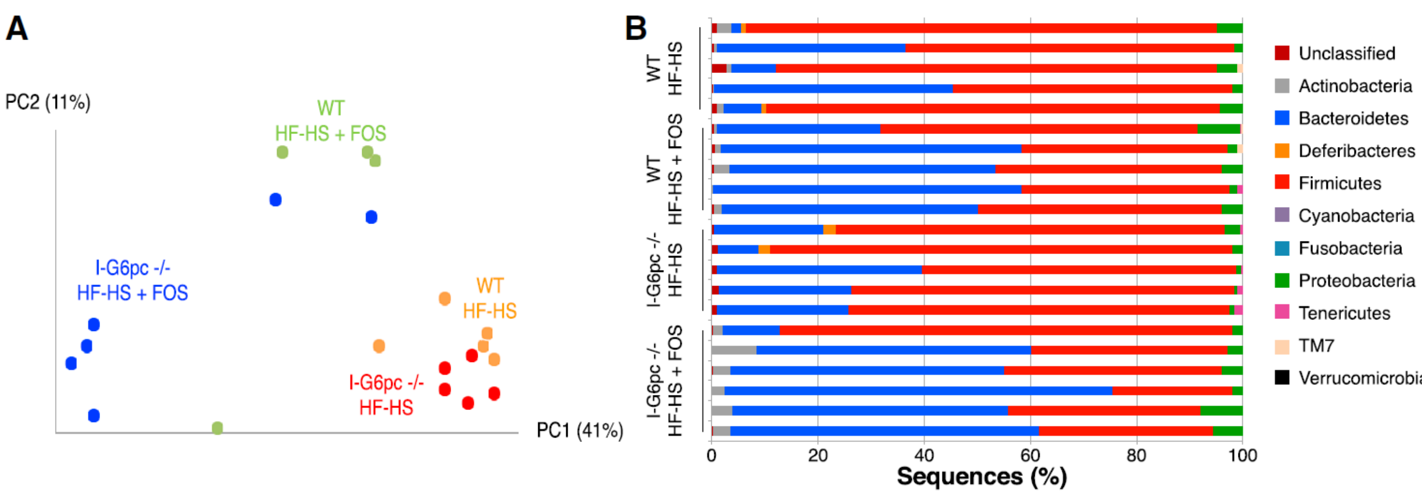

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OXFORD

Research Article

# Association Between Carbohydrate Nutrition and Successful Aging Over 10 Years

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## Abstract

**Background:** We prospectively examined the relationship between dietary glycemic index (GI) and glycemic load (GL), carbohydrate, sugars, and fiber intake (including fruits, vegetable of breads/cereals fiber) with successful aging (determined through a multidomain approach).
**Methods:** A total of 1,609 adults aged 49 years and older who were free of cancer, coronary artery disease, and stroke at baseline were followed for 10 years. Dietary data were collected using a semiquantitative Food Frequency Questionnaire. Successful aging status was determined through interviewer-administered questionnaire at each visit and was defined as the absence of disability, depressive symptoms, cognitive impairment, respiratory symptoms, and chronic diseases (eg, cancer and coronary artery disease).
**Results:** In all, 249 (15.5%) participants had aged successfully 10 years later. Dietary GI, GL, and carbohydrate intake were not significantly associated with successful aging. However, participants in the highest versus lowest (reference group) quartile of total fiber intake had greater odds of aging successfully than suboptimal aging, multivariable-adjusted odds ratio (OR), 1.79 (95% confidence interval [CI] 1.13–2.84). Those who remained consistently below the median in consumption of fiber from breads/cereal and fruit compared with the rest of cohort were less likely to age successfully, OR 0.53 (95% CI 0.34–0.84) and OR 0.64 (95% CI 0.44–0.95), respectively.
**Conclusions:** Consumption of dietary fiber from breads/cereals and fruits independently influenced the likelihood of aging successfully over 10 years. These findings suggest that increasing intake of fiber-rich foods could be a successful strategy in reaching old age disease free and fully functional.

**Key Words:** Blue Mountains Eye Study—Carbohydrate—Fiber—Glycemic index—Successful aging

# Contexte de la recherche

- Fibres alimentaires (nutriments coliques):
  - modifient l'écosystème intestinal
  - influencent l'immunité et le métabolisme
  - notamment chez les personnes en surpoids.
- Inuline
  - substrat le plus utilisé comme complément
- Légumes et céréales
  - sources de fibres naturellement consommées

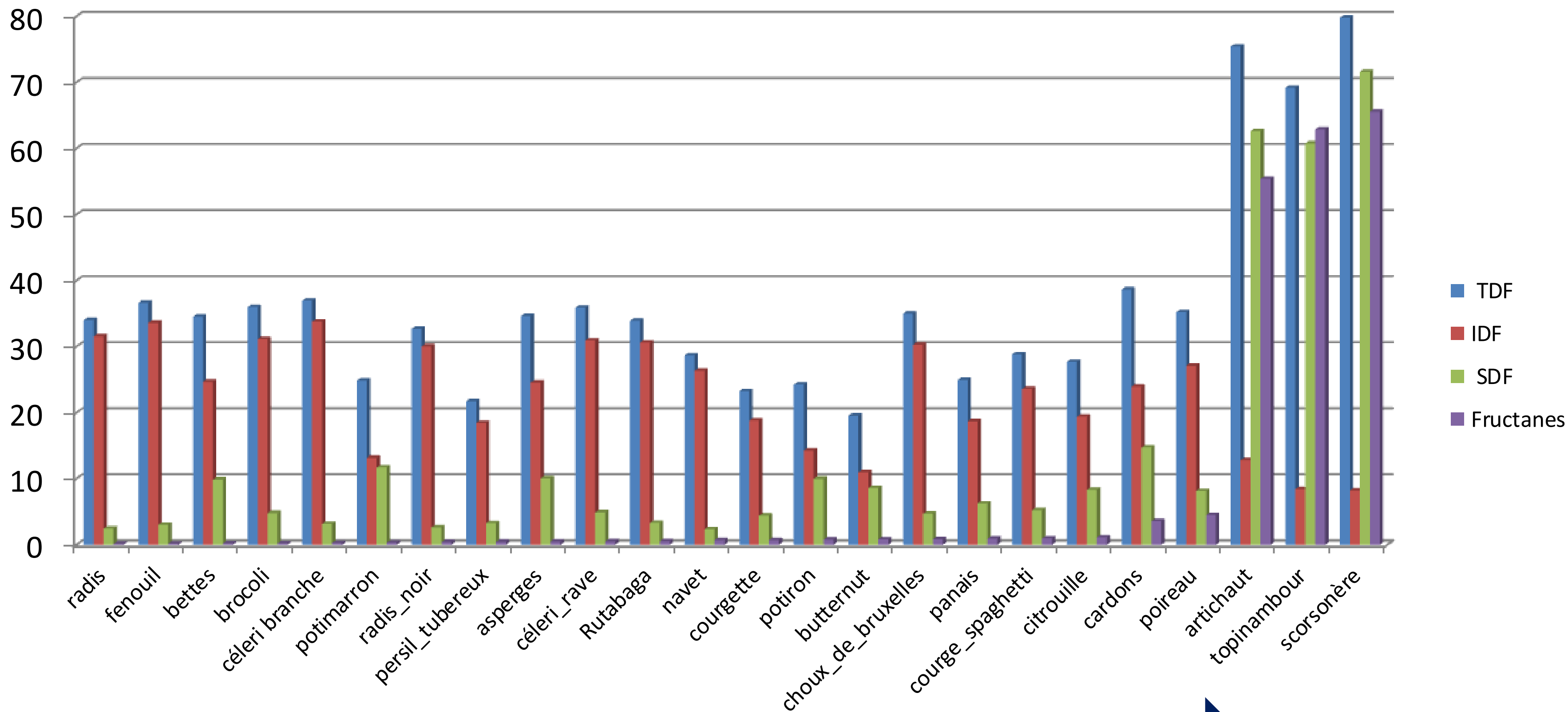


# Sélection de légumes d'intérêt

- Analyse bibliographique :
  - 53 espèces (48 légumes, 2 féculents et 3 épices)
  - Résultats incomplets, rendant les comparaison et les conclusions difficiles
  - Pas d'homogénéité dans les analyses
    - Fibres totales? Fibres solubles? Fibres insolubles?
    - FOS totaux? FOS de différents poids moléculaires? Fructanes totaux? Inuline?
  - Facteurs de variations de la teneur en nutriments coliques peu connus
    - variété botanique, climat, sol, degré de maturation, saison de récolte; stockage, et cuisson
- Analyse chimique des nutriments coliques
  - 3 à 4 variétés et/ou producteurs différents
  - Crus et cuits
  - Protéines, fructanes, fibres alimentaires (totales, solubles de haut et bas poids moléculaire et insolubles), sucres simples et totaux.



# Teneurs en nutriments des légumes




**Fructanes**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# ➔ 4 catégories

**1**

Fructane > 50 % MS
Fibres solubles > 60 % MS

- Artichaut
- Topinambour
- Scorsonère

**5**

Fructane: 33% MS
Fibres solubles : 36% MS

- Oignon

**2**

Fructane: 4 à 5 % MS
Fibres solubles : 8 à 15 % MS

- Cardons
- Poireau

**3**

Fructanes: 0 à 2,2 % MS
Fibres solubles 5 à 12 % MS

- Courge spaghetti
- Panais
- Citrouille
- Butternut
- Poivron
- Bettes
- Potiron
- Asperges
- Potimarron
- Carotte

**4**

Fructanes: 0 à 1,6 % MS
Fibres solubles : < 5 % MS

- Navet
- Radis
- Radis noir
- Fenouil
- Céleri branche
- Persil tubéreux
- Chicon
- Rutabaga
- Courgette
- Choux de Bruxelles
- Brocoli
- Céleri rave
- Chou fleur

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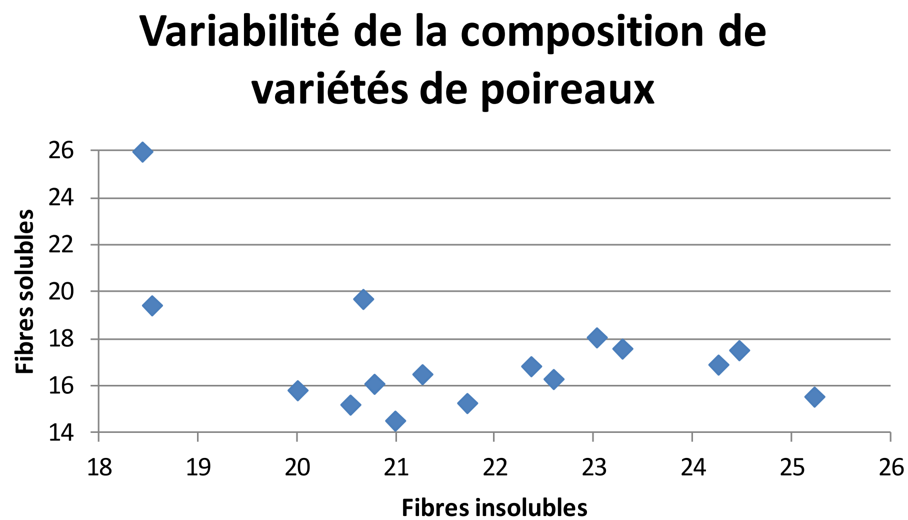
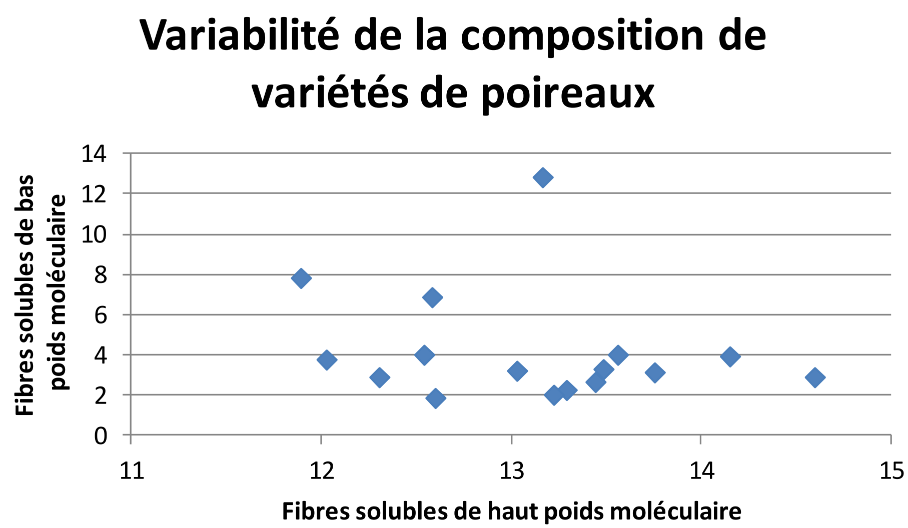
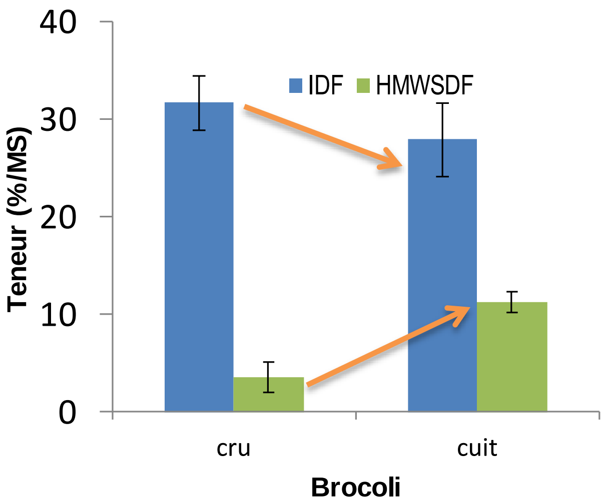
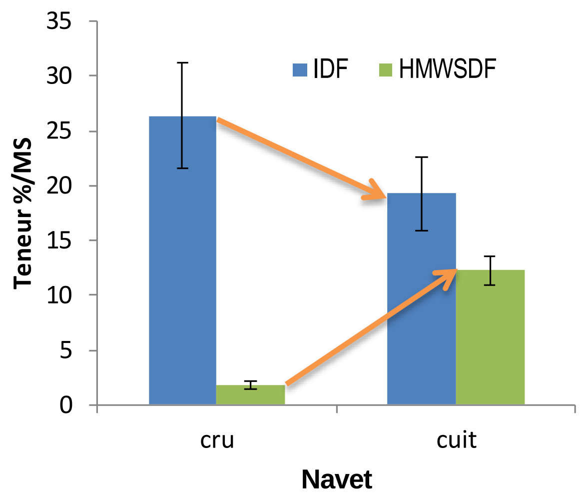
# Différences intra-variétés

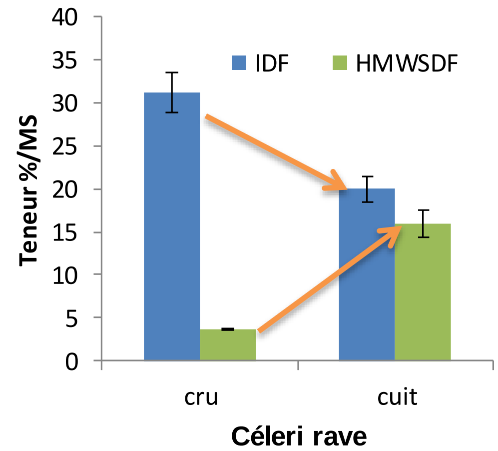


# Effet de la cuisson le profil en fibre






# Comparaison des effets des fibres

**Cuisson à la vapeur 30 à 40'**

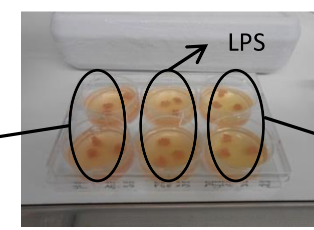
**Hydrolyse enzymatique pour simuler l'estomac et l'intestin**

**Dialyse pour récupérer la fraction non digestible soluble et insoluble**

**Fermentation par fèces pour simuler le côlon**

**Modèle de digestion *in vitro***

**Modèle ex vivo**

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# Effets santé attendus de la fermentation des nutriments coliques

## Paramètres de fermentation

| Substrats | A (ml/g) | Tmax (h) | Rmax (ml/h) | AGCC totaux | Acétate | Propionate | Butyrate | AGCC ramifiés |
|---|---|---|---|---|---|---|---|---|
| cellulose | 140,5$^{e}$ | 18,9$^{a}$ | 42,9$^{a}$ | 408$^{e}$ | 0,473$^{e}$ | 0,483$^{a}$ | 0,022$^{e}$ | 0,023$^{b}$ |
| Inuline | 271,8$^{a}$ | 6,8$^{bc}$ | 28$^{b}$ | 683$^{a}$ | 0,553$^{d}$ | 0,337$^{b}$ | 0,079$^{a}$ | 0,033$^{b}$ |
| Asperges | 169,6$^{d}$ | 7,7$^{b}$ | 16$^{c}$ | 477$^{d}$ | 0,678$^{b}$ | 0,219$^{e}$ | 0,048$^{c}$ | 0,054$^{a}$ |
| Poireau | 197,9$^{c}$ | 5,9$^{c}$ | 19$^{c}$ | 526$^{c}$ | 0,682$^{b}$ | 0,243$^{d}$ | 0,046$^{cd}$ | 0,030$^{b}$ |
| Rutabaga | 213,8$^{c}$ | 6,2$^{c}$ | 20,5$^{c}$ | 522$^{c}$ | 0,711$^{a}$ | 0,218$^{e}$ | 0,043$^{d}$ | 0,028$^{b}$ |
| Scorsonère | 246,8$^{b}$ | 3,7$^{d}$ | 30,1$^{b}$ | 608$^{b}$ | 0,600$^{c}$ | 0,317$^{c}$ | 0,055$^{b}$ | 0,028$^{b}$ |
| Topinambour | 231,1$^{b}$ | 3,7$^{d}$ | 27,7$^{b}$ | 608$^{b}$ | 0,595$^{c}$ | 0,318$^{c}$ | 0,056$^{b}$ | 0,031$^{b}$ |
| P value | <0.01 | <0.01 | <0.01 | <0.001 | <0.01 | <0.01 | <0.01 | <0.01 |

*A: Volume final de gaz; Tmax : Temps auquel le taux maximal de gaz est atteint; taux maximal de production de gaz*

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# Et le bio?

## Nutritional quality of organic foods: a systematic review[1–4]

*Alan D Dangour, Sakhi K Dodhia, Arabella Hayter, Elizabeth Allen, Karen Lock, and Ricardo Uauy*

Comparison of content of nutrients and other nutritionally relevant substances in organically and conventionally produced crops as reported in satisfactory quality studies

| Nutrient category[1] | No. of studies | No. of comparisons | Results of analysis: Standardized difference[2] | Results of analysis: P | Higher levels in organic or conventional crops? |
|---|---|---|---|---|---|
| | | | % | | |
| Nitrogen | 17 | 64 | 6.7 ± 1.9 | 0.003 | Conventional |
| Vitamin C | 14 | 65 | 2.7 ± 5.9 | 0.84 | No difference |
| Phenolic compounds | 13 | 80 | 3.4 ± 6.1 | 0.60 | No difference |
| Magnesium | 13 | 35 | 4.2 ± 2.3 | 0.10 | No difference |
| Calcium | 13 | 37 | 3.7 ± 4.8 | 0.45 | No difference |
| Phosphorus | 12 | 35 | 8.1 ± 2.6 | 0.009 | Organic |
| Potassium | 12 | 34 | 2.7 ± 2.4 | 0.28 | No difference |
| Zinc | 11 | 30 | 10.1 ± 5.6 | 0.11 | No difference |
| Total soluble solids | 11 | 29 | 0.4 ± 4.0 | 0.92 | No difference |
| Copper | 11 | 30 | 8.6 ± 11.5 | 0.47 | No difference |
| Titratable acidity | 10 | 29 | 6.8 ± 2.1 | 0.01 | Organic |

[1] Nutrient categories are listed by numeric order of the included studies.
[2] All values are means ± SEs (robust).

Am J Clin Nutr doi: 10.3945/ajcn.2009.28041.

# Mais…

## Estimating Pesticide Exposure from Dietary Intake and Organic Food Choices: The Multi-Ethnic Study of Atherosclerosis (MESA)

*Cynthia L. Curl,[1] Shirley A.A. Beresford,[2] Richard A. Fenske,[1] Annette L. Fitzpatrick,[2] Chensheng Lu,[3] Jennifer A. Nettleton,[4] and Joel D. Kaufman[1,2,5]*

[1]Department of Environmental and Occupational Health Sciences, and [2]Department of Epidemiology, University of Washington, Seattle, Washington, USA; [3]Department of Environmental Health, Harvard University, Boston, Massachusetts, USA; [4]Department of Epidemiology, Human Genetics, and Environmental Sciences, University of Texas Health Science Center, Houston, Texas, USA; [5]Department of Medicine, University of Washington, Seattle, Washington, USA

**Background:** Organophosphate pesticide (OP) exposure to the U.S. population is dominated by dietary intake. The magnitude of exposure from diet depends partly on personal decisions such as which foods to eat and whether to choose organic food. Most studies of OP exposure rely on urinary biomarkers, which are limited by short half-lives and often lack specificity to parent compounds. A reliable means of estimating long-term dietary exposure to individual OPs is needed to assess the potential relationship with adverse health effects.

**Objectives:** We assessed long-term dietary exposure to 14 OPs among 4,466 participants in the Multi-Ethnic Study of Atherosclerosis, and examined the influence of organic produce consumption on this exposure.

**Methods:** Individual-level exposure was estimated by combining information on typical intake of specific food items with average OP residue levels on those items. In an analysis restricted to a subset of participants who reported rarely or never eating organic produce ("conventional consumers"), we assessed urinary dialkylphosphate (DAP) levels across tertiles of estimated exposure ($n$ = 480). In a second analysis, we compared DAP levels across subgroups with differing self-reported organic produce consumption habits ($n$ = 240).

**Results:** Among conventional consumers, increasing tertile of estimated dietary OP exposure was associated with higher DAP concentrations ($p < 0.05$). DAP concentrations were also significantly lower in groups reporting more frequent consumption of organic produce ($p < 0.02$).

**Conclusions:** Long-term dietary exposure to OPs was estimated from dietary intake data, and estimates were consistent with DAP measurements. More frequent consumption of organic produce was associated with lower DAPs.

**Citation:** Curl CL, Beresford SA, Fenske RA, Fitzpatrick AL, Lu C, Nettleton JA, Kaufman JD. 2015. Estimating pesticide exposure from dietary intake and organic food choices: the Multi-Ethnic Study of Atherosclerosis (MESA). Environ Health Perspect 123:475–483; http://dx.doi.org/10.1289/ehp.1408197

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# Merci de votre attention