Soy in the metabolic syndrome: obesity and diabetes

Marco Mensink, Assistant Professor Nutrition, Energy Metabolism & Health, Wageningen University, NL

Alpro Foundation Symposium, Brussels, March 24 2017

WAGENINGEN
UNIVERSITY & RESEARCH
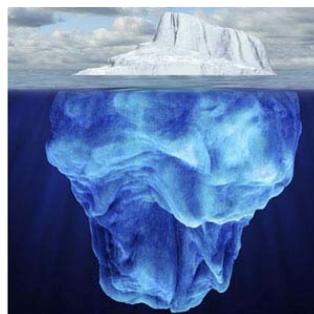

Metabolic Syndrome (MetS)

- Clustering <u>risk factors DM and CVD</u>
  - *Dyslipidaemia, Hyperglycaemia, Hypertension*
  - *Abdominal obesity*
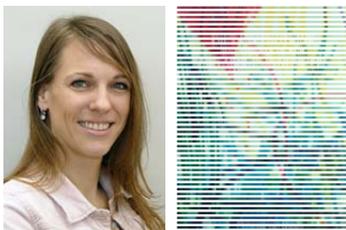
- Ectopic lipid deposition
- Insulin resistance
- Low-grade inflammation

Dysregulated Energy Metabolism

WAGENINGEN
UNIVERSITY & RESEARCH

PhD project - Monique van Nielen

DIETARY PROTEINS and aspects of the METABOLIC SYNDROME

PhD defence: Oct 20, 2015

Step 1: observational study *protein and DM*
Step 2: strictly controlled dietary intervention
Soy and aspects MetS

WAGENINGEN
UNIVERSITY & RESEARCH

alpro Foundation
Knowledge in plant-based nutrition

DIETARY PROTEIN INTAKE AND THE INCIDENCE OF TYPE 2 DIABETES

THE EPIC-INTERACT CASE-COHORT STUDY

Van Nielen et al, Diabetes Care 2014

WAGENINGEN
UNIVERSITY & RESEARCH

alpro Foundation
Knowledge in plant-based nutrition

InterAct

InterAct (Part of EPIC)
European Prospective Investigation into Cancer (epic)

EPIC 450.00 participants

Study population InterAct:
- 8 European countries
- ~27 000 participants
- >12 000 T2D cases

Denmark | Finland | France | Germany | India
Italy | Netherlands | Spain | Sweden | United Kingdom

WAGENINGEN
UNIVERSITY & RESEARCH

InterAct

Associations by sources of protein

Protein	Women	Men	Overall
	HR (95%CI)	HR (95%CI)	HR (95%CI)
Total protein	1.10 (1.06-1.14)	1.02 (0.98-1.06)	1.06 (1.02-1.09)
Animal protein	1.09 (1.05-1.14)	1.02 (0.97-1.06)	1.05 (1.02-1.08)
Plant protein	0.98 (0.87-1.09)	1.09 (0.99-1.21)	1.04 (0.93-1.16)

- No specific source associated with T2D
    - Animal: meat (red/processed/poultry/etc.), fish, eggs, dairy, milk, cheese, other
    - Plant: cereals, bread, potato, pasta & rice, vegetables (leafy/fruiting/etc.), cabbage, nuts, other
    - Soy: too low intakes in Europe

WAGENINGEN
UNIVERSITY & RESEARCH

InterAct

Intermediate conclusion I

- Diets high in total protein are associated with a modest increased T2D risk
  - Confirmed in women, not in men
  - Largely explained by animal protein
    - Cannot be explained by a single food source
  - BMI and Waist strongly influence associations

WAGENINGEN
UNIVERSITY & RESEARCH

InterAct

(Van Nielen et al, Diabetes Care 2014)

Characteristics by protein intakea

		WOMEN			MEN		
		Q1	Q3	Q5	Q1	Q3	Q5
Protein intake (g/day)		74	91	110	69	89	114
BMI (kg/m²)	↑	24	26	27	26	27	28
Physical Activity (%)		20	17	14	24	23	27
Smokers (%)		24	22	20	29	31	36
High Education(%)	↓	24	18	14	29	25	19
Dietary intake							
Carbohydrates (E%)		48	45	41	46	43	39
Fibre (g)		23	24	24	20	22	24
SFA (E%)		14	13	13	14	13	12
MUFA (E%)		13	13	14	12	13	15
Magnesium (mg)		330	315	354	384	380	429
Cholesterol (mg)		288	342	405	274	335	423

Coffee, tea and soft drinks were lower with increasing intake
Beta carotene and calcium were higher with increasing intake

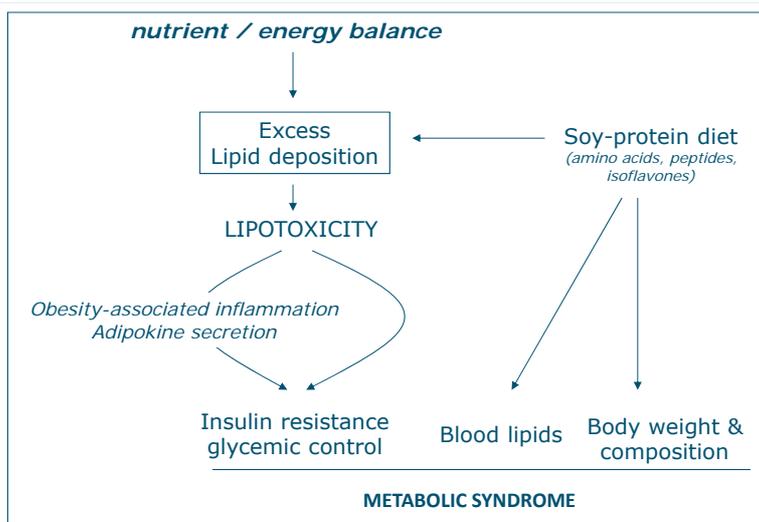WAGENINGEN
UNIVERSITY & RESEARCH

InterAct

SOY PROTEIN INTAKE AND THE METABOLIC SYNDROME

A strictly-controlled dietary intervention

van Nielen et al, Journal of Nutrition 2014

Soy protein intake & the MetS

Measurements
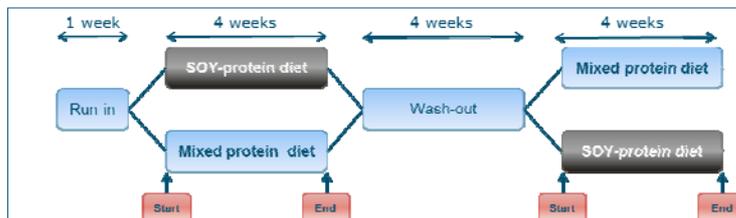
| Measurement		Method
Metabolic control	Insulin, glucose, lipids, CRP	Plasma, FSIGT
Vascular function	Augmentation Index, BP	BP and PWA
Body composition	Weight, body fat percentage	DXA
Hepatic fat	Lipid content in the liver	^{1}H-MRS

WAGENINGEN
UNIVERSITY & RESEARCH

glucose, insulin, inflammation, IHL

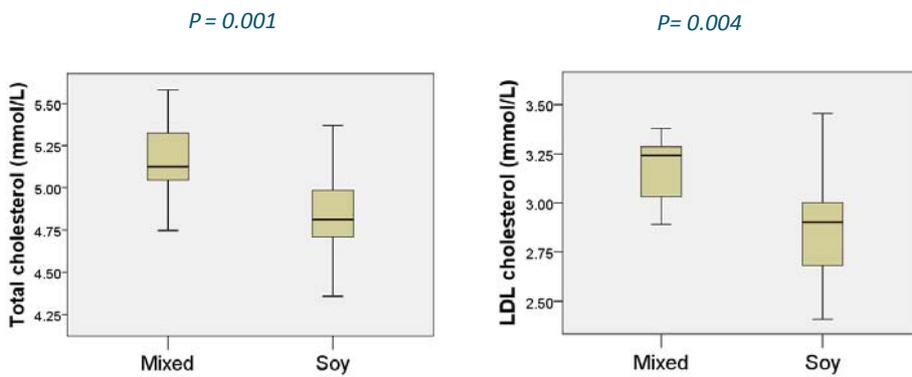| Variable	Mixed	Soy	P-value
	Mean (SD)	Mean (SD)	ANCOVA
Glucose (mmol/l)	5.4 (0.4)	5.4 (0.5)	0.90
Insulin (mU/l)	3.0 (1.4)	3.4 (1.7)	0.12
HOMA-IR	0.4 (0.2)	0.5 (0.2)	0.12
C-reactive protein (mg/l)	2.1 (1.7)	1.4 (1.3)	0.11
IHL (%)	2.3 (3.3)	2.9 (4.3)	0.20

WAGENINGEN
UNIVERSITY & RESEARCH
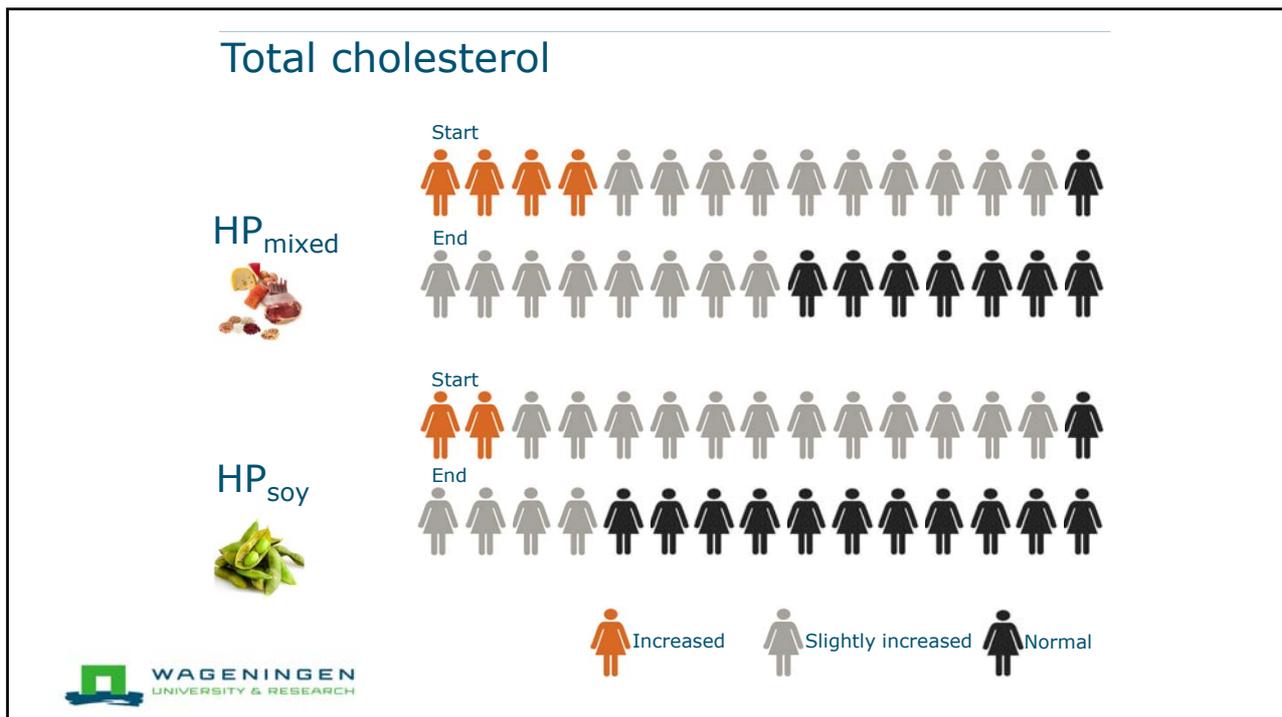
Intravenous glucose tolerance test (IVGTT)
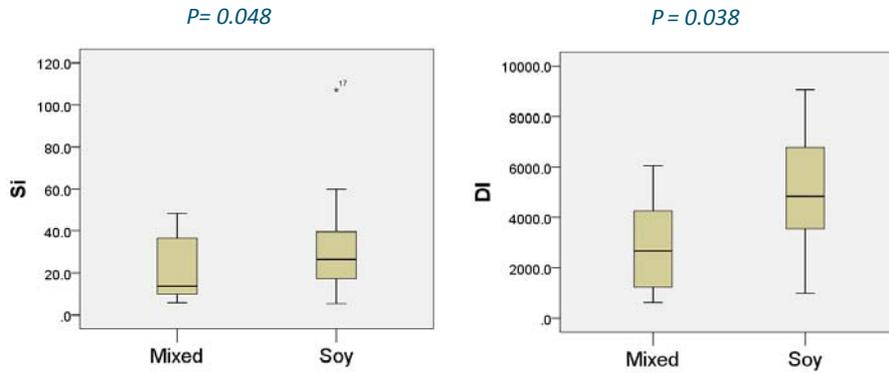
- Improved insulin sensitivity (Si and DI)
- No difference in glucose effectiveness (Sg) and acute insulin response (AIR)

Total and LDL cholesterol

Total cholesterol

HP$_{mixed}$

HP$_{soy}$

Start / End

Increased — Slightly increased — Normal

WAGENINGEN
UNIVERSITY & RESEARCH

Intermediate conclusions II

- Compared to a mixed-protein diet, the soy-protein diet had a stronger effect on:
  - *Insulin sensitivity*
  - *Total and LDL cholesterol*
  - *.. but not on intra hepatic lipids*

- Both high-protein diets reduced:
  - *Total, LDL, HDL cholesterol, triglycerides*
  - *Glucose, insulin, C-reactive protein*
  - *Body weight, total body and abdominal fat*
  - *.. and tended to reduce Hepatic fat*

WAGENINGEN
UNIVERSITY & RESEARCH

Summary and Conclusion

- total and animal protein consumption, not plant protein, are associated with an increased diabetes risk
- So, partly replacing meat by soy in a moderate high-protein diet has clear advantages regarding insulin sensitivity and total and LDL cholesterol.

-> Therefore, exchanging meat products for soy products, could be important in fighting the metabolic syndrome and reducing the risk for type 2 diabetes mellitus and cardiovascular disease

WAGENINGEN
UNIVERSITY & RESEARCH

Thanks !

Monique van Nielen

Annemarie Rietman

Edith Feskens

Els Siebelink

Alpro Foundation

marco.mensink@wur.nl

WAGENINGEN
UNIVERSITY & RESEARCH

alpro Foundation
Knowledge in plant-based nutrition

18