DAIRY AS A WHOLE FOOD

WHAT IS THE IMPORTANCE OF DAIRY IN HEALTH ACROSS ALL AGES

Docteur Jean Michel Lecerf
Nutrition Department - Institut Pasteur de Lille
MILK AND DAIRY PRODUCTS
A UNIQUE MICRONUTRIENT COMBINATION

IMPORTANT SOURCES OF

600 ml MILK
- CALCIUM 80%
- MAGNESIUM 16%
- ZINC 20%
- SELENIUM 33%

600 ml MILK
- Vit B1 29%
- Vit B2 65%
- Vit B12 58%

RDA
DAIRY PRODUCTS AND MICRONUTRIENTS INTAKES

CHILDREN

FIRST CONTRIBUTION

- Calcium: 51%
- Phosphorus: 31%
- Zinc: 27%
- Iodin: 41%
- Sélénium: 15%
- Vitamin B2: 39%
- Rétinol: 42%
- Vitamin B12: 20%

SECOND CONTRIBUTION

- Protéines: 24%
- Magnesium: 18%
DAIRY PRODUCTS AND MICRONUTRIENTS INTAKES

ADULTS

FIRST CONTRIBUTION

- Calcium: 45%
- Phosphorus: 24%
- Zinc: 20%
- Sélénium: 11%
- Iodin: 32%
- Vitamine B2: 29%
- Rétinol: 30%

SECOND CONTRIBUTION

- Protéins: 18%
- Vitamin B12: 20%

THIRD CONTRIBUTION

- Magnesium: 11%
THE CONTRIBUTION OF DAIRY PRODUCTS TO MICRONUTRIENT INTAKE

In France INCA 2 STUDY

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<tr>
<th>Nutrient</th>
<th>Children</th>
<th>Adults</th>
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<tr>
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<td>53 %</td>
<td>46 %</td>
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<tr>
<td>Phosphorus</td>
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<tr>
<td>Iodine</td>
<td>40 %</td>
<td>30 %</td>
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<tr>
<td>Potassium</td>
<td>21 %</td>
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<tr>
<td>Vitamin B2</td>
<td>38 %</td>
<td>28 %</td>
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In the Netherlands: THREE NATIONAL FOOD CONSUMPTION SURVEY + LEIDEN LONGEVITY STUDY (LLS)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Cheese</th>
<th>Milk</th>
<th>Total Dairy</th>
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<td>63 %</td>
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<td>Folate</td>
<td>11 %</td>
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<td>6 %</td>
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<tr>
<td>Vitamin B12</td>
<td>31 %</td>
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<td>15 %</td>
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<tr>
<td>Vitamin D</td>
<td>9 %</td>
<td>5 %</td>
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</tr>
<tr>
<td>Vitamin C</td>
<td>7 %</td>
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<td>4 %</td>
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### CONTRIBUTION OF MILK AND MILK PRODUCTS TO MICRONUTRIENT DIET OF THE US DIET

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<td>38 %</td>
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<td>Vitamin A</td>
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<td>Vitamin D</td>
<td>44 %</td>
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<td>Vitamin B2</td>
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<td>Zinc</td>
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<tr>
<td>Phosphorus</td>
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<td>29 %</td>
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<td>Vitamin B12</td>
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<tr>
<td>Selenium</td>
<td>18 %</td>
<td>12 %</td>
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<tr>
<td>Potassium</td>
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<td>22 %</td>
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**MILK AND DAIRY GROUP**

**LOWEST COST SOURCES**

- MILK AND DAIRY PRODUCTS

- PROTEINS
  - Calcium
  - Vitamin B2
  - Vitamin B12

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EDA – BRUXELLES 2013
### THE RECENT EVOLUTION OF DIETARY HABITS IN CHILDREN

#### DIETARY SURVEY INCA$_2$ IN FRANCE FROM 1998 – 99 TO 2006 – 2007

<table>
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<th>3 – 14 years</th>
<th>15 – 17 years</th>
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<tbody>
<tr>
<td>MILK</td>
<td>-14.9%</td>
<td>-1.6% NS</td>
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<tr>
<td>CHEESE</td>
<td>-13.9%</td>
<td>-24.3%</td>
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<tr>
<td>ALL DAIRY PRODUCTS</td>
<td>-10.5%</td>
<td>-8.3% NS</td>
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</tbody>
</table>
DECREASE OF THE FRENCH DAIRY CONSUMPTION

g/j

Source Inca, Afssa
IT IS NECESSARY TO MAINTAIN MILK SCHOOL FEEDING PROGRAMMES

IN ORDER TO MAINTAIN

- TASTE FOR DAIRY PRODUCTS
- LACTASE ACTIVITY AND LACTOSE TOLERANCE
- GOOD DIETARY HABITS WITH DIVERSITY
- NUTRITIONAL INTAKE FOR REACHING RECOMMENDED DIETARY ALLOWANCES

PARTICULARLY IN UNDERPRIVILEGED FAMILIES
WHY MAINLY IN LOW-INCOME FAMILIES?

| HIGHER PREVALENCE OF OBESITY | LOW COST OF DAIRY NUTRIENTS | INSTEAD OF SOFT DRINKS |
THE BURNING ISSUE OF THE CROSSING
EVOLUTION OF TWO DRINKS

1980

2010

MILK

SOFT DRINK

2010 1980
DIETARY REQUIREMENT OF CALCIUM

REVISED IN 2011

IN ADULT MEN < 60 years

→ REQUIREMENT 750 mg/day
→ RECOMMENDED DIETARY ALLOWANCE 900 mg/day

[ = Requirement + 2 standard deviation = 750 + 150]

CANNOT BE EASILY REACHED WITHOUT DAIRY PRODUCTS WHICH MAY ACCOUNT FOR 2/3 OF THE RDA
WHICH RECOMMENDATIONS?

- NUTRITIONAL RECOMMENDED INTAKE

FOR THE FRENCH POPULATION

ANSES - CALCIUM: 900 mg/day

1000 mg (pregnant and breastfeeding women)

1200 mg children, adolescents, women > 55 years, men > 65 years

- FOOD RECOMMENDED INTAKES

PNNS: 3 dairy products/day

to 4 dairy products/day (children, adolescents, elderly)
RDA ARE NOT ACHIEVED

CCAF SURVEY
- CALCIUM INTAKE < RDA
- CALCIUM INTAKE < 2/3 RDA*

*Risque de carence

Age

%
NON ACHIEVED RECOMMENDATIONS

FOOD INTAKE

NUMBER OF DAIRY SERVINGS

ENNS SURVEY

CCAF SURVEY

% Réalisées non atteintes

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<tr>
<th>3 - 5</th>
<th>6 - 8</th>
<th>9 - 11</th>
<th>12 - 14</th>
<th>15 - 17</th>
<th>adultes</th>
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<td>58</td>
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EARLY BEHAVIOR AND FURTHER HABITS

MILK CONSUMPTION IS NOT DEVOIDED TO INFANTS AND CHILDREN

BUT IS USEFUL AT ANY AGE

BECAUSE OF ITS NUTRITIONAL COMPOSITION

AND OF ITS CONTRIBUTION TO RECOMMENDED DIETARY ALLOWANCES

SINCE LACK OF MILK AND THEN LACTOSE, CONSUMPTION

INDUCE A LACK OF LACTASE ACTIVITY

AND CREATE A LACTOSE INTOLERANCE

ITS IMPORTANT TO MAINTAIN DAIRY CONSUMPTION ALL OVER THE LIFE
HELENA – Cross Sectional Study

- 1804 European adolescents
- 10 different European cities
- Dietary 24 h recalls
- Blood samples

$\rightarrow$ IN ADOLESCENTS WITH HIGHER DIET QUALITY INDEX (DQI) SCORES FOR ADOLESCENTS COMPARED TO LOWER DQI – SCORES DAIRY PRODUCTS CONTRIBUTE MORE TO THE INTAKE OF FAT

THAT MEANS THAT DAIRY PRODUCTS CONTRIBUTE
- HIGHLY TO - THE DIET QUALITY

*Nutrition* 2013, 29, 411-419
CHILDREN AGED 3 TO 6 YEARS, SERVED THREE PORTION SIZES OF MACARONI AND CHEESE ARE ABLE TO CONTROL THE QUANTITIES EATEN DESPITE THE INCREASE IN PORTION AROUND THE AGE OF 3,6 YEARS BUT NOT AT THE AGE OF 5,0 YEARS

J Am Diet Assoc 2000, 100, 232-4
DAIRY PRODUCTS
AND HEALTH
SOME FACTS
## Dairy Products and Cancer

World Cancer Research Fund and American Institute for Cancer Research and Others Studies since 2007

<table>
<thead>
<tr>
<th></th>
<th>Colorectal</th>
<th>Prostate</th>
<th>Bladder</th>
<th>Follicular Lymphoma and Multiple Myeloma</th>
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<td>Milk</td>
<td>➜</td>
<td>?</td>
<td>➜ (?)</td>
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<tr>
<td>Cheese</td>
<td>?</td>
<td></td>
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<tr>
<td>Fermented Milk Products</td>
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<tr>
<td>Diet Very High in Calcium</td>
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DAIRY PRODUCTS AND OSTEOPOROSIS

VITAMIN D
CALCIUM
PHOSPHORUS
PROTEINS

ABSORPTION
SYNERGY
ACCRETION

BONE

BONE MASS PEAK
GROWTH

FRACTURES
LEAN MASS

FALLS

IGF1

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DESPITE THAT 60% OF THE FAT PHASE OF DAIRY PRODUCTS IS SATURATED FATTY ACIDS

ALL EPIDEMIOLOGICAL STUDIES SHOW THAT DAIRY PRODUCTS (MILK – FERMENTED, MILK AND YOGURT, CHEESE) CONSUMPTION IS NOT ASSOCIATED WITH AN INCREASE OF CVD INCIDENCE OR CORONARY HEART DISEASE INCIDENCE, BUT WITH NEUTRAL EFFECT OR DECREASE OF THAT INCIDENCE
9243 male and female
> 30 years old
Follow-up: 24 years
AFTER ADJUSTMENT ON CONFOUNDERS

**FEMALE**

* FOR EACH 100g MILK INCREASED CONSUMPTION

<table>
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<th></th>
<th>CARDIOVASCULAR DEATH</th>
<th>CORONARY HEART DISEASE DEATH</th>
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<tr>
<td>100</td>
<td>86</td>
<td>100</td>
</tr>
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</table>

J Epidemiol 2013
EVEN IN CENTRAL AMERICA
MYOCARDIAL INFARCTION

CASE CONTROL STUDY (MYOCARDIAL INFARCTION = CMI) OF 3630 COSTA RICA ADULTS
FATTY ACID BIOMARKERS IN ADIPOSE TISSUE (C15:0 and C17:0)
→ NO INCREASE OF MI

FOOD FREQUENCY QUESTIONNAIRE

DECREASE OF THE RISK OF NON FATAL MI
FOR THE Q2 – Q3 – Q4 – Q5 QUINTILES OF DAIRY PRODUCE INTAKE
-28% -26% -33% -17%(NS)

COMPARED TO THE LOWEST QUINTILE (Q1) OF DAIRY PRODUCT CONSUMPTION

Nutr Metab Cardio Vasc Dis 2012, 22, 1039-45
EVEN IN FRANCE MORTALITY

MONICA STUDY

897 french people (45 – 65 years old)
Follow-up 14 years

MORTALITY

- **NO CONSUMPTION**: 100
- **<1 DRINK**: 60
- **>1 DRINK**: 45

Bongard V
120 852 male and female
55 – 69 years at baseline
10 years follow-up
Food Frequency Questionnaire

FFFM = Fermented Full Fat Milk

DEATH DUE TO STROKE

MALE

100

75

NO

FFFM

FEMALE

100

82

NO

FFFM

AJCN 2011, 93, 615-27
OR IN SWEDEN
RISK OF FIRST MYOCARDIAL INFARCTION

CASE (444) – CONTROL (558) STUDY (FIRST MYOCARDIAL INFARCTION)

SERUM MILK FAT BIOMARKERS (C15:0 – C17:0)

MOREOVER QUARTILES OF REPORTED QUARTILES OF CHEESE (M+F) AND FERMENTED MILK PRODUCTS WERE INVERSELY RELATED TO A FIRST MI (p<0,05)

REMAINED SIGNIFICANT AFTER ADJUSTMENT FOR CONFOUNDERS OR = 0,74

AJCN 2010, 92, 194-202
1080 women aged > 70 y in PERTH-AUSTRALIA

FOOD FREQUENCY QUESTIONNAIRE

COMMON CAROTID ARTERY INTIMA – MEDIA THICKNESS (CCA – IMT) 3 years later

→ YOGURT CONSUMPTION WAS NEGATIVELY ASSOCIATED WITH CCA – IMT AFTER ADJUSTMENT p 0,015

PATIENTS WHO CONSUMED > 100g YOGURT/d HAD A SIGNIFICANTLY LOWER CCA – IMT THAN DID PARTICIPANTS WITH LOWER CONSUMPTION (AFTER ADJUSTMENT) p0,003

AJCN 2011, 94, 234-9
WHY?

BECAUSE OF PROTECTIVE NUTRIENTS AGAINST CARDIOVASCULAR RISK IN DAIRY

- CALCIUM ➔ EFFECTS ON WEIGHT CONTROL CHOLESTEROL
- MILK-DERIVED BIOACTIVE PEPTIDES ➔ BLOOD PRESSURE
- SPECIFIC FATTY ACIDS ➔ VISCERAL FAT AND WAIST CIRCUMFERENCE
  - RUMENIC ACID
- PROBIOTICS ➔ INFLAMMATION AND MICROBIOTA
- LACTOSE ➔ GLYCEMIC INDEX
DAIRY PRODUCTS AND WEIGHT

FAT MASS

↓ APPETITE

FECAL FAT LOSS

↑ LIPID OXIDATION

MORE ↓ WEIGHT IF CALORIC RESTRICTION

CALCIUM

PROTEINS

CLA and TRANS FA

Br J Nutr 2009, 101, 659-663
Br J Nutr 2011, 105, 133-143
EJCN 2012, 66, 622-7
EJCN 2012, 66, 1104-1109
DAIRY PRODUCTS AND METABOLIC SYNDROME
THE D.E.S.I.R STUDY

5212 SUBJECTS
Follow-up 9 years

<table>
<thead>
<tr>
<th>DAIRY PRODUCTS (EXCEPT CHEESE)</th>
<th>IMPAIRED FASTING GLYCEMIA</th>
<th>TYPE 2 DIABETES</th>
<th>BMI GAIN</th>
<th>WAIST CIRCUMFERENCE INCREASE</th>
<th>TRIGLYCERIDES</th>
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<td>DIETARY CALCIUM DENSITY</td>
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<tr>
<td>CHEESE</td>
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</table>

INVERSE RELATIONSHIP

- INCIDENT METABOLIC SYNDROME
- DIASTOLIC BLOOD PRESSURE
- TRIGLYCERIDES

TYPE 2 DIABETES
- BMI GAIN
- WAIST CIRCUMFERENCE INCREASE
- TRIGLYCERIDES

IMPAIRED FASTING GLYCEMIA

TRIGLYCERIDES

BMI GAIN

CHEESE

DAIRY PRODUCTS

EXCEPT CHEESE

CALCIUM DENSITY
DAIRY FOOD INTAKE AND DIABETES

5582 subjects > 25 years
Follow-up : 5 years

- MEN CONSUMING > 1,9 DAIRY SERVINGS / day
  → ≈ 50% DIABETES OCCURRENCE
  / COMPARED TO THOSE CONSUMING < 0 – 1,2 Servings/day

- WOMEN  NON SIGNIFICANT REDUCTION

Pub Heath Nutr 2012,
DAIRY PRODUCTS AND DIABETES

WOMEN’S HEALTH INITIATIVE STUDY
82076 post menopausal women
8 y of follow-up

MORE IN WOMEN WITH
A HIGHER BMI
HIGH YOGURT
CONSUMPTION ++

FIGURE 1  RR of incident diabetes in postmenopausal women by quintile of low-fat dairy product intake at various levels of BMI.

SELF PERCEIVED LACTOSE INTOLERANCE IS ASSOCIATED WITH HYPERTENSION AND DIABETES

CROSS-SECTIONAL STUDY

3452 ADULTS

12.3% PERCEIVED THEM SELVES TO BE LACTOSE INTOLERANT

HAD SIGNIFICANTLY LOWER (p <0.05) AVERAGE DAILY CALCIUM INTAKES FROM DAIRY FOODS

HIGHER PERCENTAGE HAVING PHYSICIAN DIAGNOSED DIABETES AND HYPERTENSION

For a 1000 mg increase in calcium intake from dairy foods per day

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AJCN 2011, 94, 191-8
<table>
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<th>CHILDREN</th>
<th>ADOLESCENT</th>
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THE NUTRIENT RICHNESS OF MILK AND DAIRY PRODUCTS

- NEARLY A COMPLETE FOOD WITH ALMOST
  - ALL MACRONUTRIENTS
  - ALL MICRONUTRIENTS
  ESSENTIAL FOR LIFE
- THE NATURAL FOOD WHICH HAVE THE MOST NUTRIENT DIVERSITY
  AMONG ALL HUMAN AVAILABLE FOOD
  FOR EXAMPLE GREAT DIVERSITY OF FATTY ACIDS WITH
  ABOUT 400 KINDS OF FATTY ACIDS NOT ONLY
  SATURATED FATTY ACIDS
THE NEW MATRIX EFFECT

NOT ONLY THE SUM OF ITS NUTRIENTS

BUT ALSO THE NEW MATRIX EFFECT

FAVOURABLE INTERACTIONS

EXAMPLES

BONE METABOLISM
- Vitamin D
- Calcium
- Phosphorus
- IGF1
- Proteins

WEIGHT CONTROL
- Calcium
- Proteins
- CLA

CARDIOVASCULAR FUNCTION
- Calcium
- Fatty acids (CLA)
- Probiotics (yogurt)
- Bioactive peptides
- Vitamin D
CONCLUSION (1)

DAIRY PRODUCTS ARE VERY GOOD SOURCES AND LOW COST SOURCES OF MANY MICRONUTRIENTS

MOREOVER THEY HAVE FAVORABLE EFFECTS ON WEIGHT MANAGEMENT, METABOLIC SYNDROME, COLORECTAL CANCER INCIDENCE, BONE HEALTH
CONCLUSION (2)

DAIRY PRODUCTS ARE USEFUL FOR HEALTH AND NUTRITION AT ANY AGE

NOT ONLY FOR CHILDREN

NOT ONLY FOR OSTEOPOROSIS

MILK AND DAIRY PRODUCTS ARE NOT ONLY ABLE TO CONTRIBUTE TO

THE RECOMMENDED DIETARY ALLOWANCES WHATEVER AGE BUT

THEY HAVE AN INCREDIBLE NUTRIENT RICHNESS, ARE

NUTRITIONS BY NATURE, AND THEY HAVE A SPECIFICITY

THROUGH THE MATRIX EFFECT