School of Agriculture, Policy and Development
Animal, Dairy and Food Sciences Division

University of Reading

FATTY ACID PROFILE OF CONVENTIONAL, ORGANIC & FREE-RANGE MILK IN THE UK

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MILK IN HUMAN NUTRITION

Nutritional importance

As a part of human nutrition, milk shows profound characteristics:

- Milk has been traditionally considered as a basic food in many diets, mainly due to its **nutrient-dense character**
- It is the **most complete single food** available
- It contains **numerous beneficial compounds** for human health
- It can be transformed to a wide range of dairy products

Photos from: pixabay

MILK IN HUMAN NUTRITION

Fatty acid (FA) composition

Milk saturated fatty acids (SFA)

- Increase risk of cardiovascular disease and the level of LDL-cholesterol
- C12:0, C14:0, C16:0 are considered mainly responsible

Milk unsaturated fatty acids (UFA)

- MUFA: vaccenic (VA), oleic (OA)
- PUFA: rumenic (RA), α-linolenic (ALNA), eicosapentaenoic (EPA), docosapentaenoic (DPA), omega-3 (ω-3), omega-6 (ω-6)
- The have shown positive effects on human health
  - Protection against cardiovascular heart disease, obesity, diabetes
  - Prevention of many types of cancer
  - Action against hypertension, behavioural disturbances and asthma
  - Anti-inflammatory and immunological function
  - Development of brain, visual function and cognition

Images from: pixabay *LDL = low density lipoprotein*

MILK IN HUMAN NUTRITION

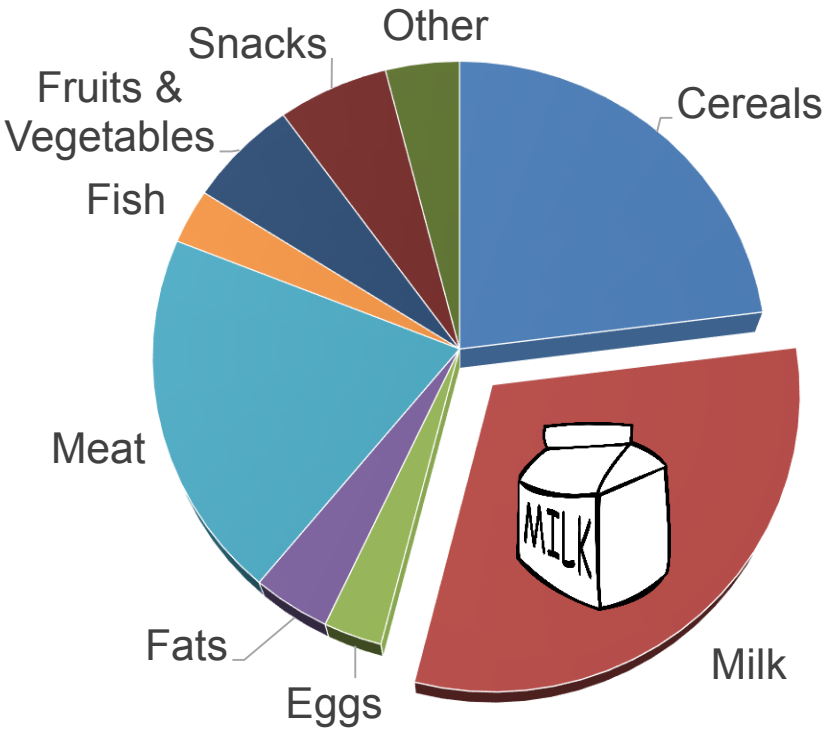
Role of milk on SFA intake

Public Health England

Food Standards Agency
food.gov.uk

> ***"mean intake of SFA exceeded the recommendation (no more than 11% food energy) in all older age/sex groups"***
> *NDNS, 2018*

National Diet and Nutrition Survey. Results from Years 7-8 (combined) of the Rolling Programme (2014/15 to 2015/16)



Producing/consuming milk with lower SFA can reduce SFA intakes without requiring changes in consumer eating habits

Images from: openclipart

SFA = saturated fatty acids

INTRODUCTION

Objectives

This study therefore aimed to:

1. **Investigate the effect of production system** (conventional, organic, free-range) **on retail milk fatty acid profile** throughout the year
2. **Assess the potential implications on the intakes of fatty acids** which are relevant to human health

Photo from: pixabay

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MATERIALS AND METHODS

Experimental design

- 3 production systems: **Conventional** / **Organic** / **Free-Range**

- 4 brands/replicates for Conventional/Organic + 2 for Free-Range
- 12 consecutive months (March 2016 – February 2017)

Measurements

- **GAS CHROMATOGRAPHY** 100 m × 0.25 mm, 0.20 µm → 80 fatty acids
- **MID-INFRARED SPECTROSCOPY** Fat, Protein, Casein, Lactose, Urea, SCC

Statistical analysis

- **ANOVA REML** Fixed: Production System, Month Random: Milk ID

SCC = somatic cell count; REML = residual maximum likelihood analysis

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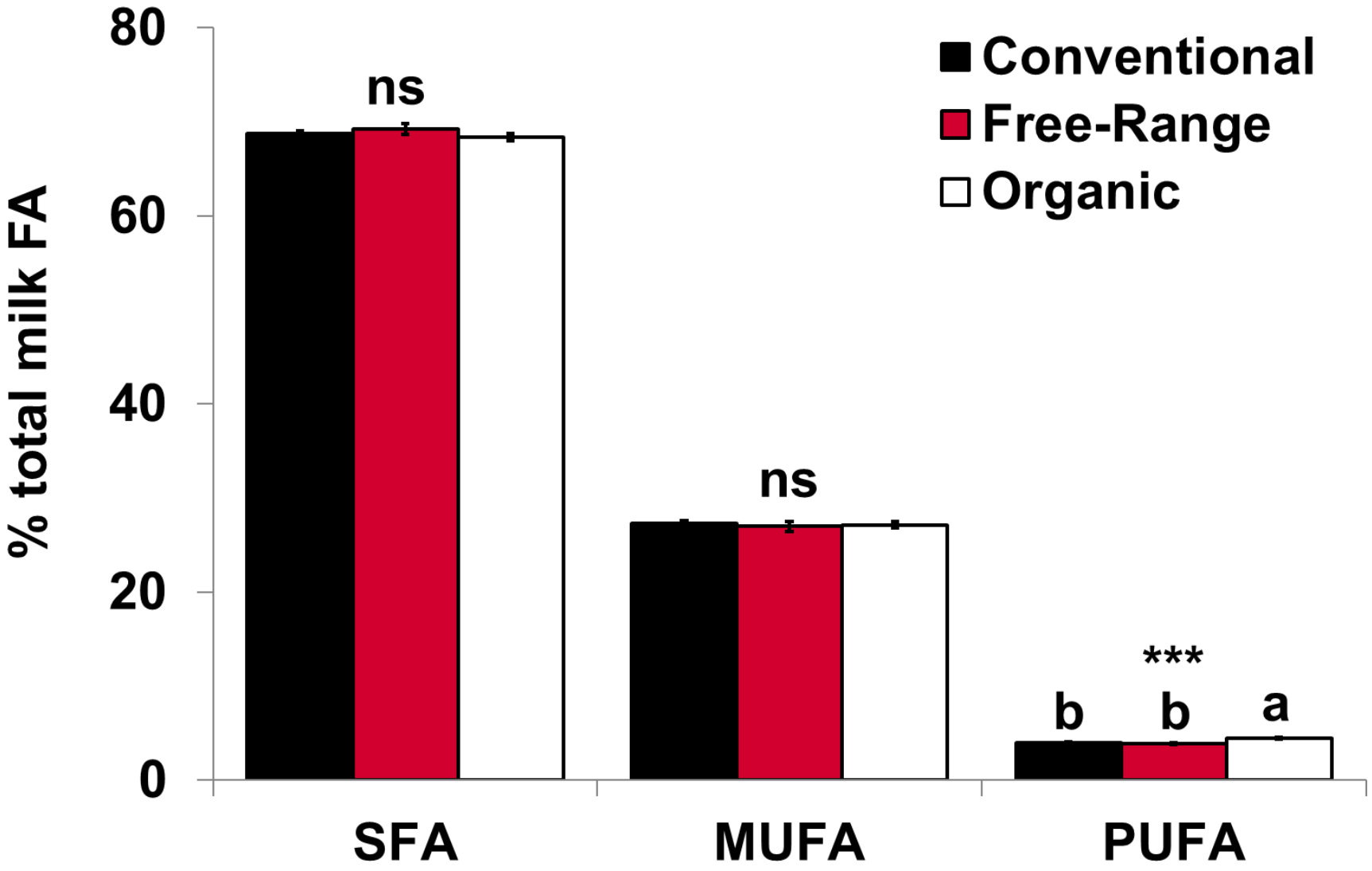
RESULTS

Fatty acid groups



****, P < 0.001; **, P < 0.01; *, P < 0.05; †, 0.05 < P < 0.10; ns, P > 0.10. Means for production system within a variable with different upper case letters are significantly different according to Fisher's Least Significant Difference test (P < 0.05).*

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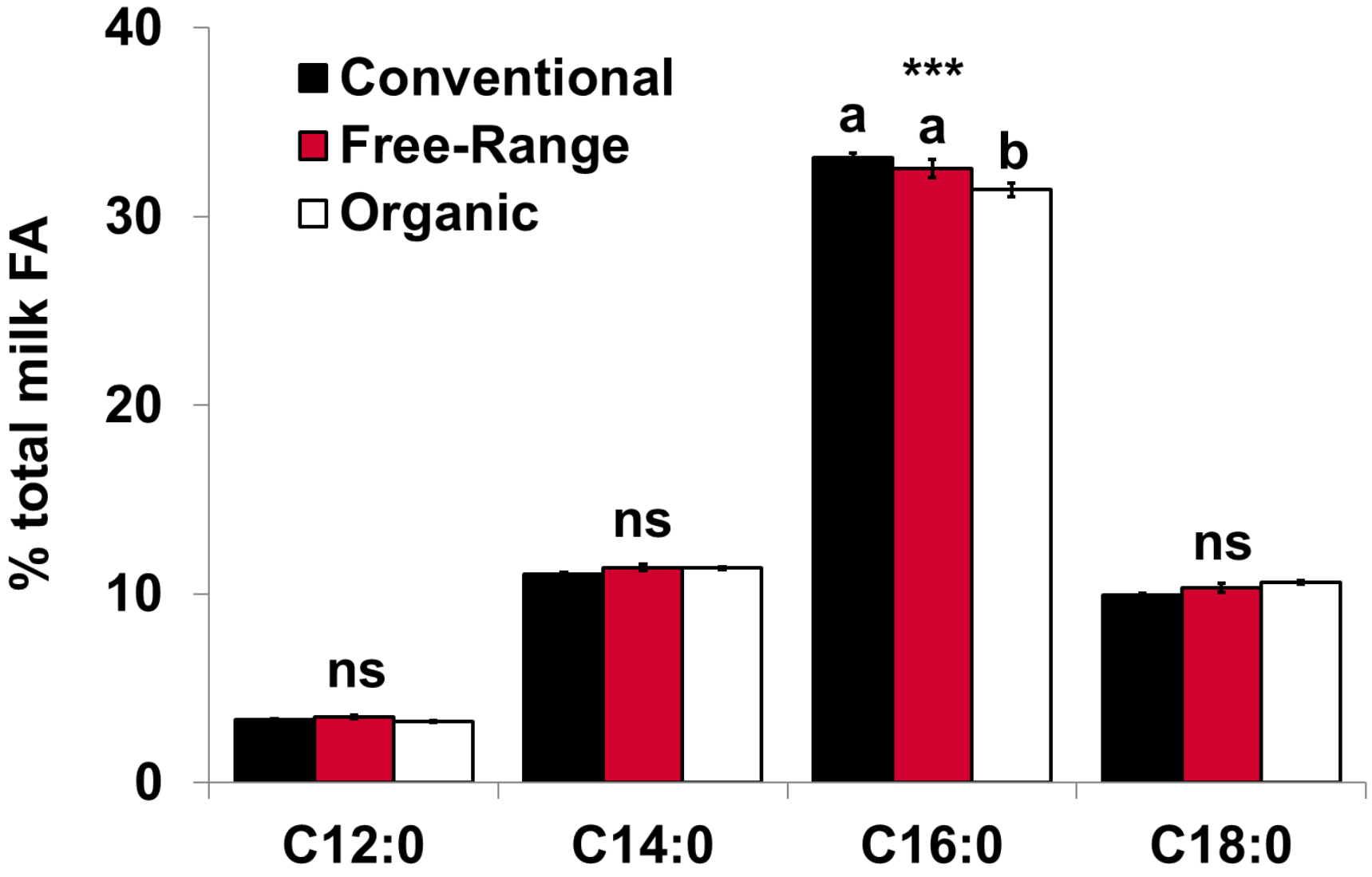
RESULTS

Individual SFA



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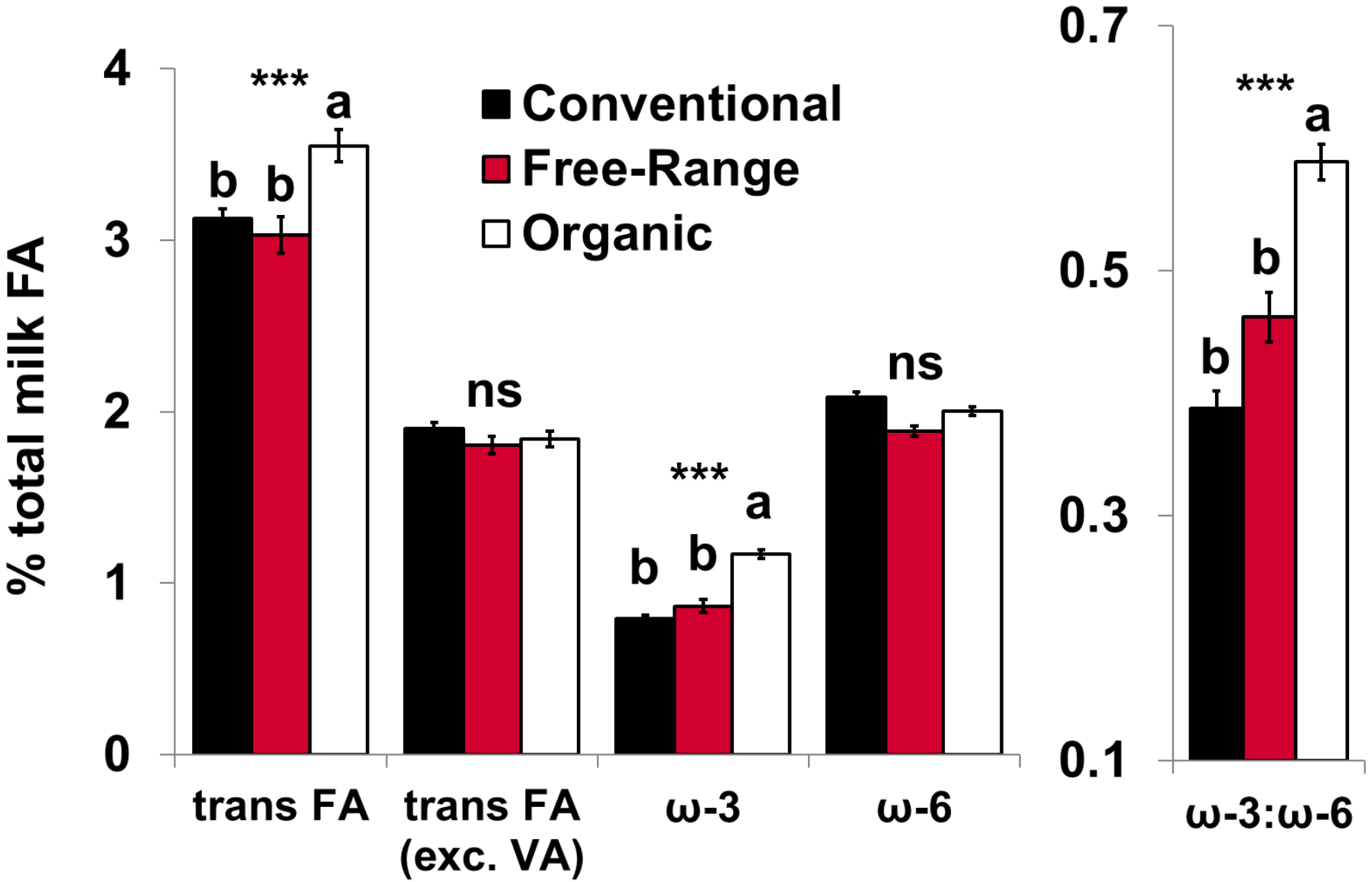
RESULTS

Fatty acid groups



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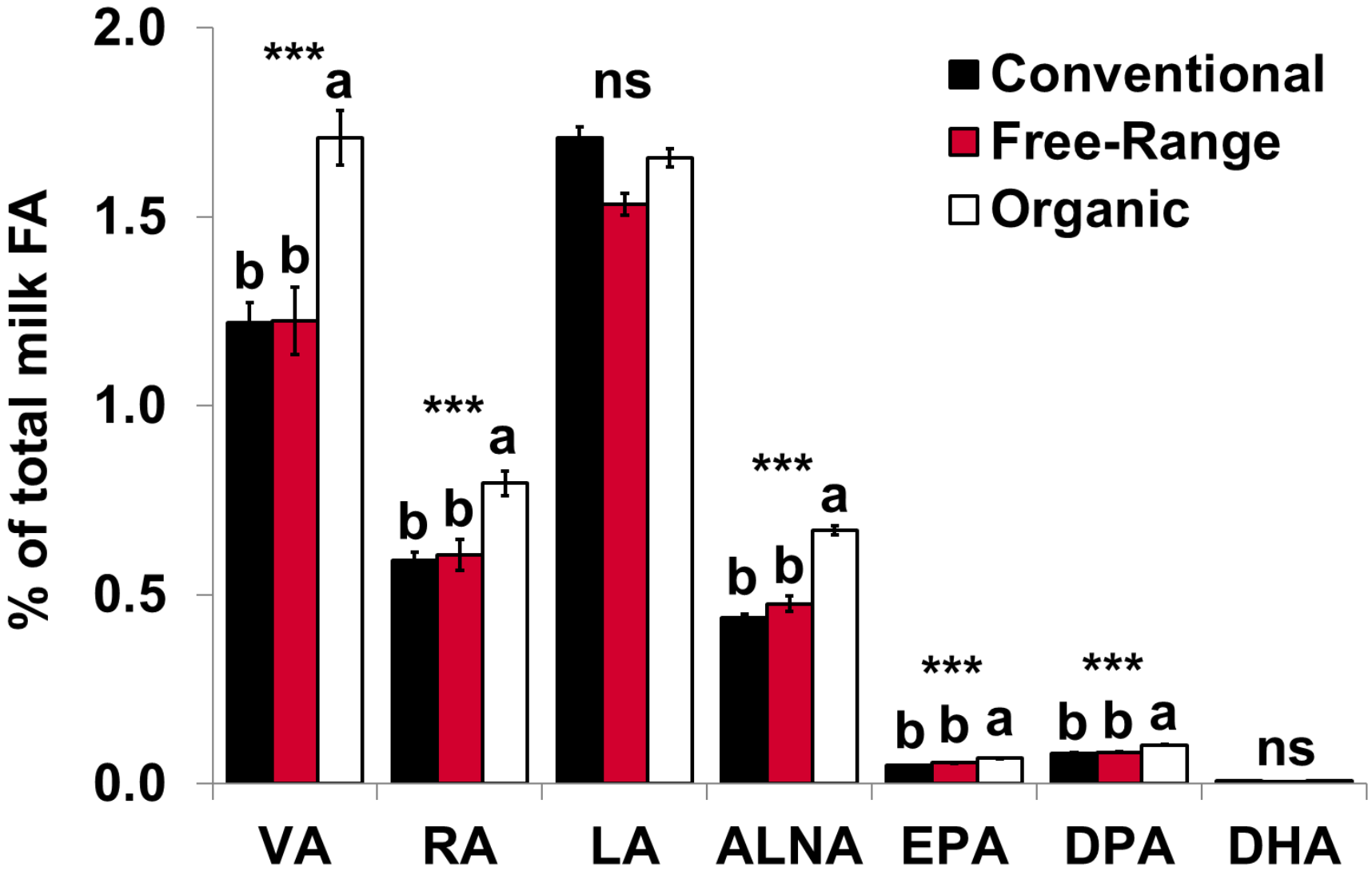
RESULTS

Individual MUFA & PUFA



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EXAMPLE

… of switching to organic milk (UK data)

FA	Intake (mg/d)	% RNI from CON	% RNI from ORG
Men & Women 19-64 years old			
PUFA	+60	2.4%	2.9%
ALNA	+28	3.4%	5.2%
EPA+DHA	+2	2.7%	3.2%
Men & Women ≥ 65 years old			
PUFA	+70	3.6%	4.4%
ALNA	+33	5.2%	7.9%
EPA+DHA	+3	3.2%	4.3%

- Reduction in the intakes of undesirable C16:0 and increase of the intakes of desirable VA and RA (no existing RNI for these)

RNI = reference nutrient intake

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CONCLUSION

- Organic milk contains
  - less of the nutritionally undesirable C16:0
  - more of the nutritionally beneficial VA, RA, ALNA, EPA, DPA, PUFA and n-3 PUFA
- Increased grazing and clover intake and forage:concentrate ratio may explain the differences in FA profiles between organic and conventional milk
- Free-range milk had similar FA profile to conventional milk
- Consuming organic milk may slightly increase the intake of beneficial FA

but…

No studies have been carried out to assess the impact on human health

Image from: pixabay

ACKNOWLEDGMENTS

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