

Food Authenticity and Food Fraud Prevention

Recent misleading claims related to food and nutrition

Roland Ernest Poms
Güssing, Austria

*MoniQA – International Association for Monitoring and Quality
Assurance in the total food supply chain*

MoniQA Association

MoniQA Global Food Safety Network

...providing expertise and services for effective food safety management..

...for food manufacturers, food retailers, international trade, food analytical laboratories, food control and regulatory bodies

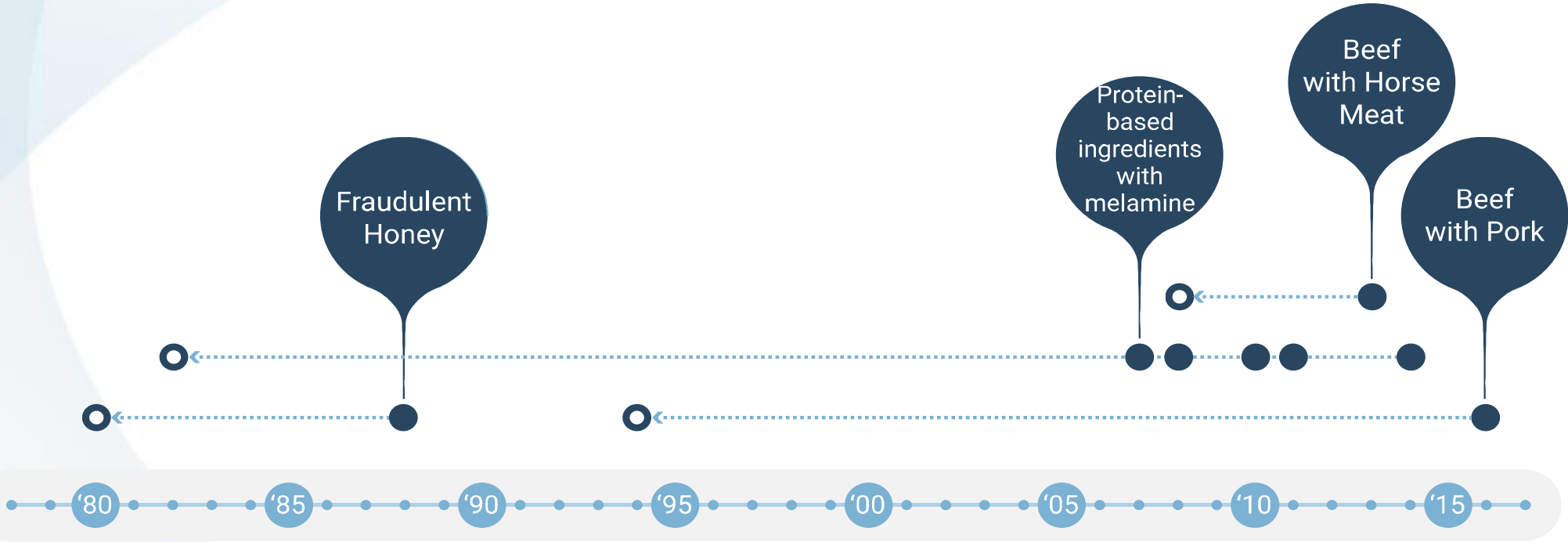
- Non profit-distributing association
- Established in July 2011
- Membership based
- Secretariat in Güssing, Austria

Consumer Trends and Food Claims

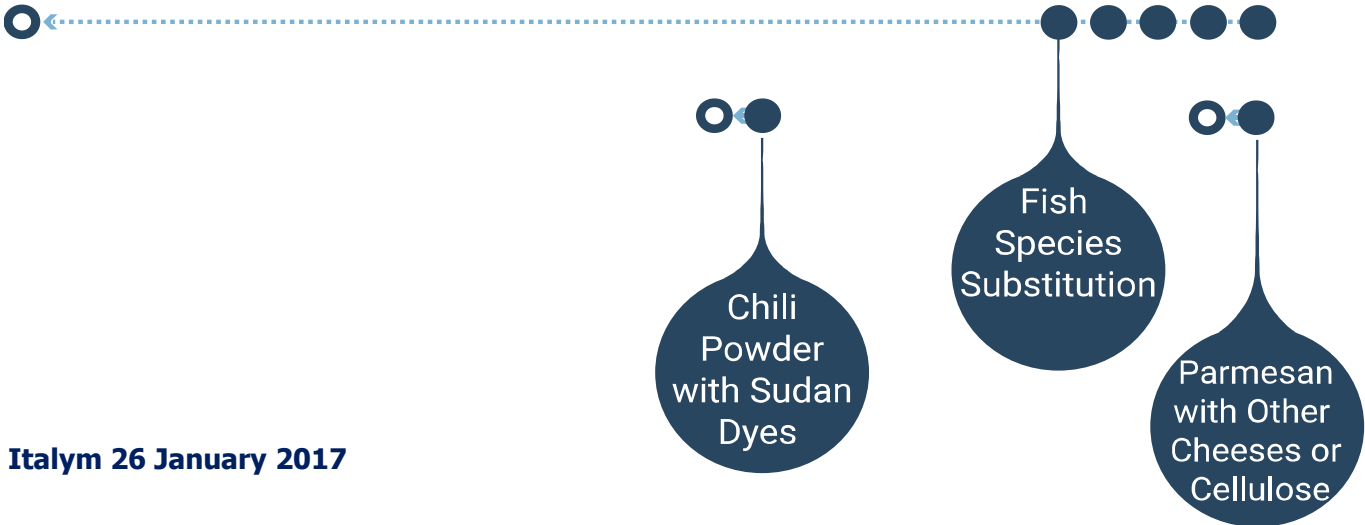
- All natural – whole foods, health foods
- Organic
- High fibre
- Gluten free
- Low Carb Diet
- GMO free
- Vegan
- Health Claims



Some Examples from Food Fraud History



○ Inference
● Incident

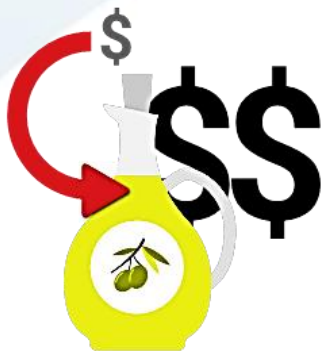


Definition “Food Fraud”

“The deliberate and intentional substitution, addition, tampering, or misrepresentation of food, food ingredients, or food packaging; or false or misleading statements made about a product, for economic gain”

(Spink & Moyer, 2011)

What is food fraud or EMA?



Dilution or Substitution



Artificial enhancement



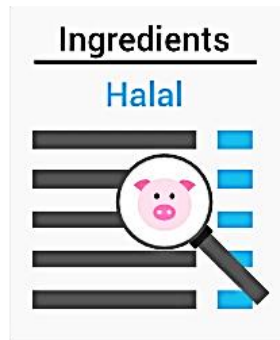
Use of undeclared, unapproved, or banned biocides



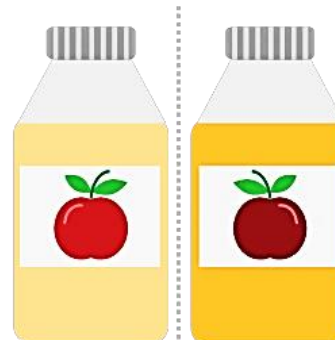
Removal of authentic constituents



Misrepresentation of nutritional value



Fraudulent labeling claims



Formulation of a fraudulent product



Counterfeits, theft overruns gray markets

Impact of Food Fraud



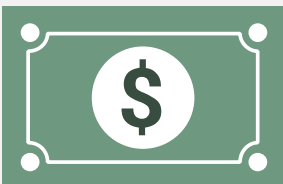
UP TO **10%** FOOD SUPPLY IS AFFECTED

PREVALENCE

IMPACT



Public Health
(In some cases)



Economic



Compliance

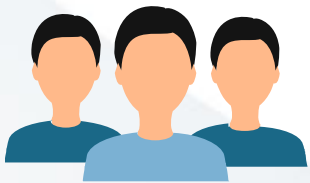


Brand Damage

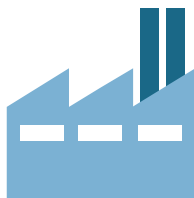


Consumer Confidence

WHO IS AFFECTED



Consumer



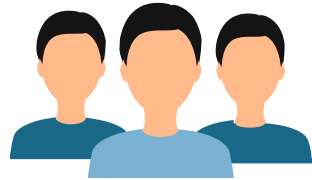
Food Industry



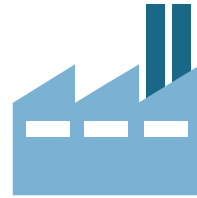
Government

Drivers to Address Food Fraud

WHO IS
AFFECTED



Consumer



Food Industry



Government



MELAMINE CRISIS

✝ 6 Children
7,000 Pets

HOSPITAL
300,000
Children



AVERAGE COST

💰 1 Incident =
2-15%

2016
December
Annual
Business
Revenue Loss



Getting ahead of food fraudsters

Instead of looking for
*what should not be
there...*



Define very carefully
the characteristics of
what should be there



Exclude anything
that *deviates
significantly from
those characteristics*

Targeted vs non-targeted methods

TARGETED ANALYSIS

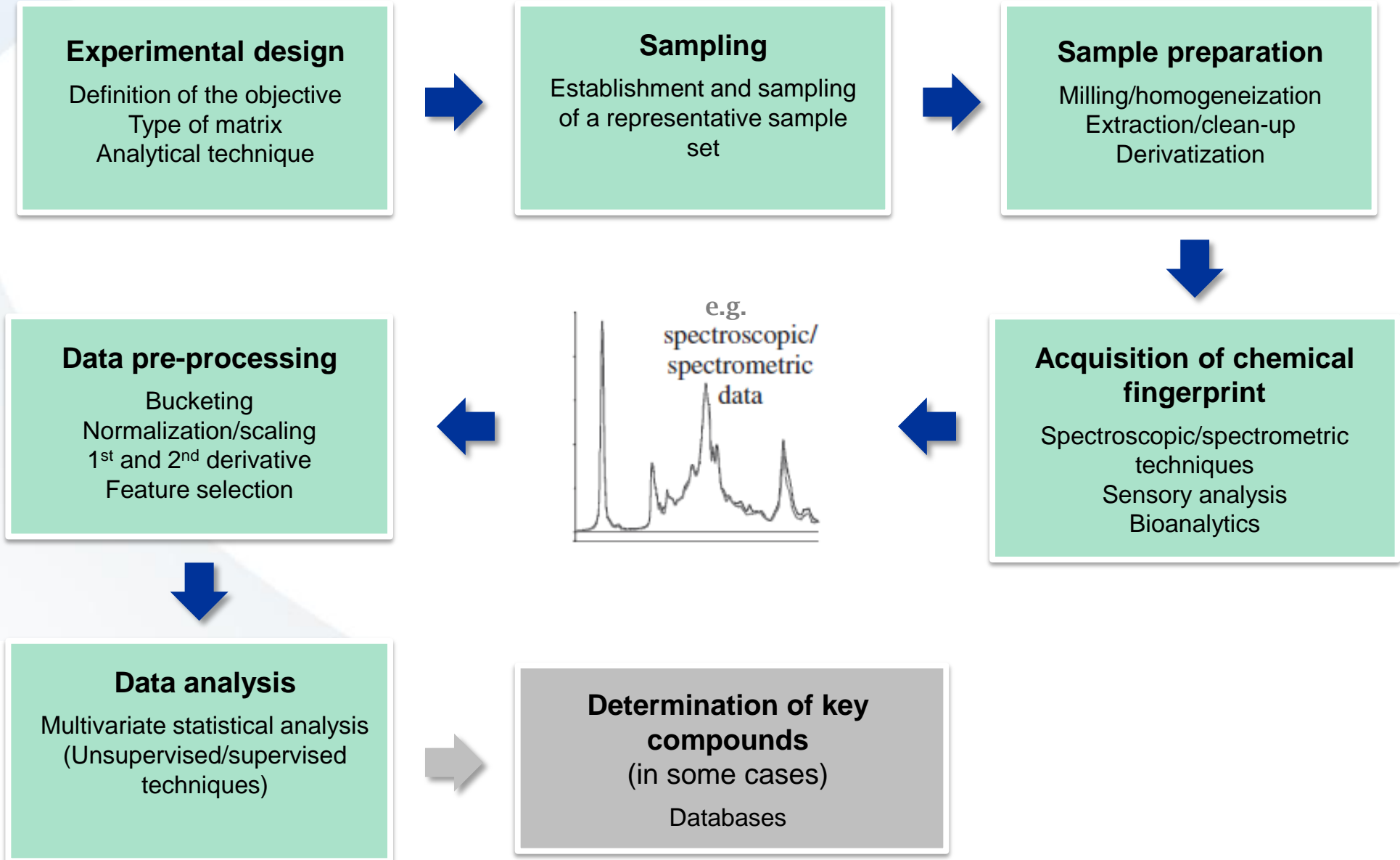


NON-TARGETED ANALYSIS



Infographics© Carmen Diaz-Amigo 2015

Non-targeted methods: general approach and key steps



Traceability Systems

Reference Sample System (RSS)

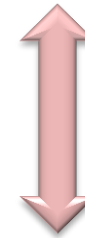
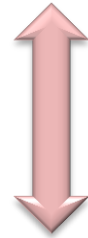
Database System

Reference
supplier, producer



Database
Region, Country

specific



general

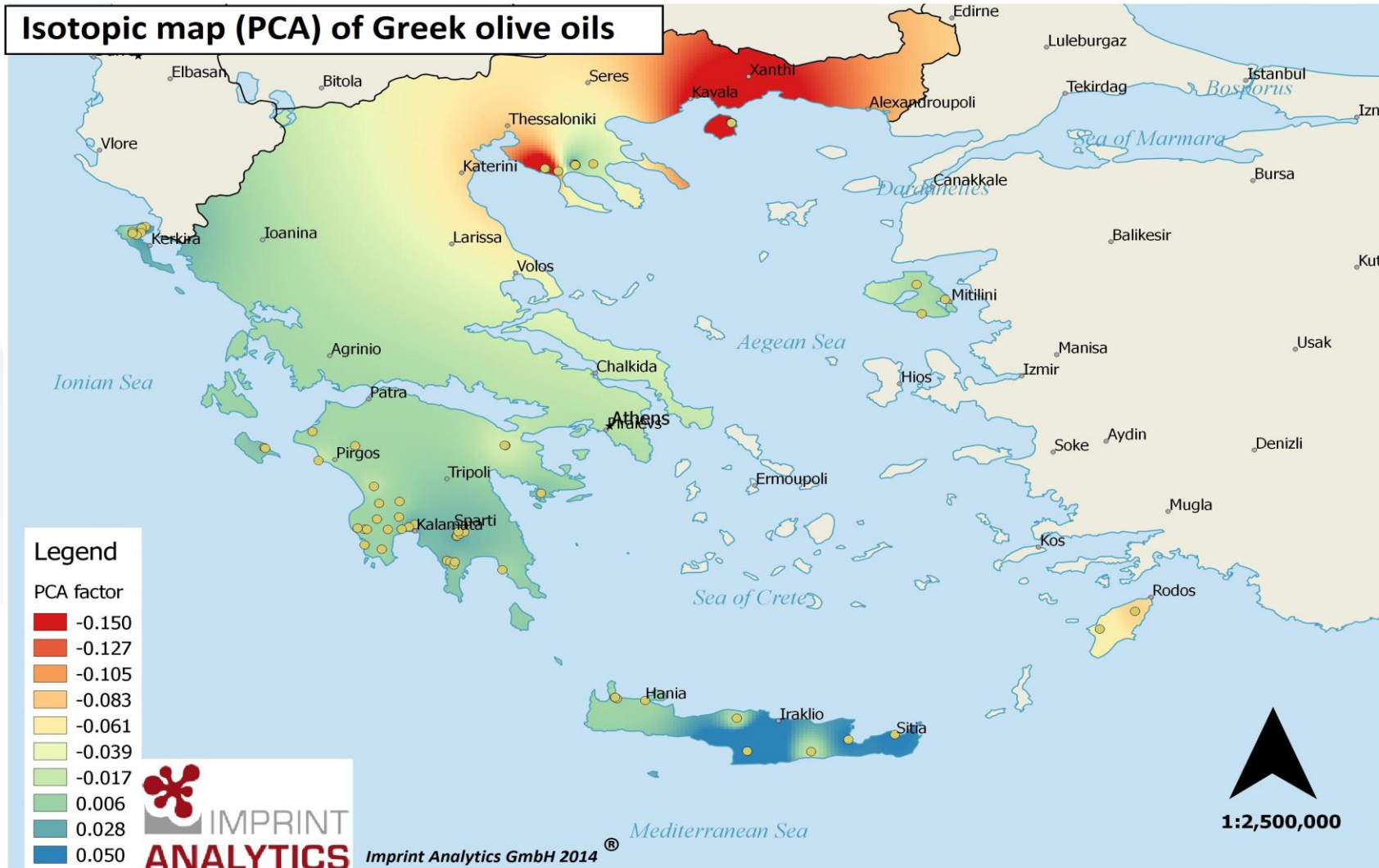
**control,
suspect,
charge comparison**



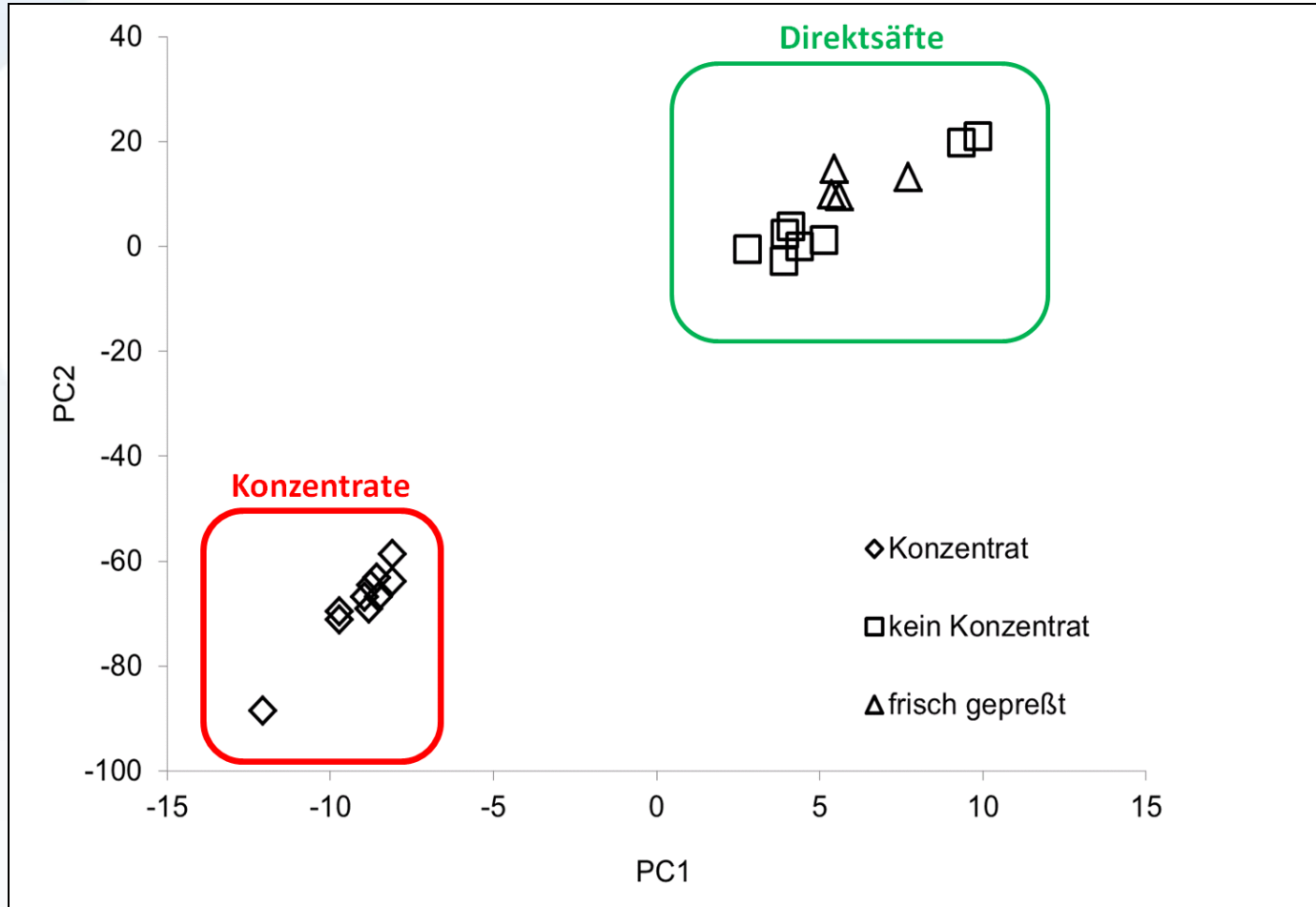
unknown sample

Database System Olive Oil

determination of geographic origin by generation of region specific isotopic maps:

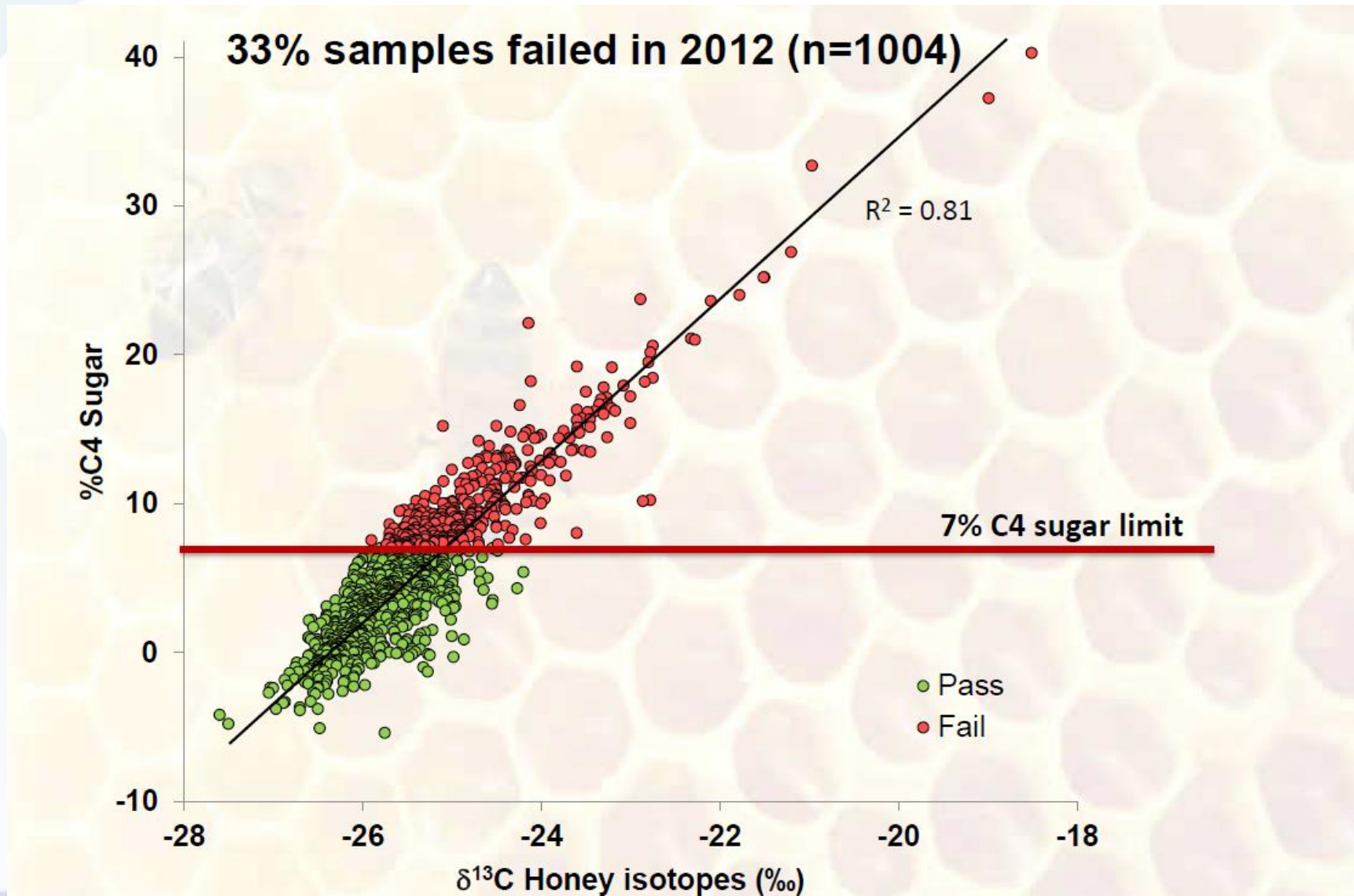


Mislabelling of Fruit Juices



Orange Juice adulteration
(data Imprint Analytics GmbH)

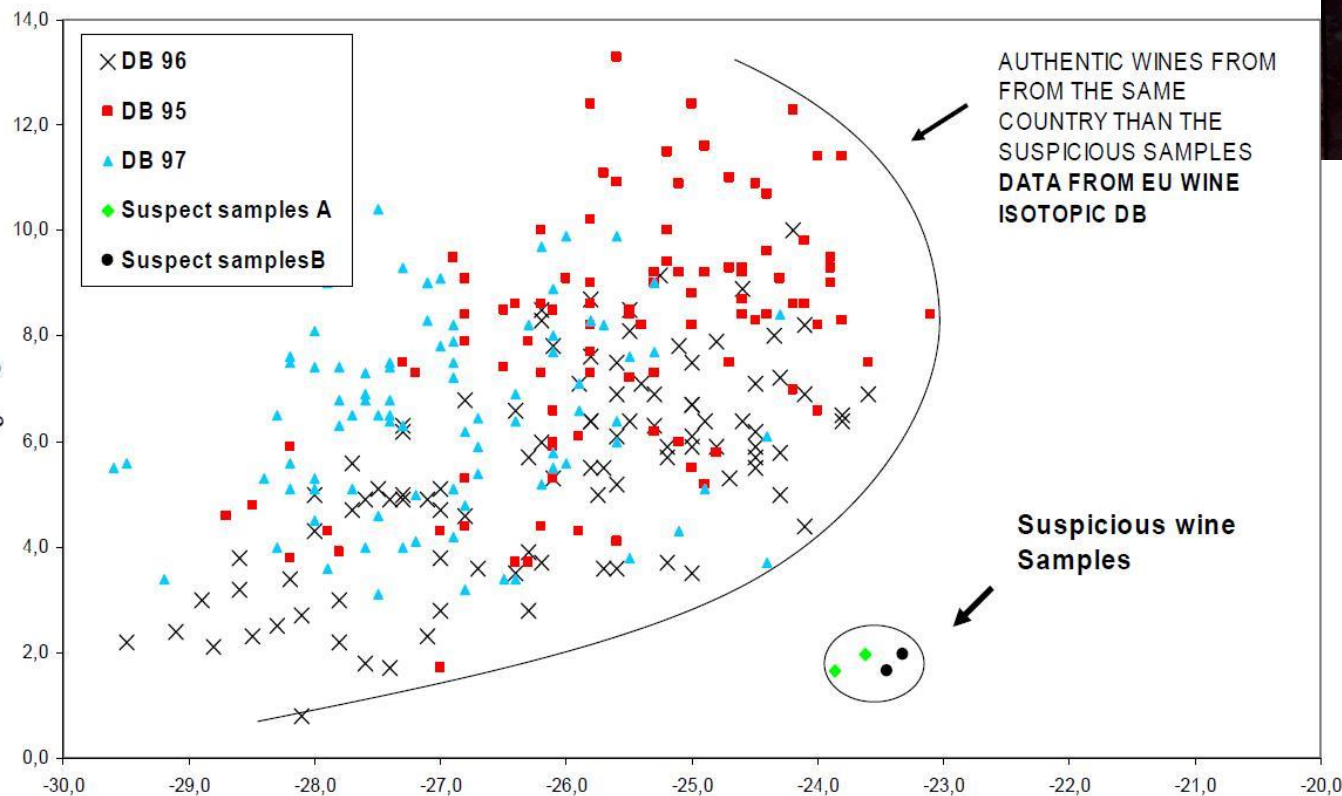
Honey sugar fraud



Wine (Mis)Labelling



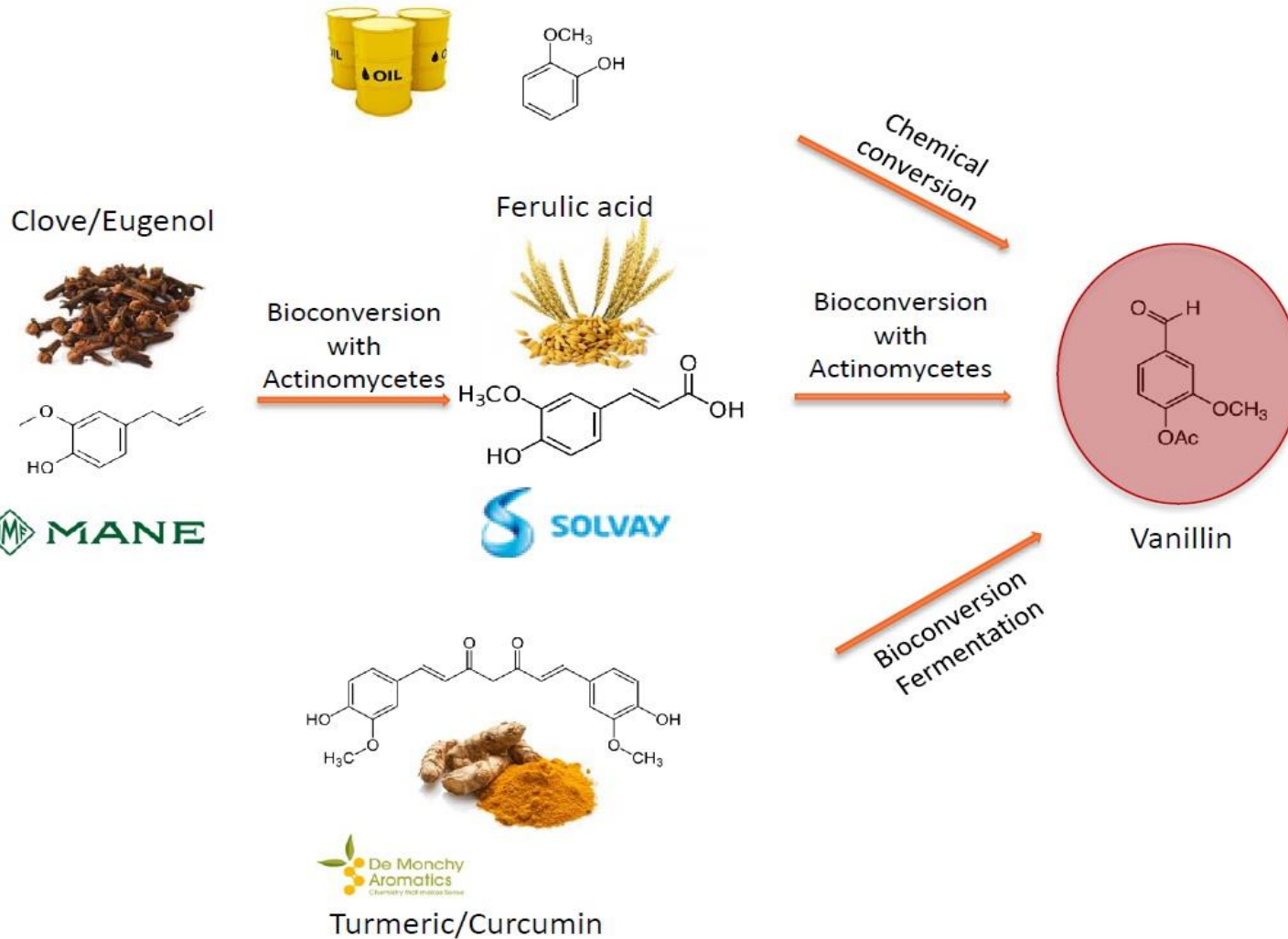
Original
VS.
Fraud



EU Wine Database

BEVABS, European Commission, 2006

Artificial vanilla-flavors



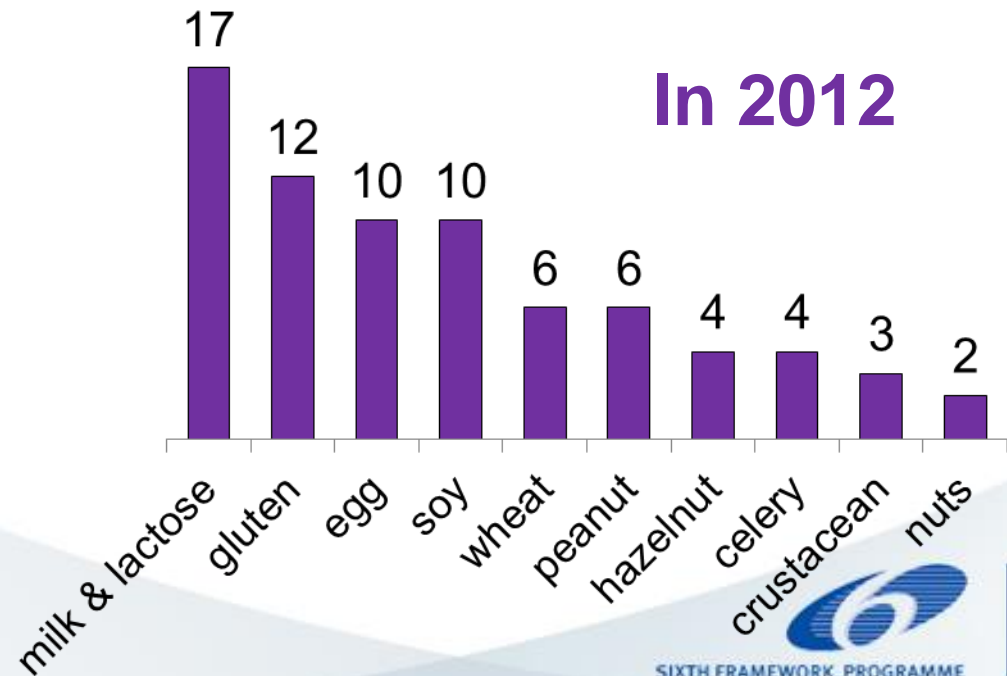
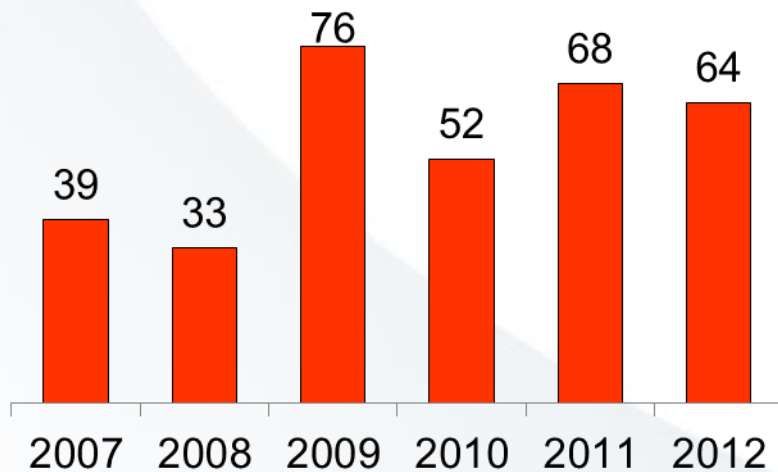
- Synthetic vanillin, mainly form guaiacol
- Ex-Ferulic vanillin mainly from rice bran (EU and US natural)
- Ex-Clove vanillin from clove oil or isolated isoeugenol (US natural, Mane process EU natural)
- Ex-turmeric vanillin from curcumin (EU natural)
- Exploitation of whole-cell bioconversions mainly using actinomycetes (*Amycolopsis spp.*, *Streptomyces spp.*) and pseudomonads

Reasons for unrecognized „hidden“ allergens in prepackaged foods

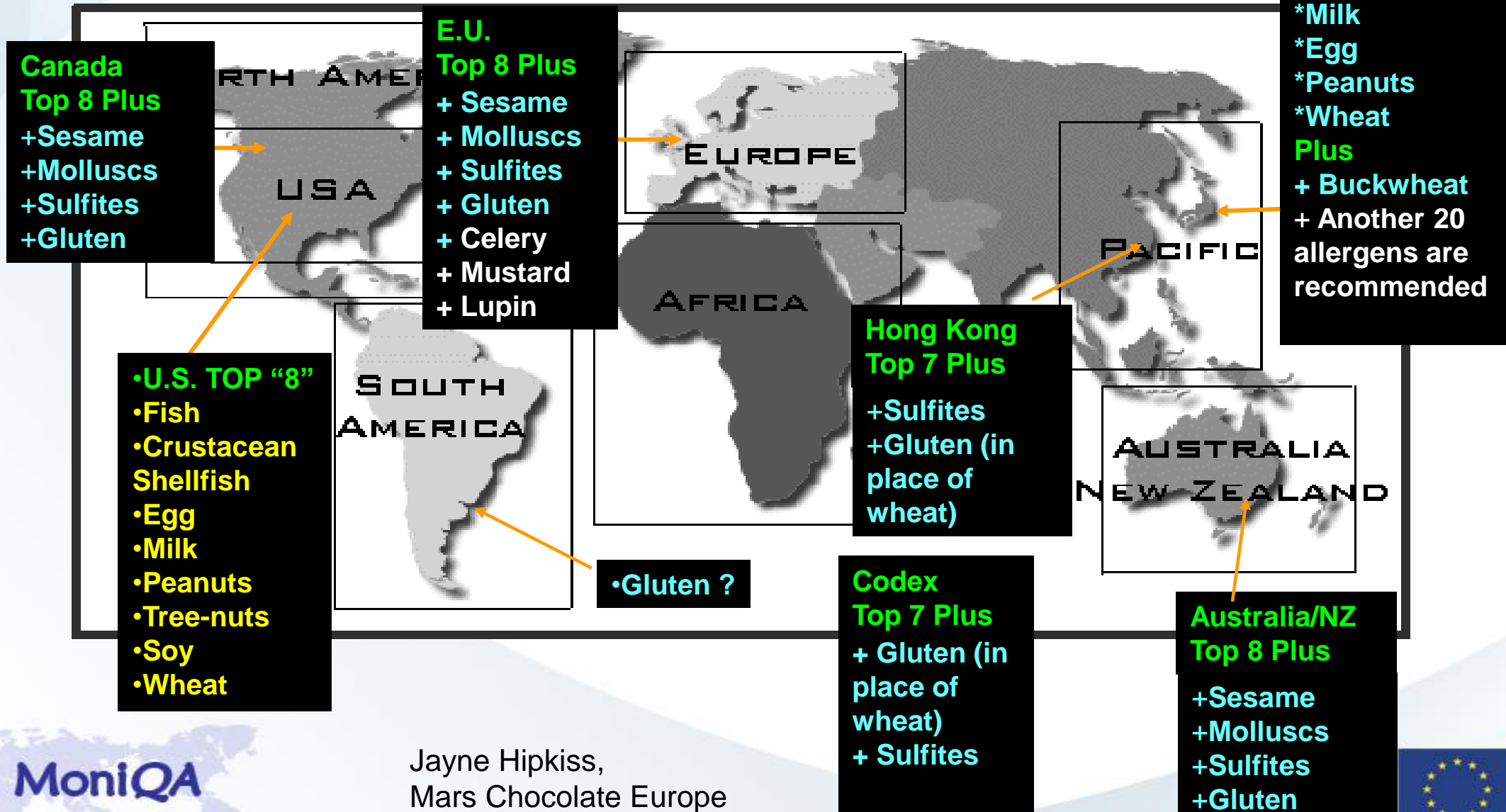
Wrong or missing labeling



Allergen related alerts due to unlabeled ingredient/trace (2007-2012)



International Food Allergen List



Jayne Hipkiss,
Mars Chocolate Europe



(EC) No 41/2009 – Gluten-free Maximum Limits

- 100 ppm for foods bearing the claim “very low gluten”
- **20 ppm** for foods bearing the claim “gluten-free”
 - ...includes specially processed oats, normal foods and Parnuts foods, as well as cereal-based baby foods and baby foods for infants and young children, as long as the content of gluten in the food as sold to the consumer is 20 ppm or less...



- **0 ppm** for infant formulae and follow-on formulae
 - Commission Directive 2006/141/EC of 22 December prohibits the use of ingredients containing gluten in the manufacture of such foodstuffs

When false information goes viral...

- The power of Bloggers, Tweets, Facebook, and Co
 - Followers
 - Likes
 - Fake News

Validated information?

- Causality?
- Based on observations?
- Substantiating scientific evidence?
- Epidemiological study? DBPC Food Challenge?
- Confirming publications?
- Peer reviewed literature?

William Davis

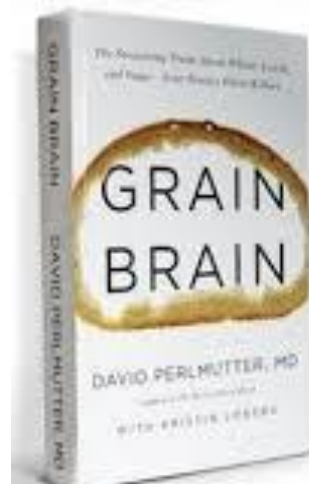
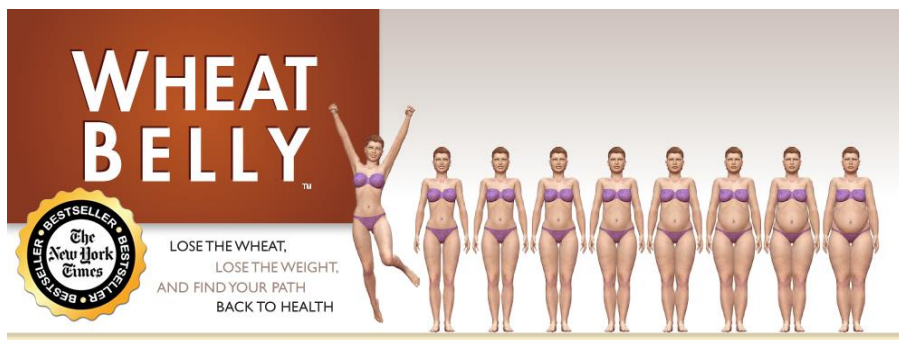
MD-preventive cardiologist's unique approach to diet allows him to advocate reversal, not just prevention, of heart disease.

... Nothing here should be construed as medical advice 1985 -St. Louis University School of Medicine; Ohio State University Hospitals -Internal Medicine and Cardiovascular Diseases-residency: **Training in advanced cardiac catheterization techniques** and coronary angioplasty in the Case-Western Reserve University



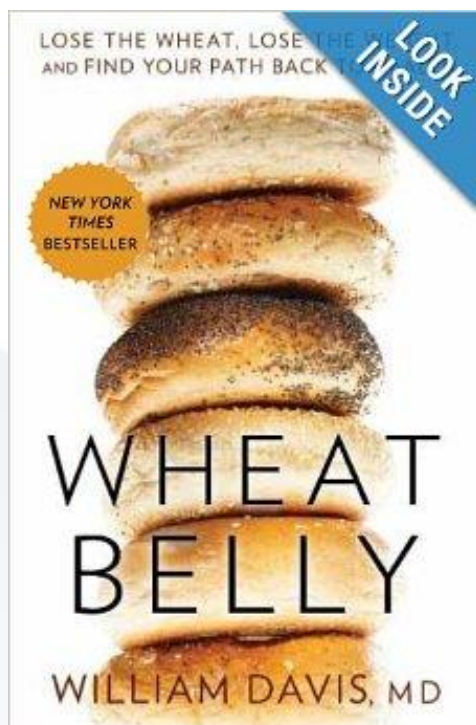
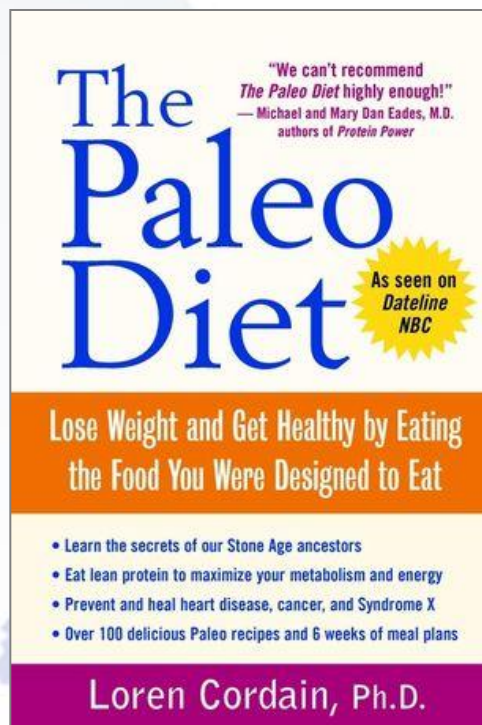
“I'd like to make the case that foods made with wheat make you fat... overly enthusiastic wheat consumption is the main cause of the obesity and diabetes crisis in the United States.”

“Wheat consumption causes addiction to food, obesity and auto-immune diseases!”



GRAIN
BRAIN

*The Surprising Truth About
Wheat, Carbs, and Sugar - Your
Brain's Silent Killers*



...some claims:

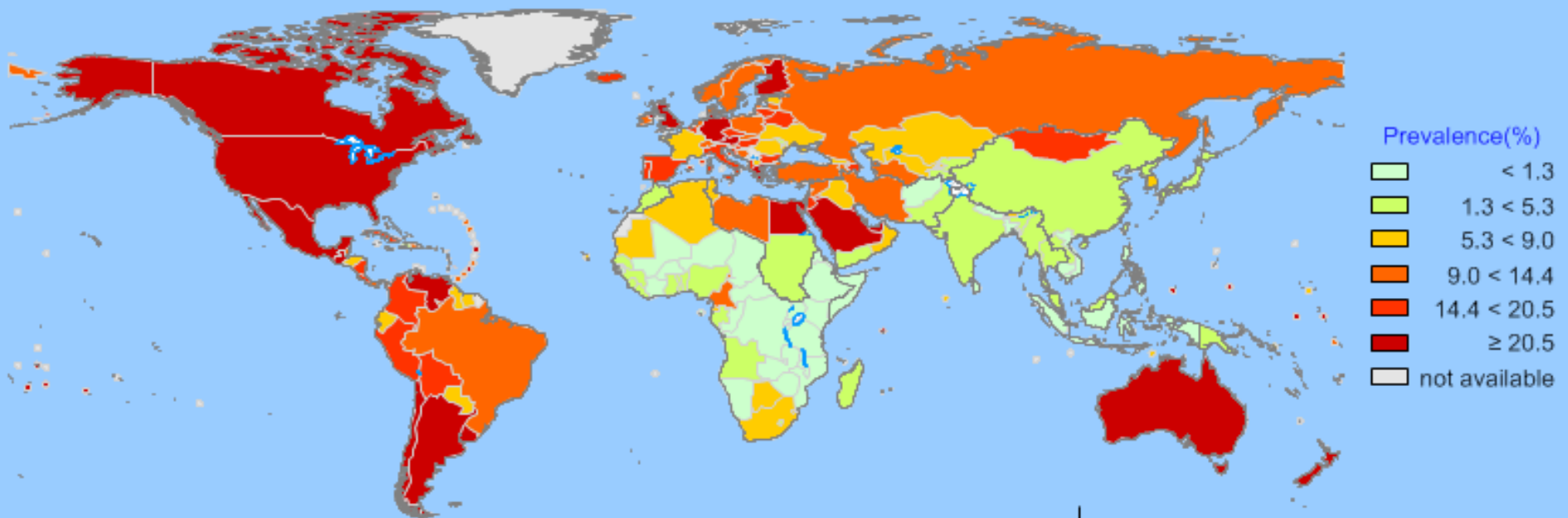
- *genetically modified*
- *different poisonous gluten,*
- *harmful lectins,*
- *addictive gluten exorphins*



Obesity

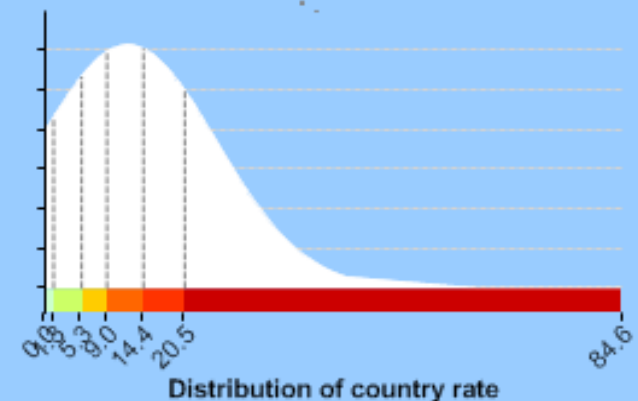
- a major risk factor for a number of chronic diseases (diabetes, cardiovascular diseases and cancer)

Estimated Obesity(BMI ≥ 30 kg/m²) Prevalence, Males, Aged 15+, 2010



Source: Ono T, Guthold R, Strong K, WHO Global Comparable Estimates, 2005

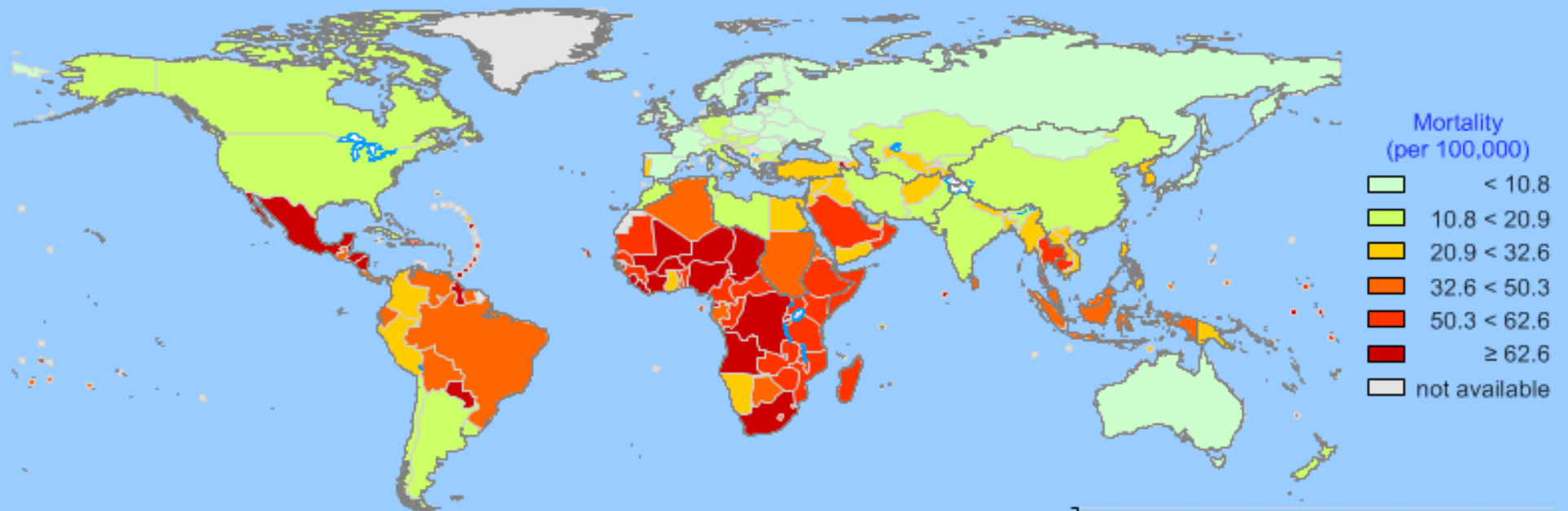
The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. © WHO 2012. All rights reserved



Diabetes

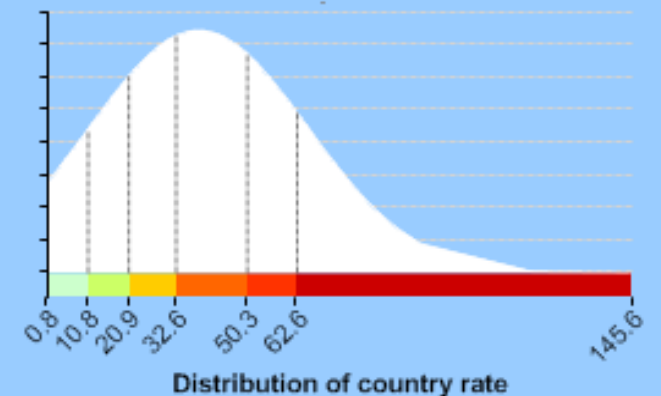
– deaths projected to double between 2005 and 2030

Estimated Age Standardized Death Rate(per 100,000), Diabetes (mellitus), Females, 2004



Source: Mathers, C. D., C. Bernard, K. M. Iburg, M. Inoue, D. Ma Fat, K Shibuya, C. Stein, N. Tomijima, and H. Xu, Global Burden of Disease: data sources, methods and results., 2008

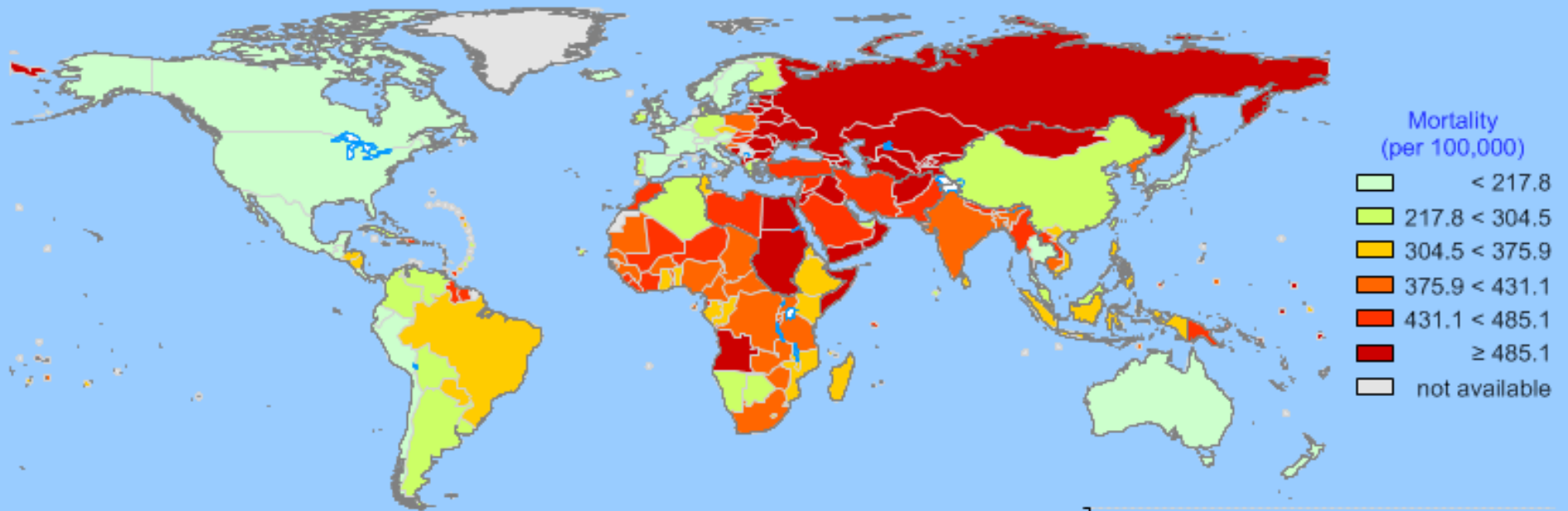
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Cardiovascular diseases

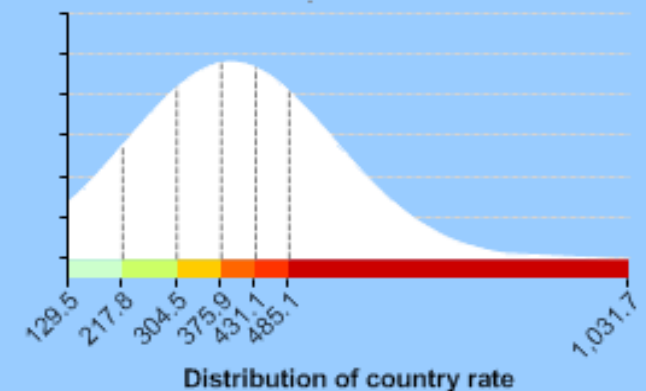
– represent 30% of all global deaths

Estimated Age Standardized Death Rate(per 100,000), Cardiovascular diseases, Males, 2004



Source: Mathers, C. D., C. Bernard, K. M. Iburg, M. Inoue, D. Ma Fat, K Shibuya, C. Stein, N. Tomijima, and H. Xu, Global Burden of Disease: data sources, methods and results., 2008

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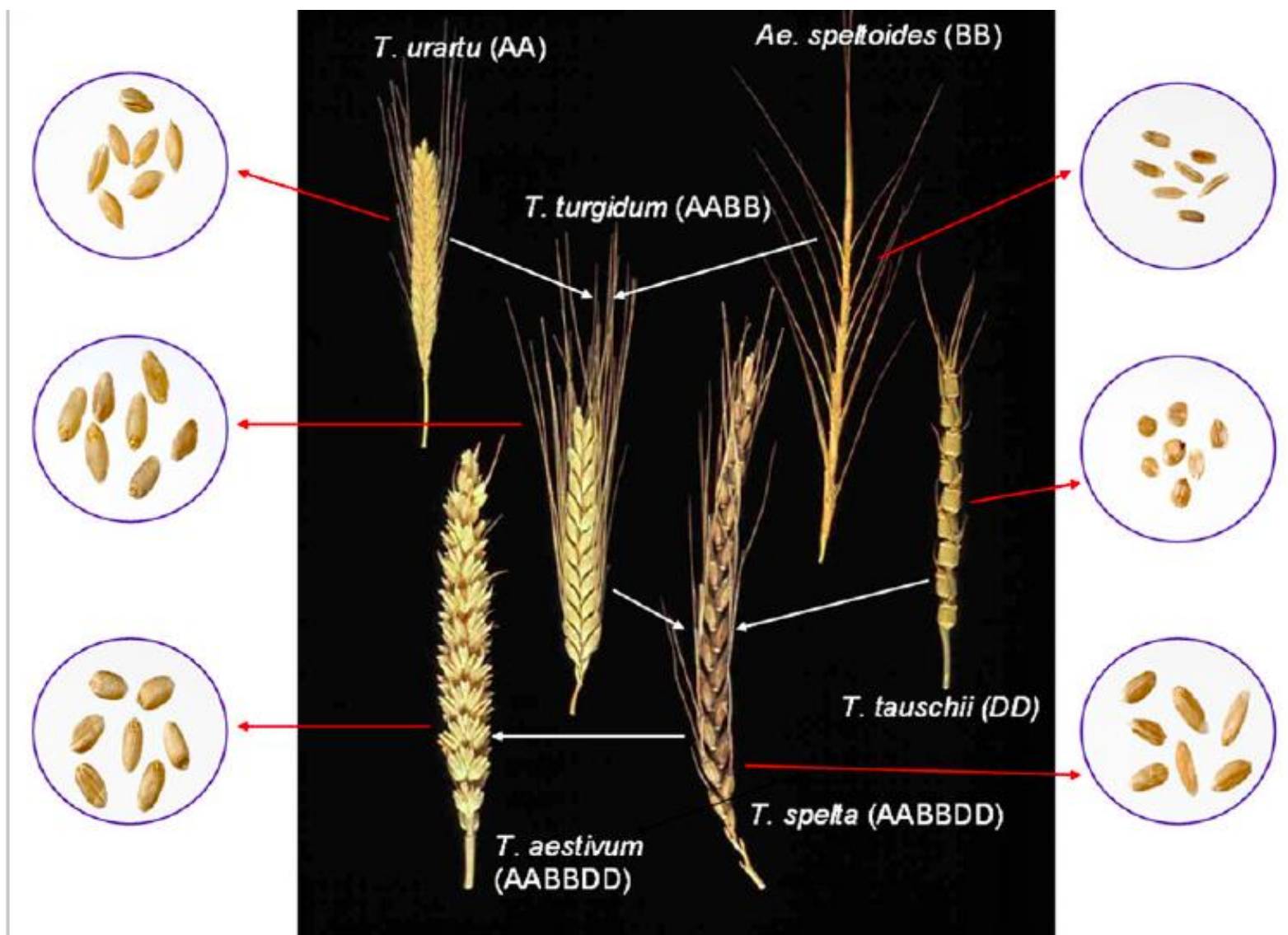
Claim: New protein causes addictive weight gain



- “....a new protein in this thing called gliadin. everybody else is susceptible to the gliadin protein that is an opiate. This thing binds into the opiate receptors in your brain and in most people stimulates appetite, such that we consume 440 more calories per day, 365 days per year.”
- How much weight would we gain if we ate 440 cal/d?
= 21 kg / yr

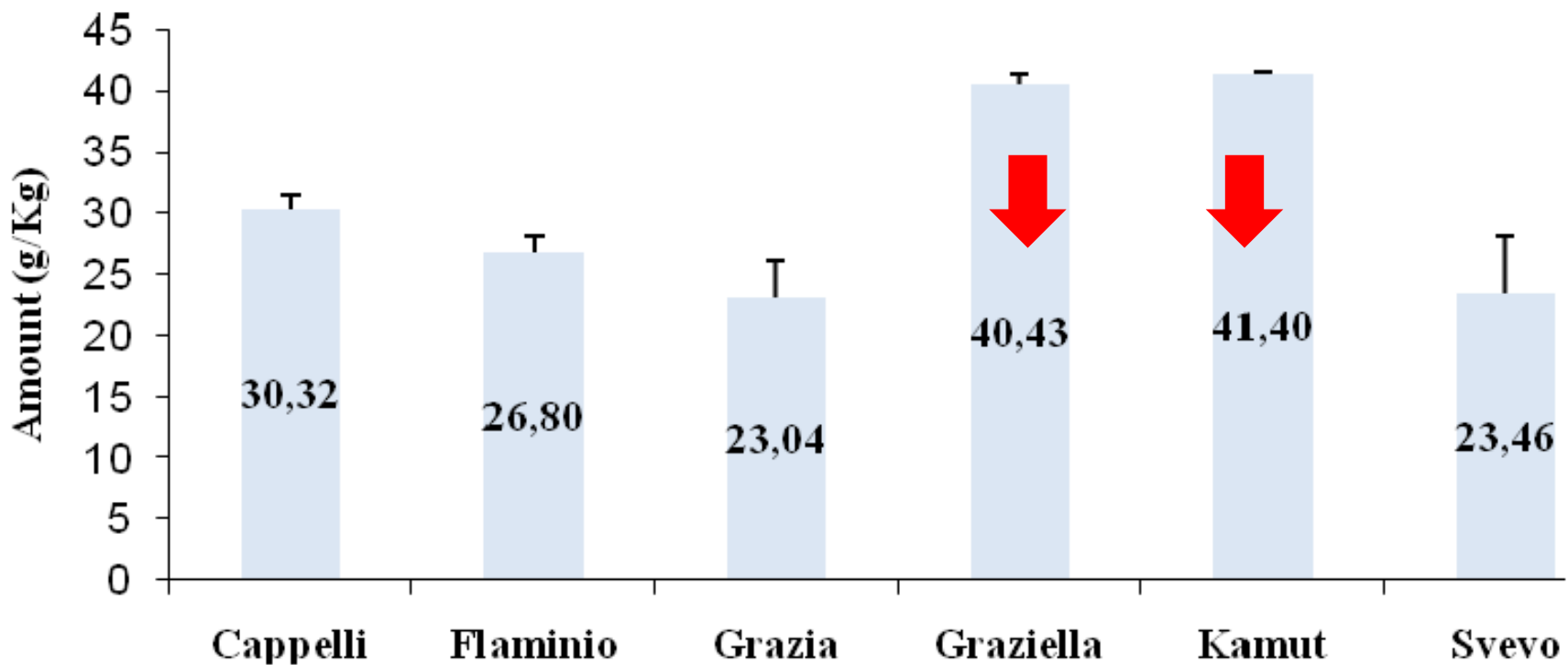
Has “modern” wheat been modified?

Cereals have undergone an natural selection process by farmers over thousands of years.



Ancient grains – Wheat Graziella Ra® and Kamut® have a higher α -gliadin content than their modern counterparts

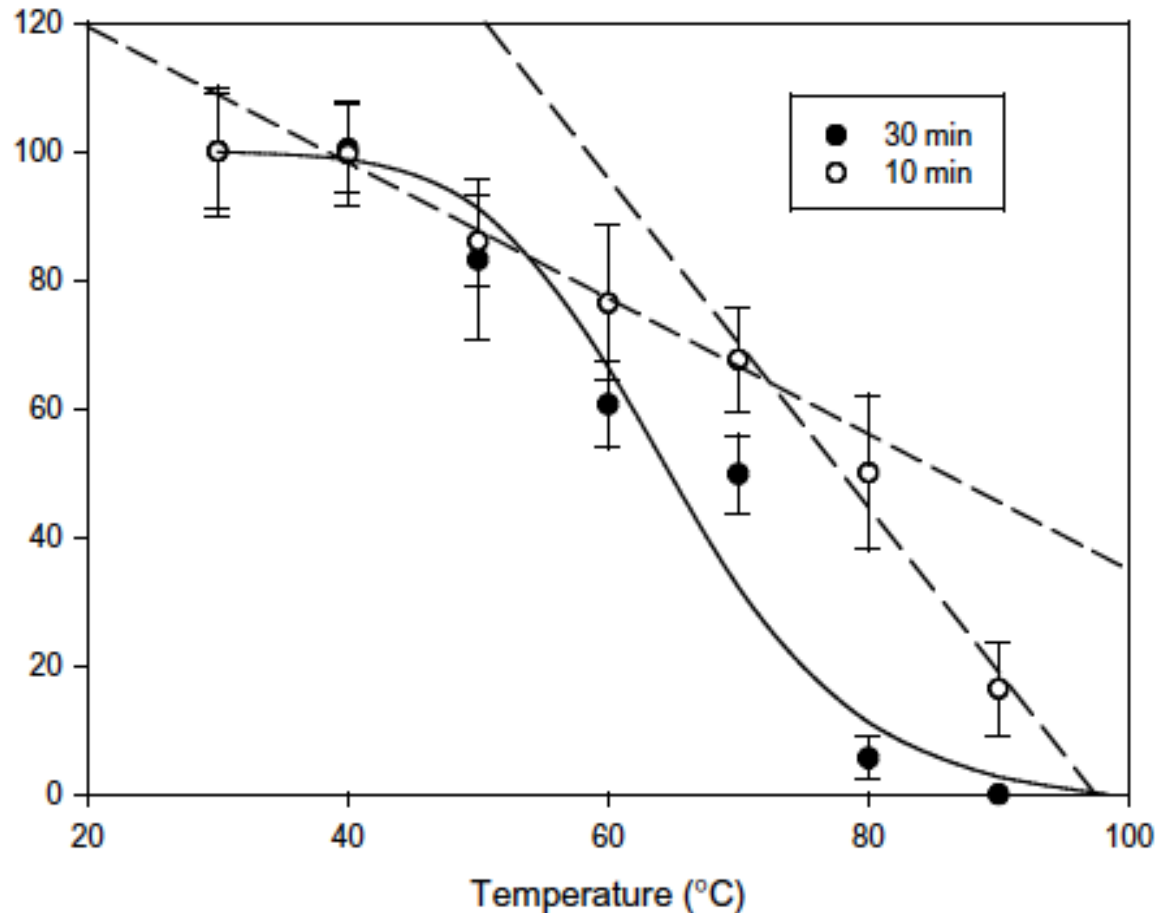
Figure 1. Total gliadin determination by a two step sandwich ELISA. All values reported as mean \pm SD from three independent experiments.



Effect of exorphins on gut function, hormonal release, and appetite.

- “Although a number of studies have suggested a role for endogenous opiates in appetite regulation, we could not demonstrate any effect of "exorphins" on the amount of calories ingested nor on the perception of satiety”.
- *Logical findings in the light that such large peptides cannot be absorbed*

Lectins, present in wheat germ, become denatured upon heat exposure and lose their agglutination activity



65° C/30 min. or 70° C /10 min. is needed for WGA denaturation.

Summarizing

- Modern wheat is Non GMO
- Farmers selected and cross bred wild varieties to yield:
 - more starch
 - more protein
- Modern wheat does NOT contain more/new gluten proteins and lectins. (Gluten structure may have changed)
- Opioid like peptides ARE too large to be absorbed intact

Milling and food processing impacts on what is used in food



HEALTHGRAIN

Exploiting bioactivity
of European cereal grains
for improved nutrition
and health benefits

www.healthgrain.org

Whole Grain Definition

Developed by
the European HEALTHGRAIN Consortium

Effects of whole grain consumption on risk reduction of nutrition-related diseases

WHOLE GRAIN

HEALTHY
WEIGHT

HEALTHY
HEART

HEALTHY
DIET

HEALTHY
LIFESTYLE

Obesity

Cardiovascular
diseases

Diabetes

Colorectal
cancer

Review

Cereal grains for nutrition and health benefits: Overview of results from *in vitro*, animal and human studies in the HEALTHGRAIN project

Inger Björck^a, Elin Östman^{a,*},
Mette Kristensen^b,
Nuria Mateo Anson^c,
Ruth K. Price^d,
Guido R.M.M. Haenen^c,
Rob Havenaar^e,
Knud Erik Bach Knudsen^f,
Anders Frid^g,
Hannu Mykkänen^h,
Rob W. Welch^d and
Gabriele Riccardiⁱ

^aDept. of Toxicology, Maastricht University, P.O. Box 616, 6200 MD Maastricht, The Netherlands

^bNorthern Ireland Centre for Food and Health, School of Biomedical Sciences, University of Ulster, Coleraine BT52 1SA, UK

^cTNO Quality of Life, Biosciences, P.O. Box 360, 3700 AJ Zeist, The Netherlands

^dDept. of Animal Science, Faculty of Science and Technology, Aarhus University, Blichers Allé 20, DK-8830 Tjele, Denmark

^eClinic of Endocrinology, University Hospital SUS, SE-205 02 Malmö, Sweden

^fClinical Nutrition and ETTK (Food and Health Research Centre), Kuopio campus, University of Eastern Finland, P.O. Box 1627, 70211 Kuopio, Finland

^gDept of Clinical and Experimental Medicine, Federico II University, Naples, Italy

Epidemiological studies have linked whole grain intake to the prevention of the metabolic syndrome, obesity and associated chronic diseases such as CVD and T2D. The *Nutrition* module within the HEALTHGRAIN project, included 10 partners and undertook *in vitro*, animal and human *in vivo* studies with the overall aims of elucidating the components and mechanisms underlying the health benefits of cereal grains. This review summarises the major outcomes of these studies, including yet unpublished findings.



Nutrition, Metabolism & Cardiovascular Diseases (2008) 18, 283–290



Nutrition,
Metabolism &
Cardiovascular Diseases

www.elsevier.com/locate/nmcd

Whole grain intake and cardiovascular disease: A meta-analysis

Philip B. Mellen^{a,*}, Thomas F. Walsh^a, David M. Herrington^b

^a Department of Internal Medicine, Section of General Medicine, Wake Forest University Health Sciences, Medical Center Blvd., Winston-Salem, NC 27157, USA

^b Department of Internal Medicine, Section of Cardiology, Wake Forest University Health Sciences, Medical Center Blvd., Winston-Salem, NC 27157, USA



Nutrition Research 30 (2010) 815–822

Nutrition
Research

www.nrjournal.com

Whole grain and fiber consumption are associated with lower body weight measures in US adults: National Health and Nutrition Examination Survey 1999–2004

Carol E. O'Neil^{a,*}, Michael Zhanovec^a, Susan S. Cho^b, Theresa A. Nicklas^c

^aSchool of Human Ecology, Louisiana State University Agricultural Center, Baton Rouge, Louisiana 70803, USA

^bNutraSource, Clarksville, Maryland, 21029, USA

^cUSDA/ARS Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, Texas 77030, USA

Received 11 August 2010; revised 15 October 2010; accepted 26 October 2010





Whole-grains contain more fibre, vitamins, minerals and phytochemicals (plant substances) than refined grains. For example, the vitamin content of brown rice is about 5-10 times higher than white rice.

The beneficial components in whole-grains work together to lower your risk of heart disease and diabetes. Fibre helps to reduce 'bad' cholesterol and regulate blood sugar levels. Some of the vitamins, minerals and phytochemicals act as antioxidants to help protect against blocked arteries. Whole-grains may also support weight management as they help promote the feeling of fullness.

To learn more about whole-grains and try out delicious recipes, visit www.hpb.gov.sg/foodforhealth

Have 2-3 servings of whole-grains daily in place of foods made from refined grains.
 Examples of 1 serving are ½ bowl of brown rice or 2 slices of wholemeal bread.

Whole-grain products include:

- Brown rice
- Wholemeal bread
- Brown rice, lentils and wholewheat pasta
- Oats and whole-grain breakfast cereals

Summary

- Food authenticity is an important issue for consumer trust, public health, national and global economy, international trade, and standards
- Food fraud affects up to 10-15 % of food supply and has become a > \$15 MIO business
- Authentication of foods and testing for labelling compliance needs novel approaches
- Non-validated information is easily accessible and can go viral via social media
- Transparency and communication based on facts and scientific evidence are needed

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Hamit Köksel, Hacettepe University and ICC President, Turkey

Thank you for your attention!

***Roland Ernest Poms
Secretary General***

**www.moniqa.org
moniqa@moniqa.org**

MoniQA

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SIXTH FRAMEWORK PROGRAMME

