



The Food and Environment
Research Agency

New methods and systems for tracing the origin of food: an overview

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Safety and quality of wine?

- Need to keep the wine consumer better informed ?
 - “Adulteration of wine-extended with Gypsum, lime and lead”¹



- ¹Pliney the Elder: *Natural History*, 1st Century AD

To be discussed

- Need for improved food traceability and assurance
- Overview of key outputs of TRACE
- Food mapping –use of predictive isoscapes
– demonstration
- Exploitation and conclusions

Rationale for TRACE: 2003/4

- Drivers for food traceability
 - Consumer food safety and socio-economic concerns
 - BSE,
 - Foot and mouth
 - dioxins
 - Sudan red
 - One step up one step down legislation introduced primarily to enhance risk management in terms of selectivity of recall
 - Reg (EC) 178/2002 General food Law
 - » One step up one step down traceability implemented 2005
- Consumer preference for products of defined origin
 - Local foods, regional foods, country origin, PDO
 - How to verify?

Marketing of “traceable food”

- Marketing to consumer preferences and concerns about origin of food
 - Local, regional, designated origin
 - Food miles, carbon footprint, sustainability
 - Organic, animal welfare, fair trade
 - Biofuels



Traceability is a tool

- Traceability does not make food safe or assure product integrity
 - World Customs Organisation estimate \$49 billion counterfeit food and beverages in 2004 (Source: Spink, J., 2009. Food Profiteering and the counterfeit product threat. In Feeding our Hungry planet Michigan State University Symposium presentation)
- Traceability systems track and trace food packaging
- Need methods for verifying the contents



www.trace.org



- To develop traceability methods and systems that will provide consumers with added confidence in the authenticity of European food.
- €12M EU (€19M EU)
- 50+ participants, multi-disciplinary, 150
- Industry, academia, 150 researchers
- Europe, Argentina, China (+ US, NZ, AUS)
- 5 yrs 2005-2009



Increasing consumer confidence

- Improved (cost effective) traceability for all
 - through improved traceability AND development of methods for verifying origin
- European food perceived as higher quality as quality (and safety) specifications can easily be traced and verified.
- Promotes value added foods and sustainable agriculture e.g. regional foods, organic, country of origin.
- Benefits the food industry as well as consumers

TRACE Key outputs: improvements in Traceability

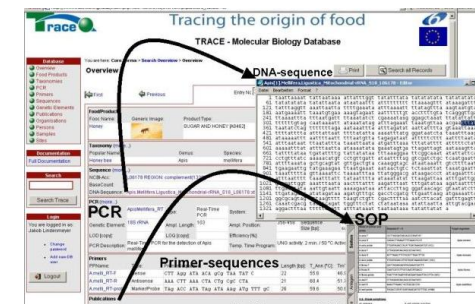
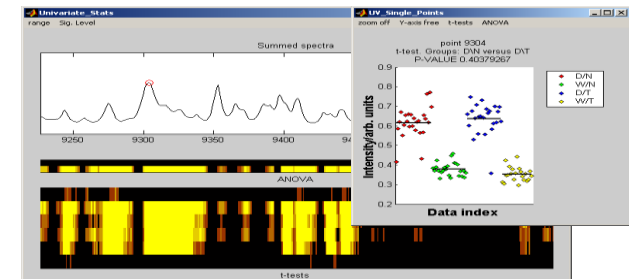
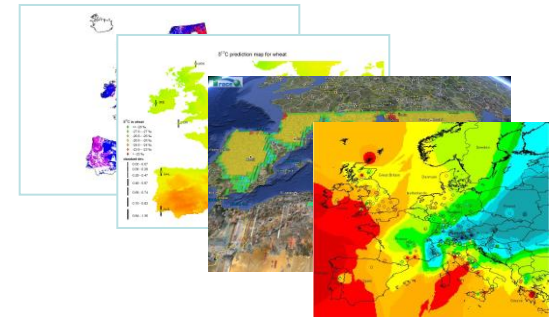


- Improved data interchange
- Good traceability practice
 - Generic and sector specific customisations (www.trace.eu.org/tracefoodwiki.php)
- Applications and demonstrations in industry sectors
- Interactive portal- Tracing your food www.trace.eu.org/tracingyourfood.php
- Consumer behaviour studies



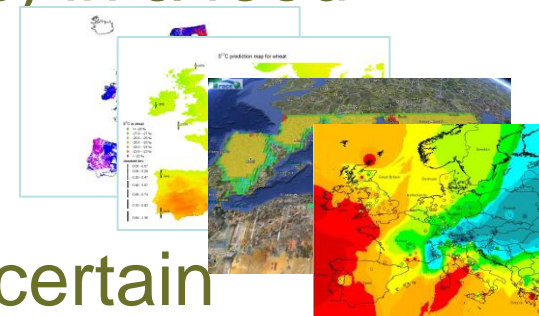
TRACE key outputs: verifying origin

- Determining geographical origin
 - providing objective evidence on geographical origin
- Food assurance systems
 - Characterising foods through spectroscopic fingerprinting
- Methods for species/variety id
 - Honey, cereal, meat
 - Generic methods for plant species
 - Molecular database of methods and sequences
<http://www.trace.eu.org/mbdb>



Production of predictive isoscapes

- Can components (stable isotopes) in a food and its environment be linked?
- If so can we predict the levels of certain components in a food of declared provenance ?
- Can the predicted levels (specifications) be used as an objective means of verifying geographical origin ?



Experimental Design

- 21 Model sampling sites
 - Climate
 - Geography
 - Geology
- ~12,000 groundwater, soil and food samples analysed
 - $\delta^2\text{H}$, $\delta^{18}\text{O}$, $\delta^{13}\text{C}$, $\delta^{15}\text{N}$, $\delta^{34}\text{S}$, $\delta^{87}\text{Sr}$ and trace elements
 - >~600,000 analytical data points to be produced
- Geochemical modelling to produce Specification Prediction Models

Demonstration Activities

- TRACE outputs tested in the following industry organisations:
 - Aqua insalus, (ES)
 - Famille Michaud Apiculture, (FMA)
 - Beijing Dafa Chia Tai Co
- Evaluation undertaken at the end of each study



Specifications for mineral water:

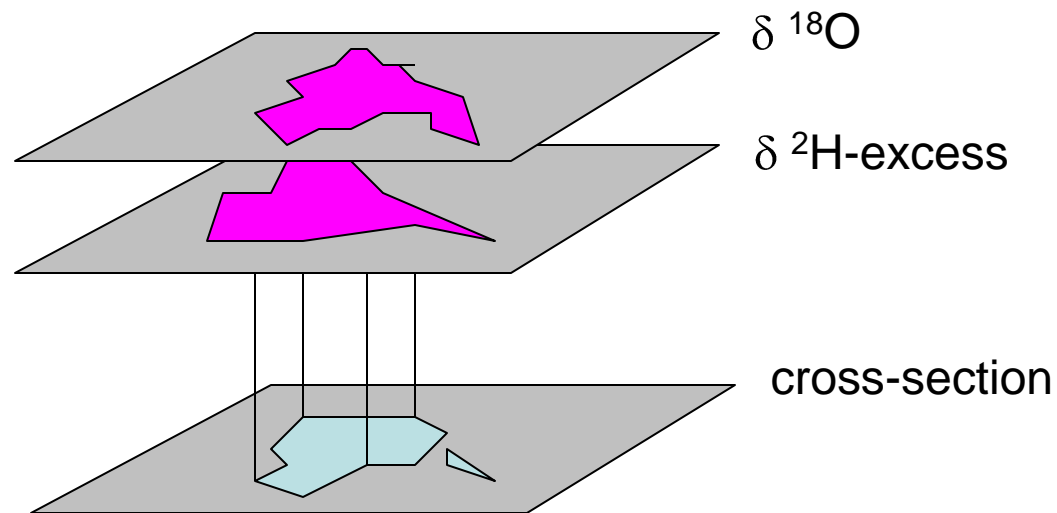
$\delta^{18}\text{O}$ & $\delta^2\text{H}$ -excess:



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$$S_{\min_{\text{wat}}}(\text{Insalus}) = -8.5 < \delta^{18}\text{O} < -5.3 \& -17.7 < \delta^2\text{H} - \text{excess} < -10.8$$

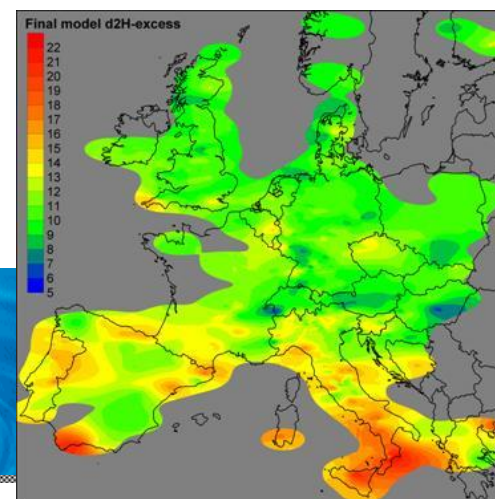
Combination of ranges applies to an area, which is the cross-section of BOTH specification areas:



Grishja van der Veer (Geochem) and
Susanne Voerkilius (Hydroisotop)

Specification for Insalus water

Parameter	Specification	Result	Compliance
CART	multivariate	?	Y/N
^{87}Sr	0.704-0.714	?	Y/N
$^{18}\text{O} \text{ ‰}$	-5.3--8.5	?	Y/N
^2H excess	10.7-17.5	?	Y/N



Produced by Grishja van de Veer (Geochem) & Susanne Voerkilius (Hydroisotop)

Demonstration of predictive isoscapes



Exploitation of TRACE (1)

- Tracecore XML to be adopted and integrated into industry standard by EPCIS
- Several examples of European industry investing in GTP to gain business advantage
- GTP principles being exported to and implemented in Asia

Exploitation of TRACE (2)

Industry implementation of isotopic methods for determining geographical origin

- Parmigiano Reggiano PDO cheese consortium (IT)
- Grana Padano PDO cheese consortium (IT)
- Granja Pocitana S.R.L. olive oil (AR)
- Bodega Augusto Pulenta winery (AR)
- Carton Group chicken producer (IE)
- EBLEX (and consortium) beef (UK)
- BPEX implementing isotopic techniques in the pork industry (UK)
- Australian pork industry

Summary

- TRACE has played the lead role in progressing the state of the art for tracing and assuring the provenance of food
- TRACE outputs are being implemented within the food industry to enhance consumer confidence and to assure added value to the food sector

Acknowledgements

- Adrian Charlton (Fera)
- Paul Reece (Fera)
- Hez Hird (Fera)
- Helen Grundy (Fera)
- Derek Tomlinson (Fera)
- Katerina Heinrich (Fera)
- Malcolm Baxter (Fera)

- Grishja van der veer (Geochem), Susanne Voerkilius (Hydroisotop) and many others....

Acknowledgements to the TRACE consortium....:

