Autenticidade de Queijos: Métodos instrumentais e sensoriais/Cheese Authenticity Assessment: Chemical, Instrumental and Sensory Techniques

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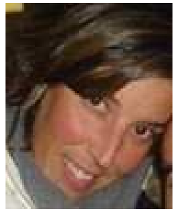
Pinheiro, C.*; Lamy, E.; Machado, G.



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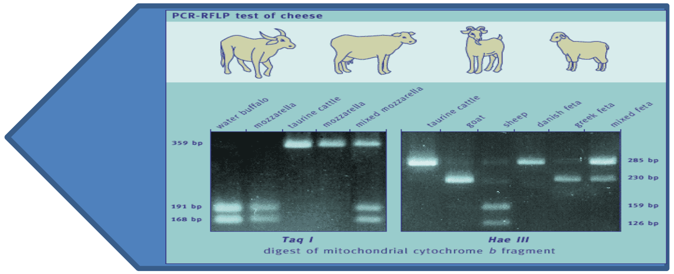
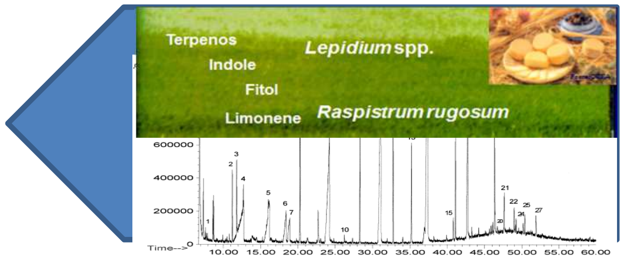
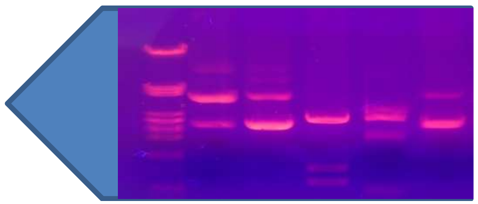






Autenticidade / Authenticity ????

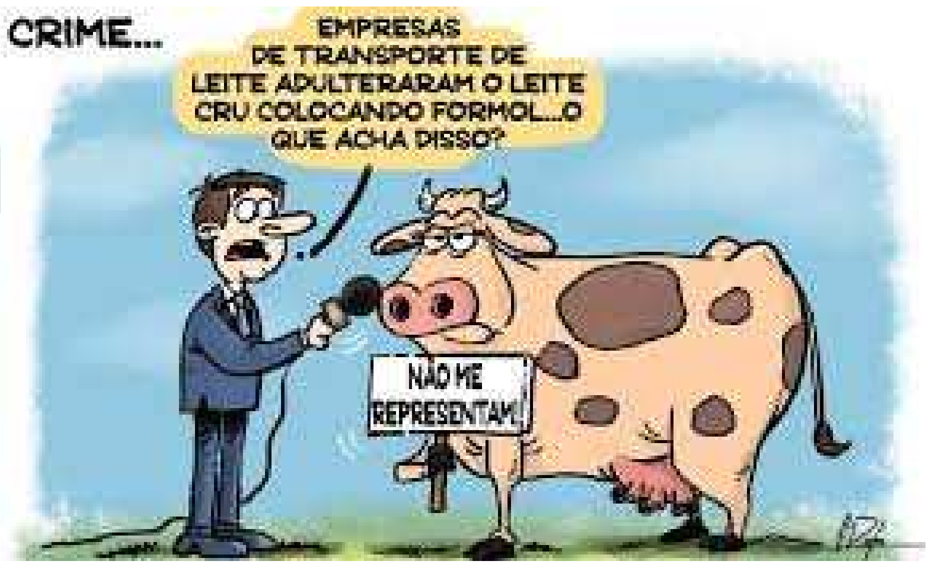
authenticity

Autenticidade / Adulteração

logo verdadeiro

logo falso

Autenticidade / Adulteração



Autenticidade / Adulteração…. Mistura

Autenticidade / Adulteração…. A Embalagem…liberdade comercial

Autenticidade / Adulteração

News

« Ocultar

Imitation Pasteurized Process Cheese Food
Ingredients: Water, modified food starch, soybean oil, maltodextrin, whey gelatin, salt, enzyme-modified cheese (cultured milk, water, salt, sodium phosphate, cream, sodium citrate, enzymes, sorbic acid, artificial color), sodium hexametaphosphate, guar gum, sorbic acid, artificial color, natural flavor.
Upton Sinclair nightmare of canned camembert! TALK ABOUT Imitation Cheese HERE! What's yours is Nachos. Where tubular toppings are disgust since 2009!

Discussions

Euphemisms for "Edible ersatz oil based ch...

I' m watching "The Finder" on Fox and Walter snaps a Polaroid of a storage place...

Dr. Disney Wizard 21 meses atrás 0 replies

Like cheese, not like cheeze.

Similar to the attraction of a wide variety of experiences, I savor a broad pala...

Dr. Disney Wizard 49 meses atrás 0 replies

Autenticidade / Adulteração…. Os nomes …

Munster-géromé

Other names	munster fermenté
Country of origin	France
Region, town	Munster
Region	Vosges, Haut-Rhin, Bas-Rhin
Source of milk	Cow
Pasteurised	No
Texture	Soft smear-ripened[1]
Fat content	45 %
Dimensions	diameter 7-19 cm, height 2-8 cm
Weight	150 to 1500 g (flat cylinder)
Aging time	5 weeks to 3 months
Certification	AOC 31 mai 1978 adapted in 1986

Muenster

Country of origin	United States
Source of milk	Cows
Texture	Soft
Fat content	8.5 g / oz (30%)
Protein content	6.6 g / oz (23%)

Autenticidade / Adulteração…. O nome … o País …

Emmentaler

Country of origin	Switzerland
Region, town	Berne, Emmental
Source of milk	Cows
Pasteurised	Traditionally, no
Texture	hard
Aging time	2-14 months depending on variety
Certification	No[clarification needed]

Emmentaler outside Switzerland
Several varieties of Emmentaler or Emmental have certification, these include:

Allgäuer Emmentaler, from Bavaria, Germany, has PDO status

Emmental de Savoie, from Savoie, France, has PGI status

Emmental français est-central from Franche-Comté, France, also has PGI status

Emmentaler Switzerland AOC has been registered since 2000 as an appellation d'origine contrôlée (AOC).[4]

Autenticidade / … o País …

F

CH

D

Fi

ROLEX

EMMENTALER SWITZERLAND
Das Schweizer Original

VICTORINOX

Autenticidade / Adulteração…. O nome … o País …

F

CH

D

Fi

Industrial vs tradicional

Autenticidade / Adulteração…. O leite… a BOA embalagem …

O que se entende por queijo ?

CODEX GENERAL STANDARD FOR CHEESE

CODEX STAN 283-1978

Formerly CODEX STAN A-6-1973. Adopted in 1973. Revision 1999, Amendments 2006, 2008, 2010, 2013.

2. DESCRIPTION

2.1 Cheese is the ripened or unripened soft, semi-hard, hard, or extra-hard product, which may be coated, and in which the whey protein/casein ratio does not exceed that of milk, obtained by:

(a) coagulating wholly or partly the protein of milk, skimmed milk, partly skimmed milk, cream, whey cream or buttermilk, or any combination of these materials, through the action of rennet or other suitable coagulating agents, and by partially draining the whey resulting from the coagulation, while respecting the principle that cheese-making results in a concentration of milk protein (in particular, the casein portion), and that consequently, the protein content of the cheese will be distinctly higher than the protein level of the blend of the above milk materials from which the cheese was made; and/or

(b) processing techniques involving coagulation of the protein of milk and/or products obtained from milk which give an end-product with similar physical, chemical and organoleptic characteristics as the product defined under (a).

2.1.1 Ripened cheese is cheese which is not ready for consumption shortly after manufacture but which must be held for such time, at such temperature, and under such other conditions as will result in the necessary biochemical and physical changes characterizing the cheese in question.

2.1.2 Mould ripened cheese is a ripened cheese in which the ripening has been accomplished primarily by the development of characteristic mould growth throughout the interior and/or on the surface of the cheese.

2.1.3 Unripened cheese including fresh cheese is cheese which is ready for consumption shortly after manufacture.

O que se entende por queijo ?

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Raw materials

Milk and/or products obtained from milk.

3.2 Permitted ingredients

- Starter cultures of harmless lactic acid and/or flavour producing bacteria and cultures of other harmless microorganisms
- Safe and suitable enzymes
- Sodium chloride
- Potable water

4. FOOD ADDITIVES

Only those food additives listed below may be used and only within the limits specified.

Unripened cheeses

As listed in the *Standard for Unripened Cheese Including Fresh Cheese* (CODEX STAN 221-2001).

Cheeses in brine

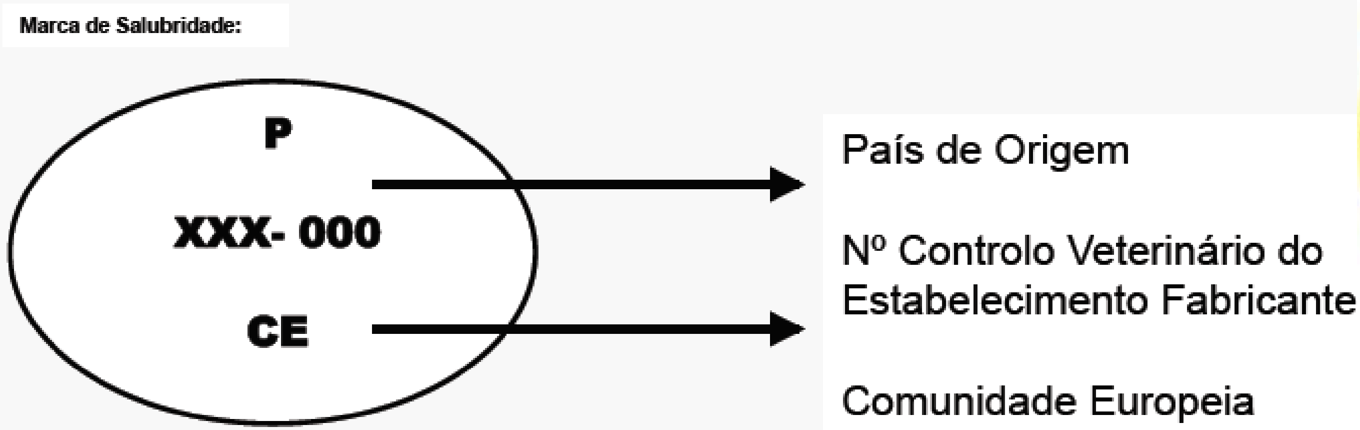
As listed in the *Standard for Cheeses in Brine* (CODEX STAN 208-1999).

Ripened cheeses, including mould ripened cheeses

Additives not listed below but provided for in Codex individual standards for varieties of ripened cheeses may also be used for similar types of cheese within the limits specified within those standards.

Autenticidade / A Marca …. O Rótulo …

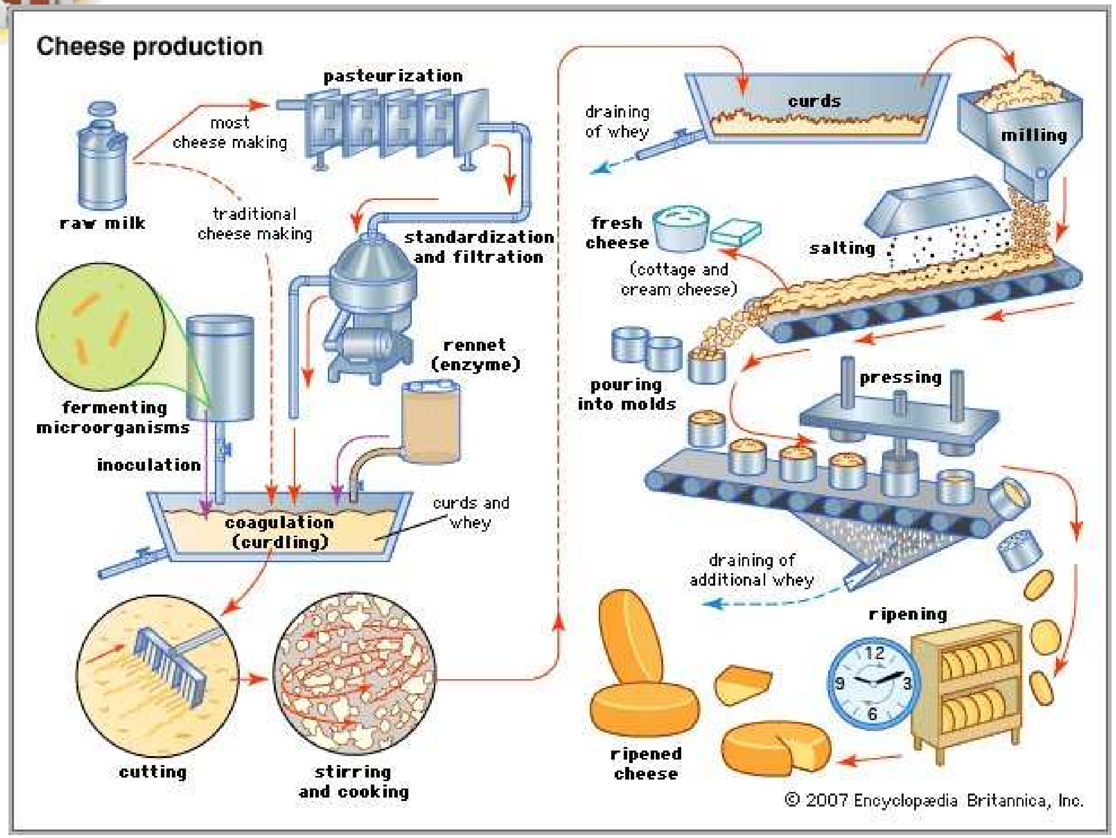
Autenticidade / A Marca …. O Rótulo …



Regulamento (UE) nº 1169/2011, de 25 de outubro.

Portanto .... Autenticidade do queijo reveste-se de uma importância vital, a todos os níveis do processo de produção, desde a matéria-prima até ao produto acabado...

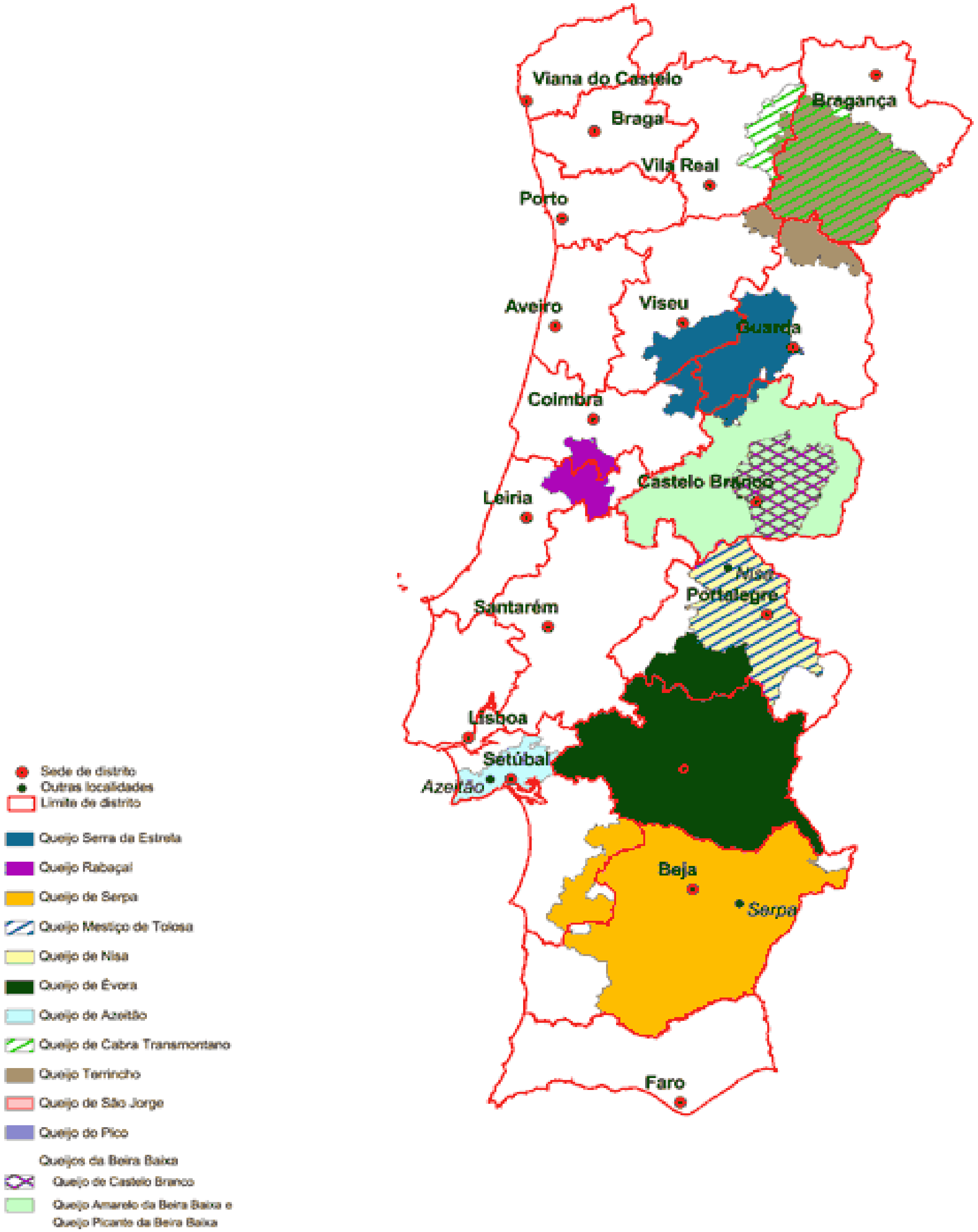
PRODUTOR



consumidor

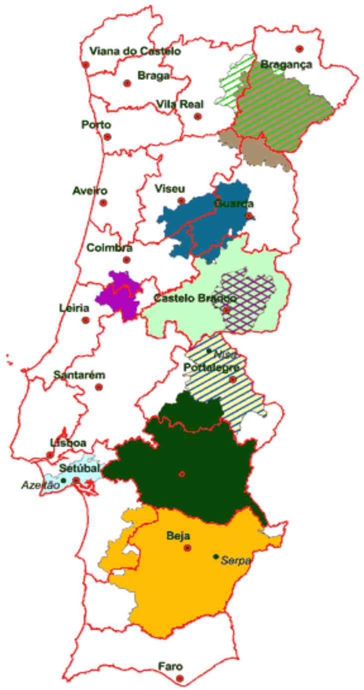
Autenticidade .... DOP--- IGP ...

- Queijo de Cabra Transmontano
- Queijo Terrincho
- Queijo Serra da Estrela
- Queijo Castelo Branco
- Queijo Amarelo da Beira Baixa
- Queijo Picante da Beira Baixa
- Queijo Rabaçal
- Queijo Nisa
- Queijo Mestiço Tolosa
- Queijo de Évora
- Queijo Serpa
- Queijo de Azeitão
- Queijo de São Jorge
- Queijo do Pico



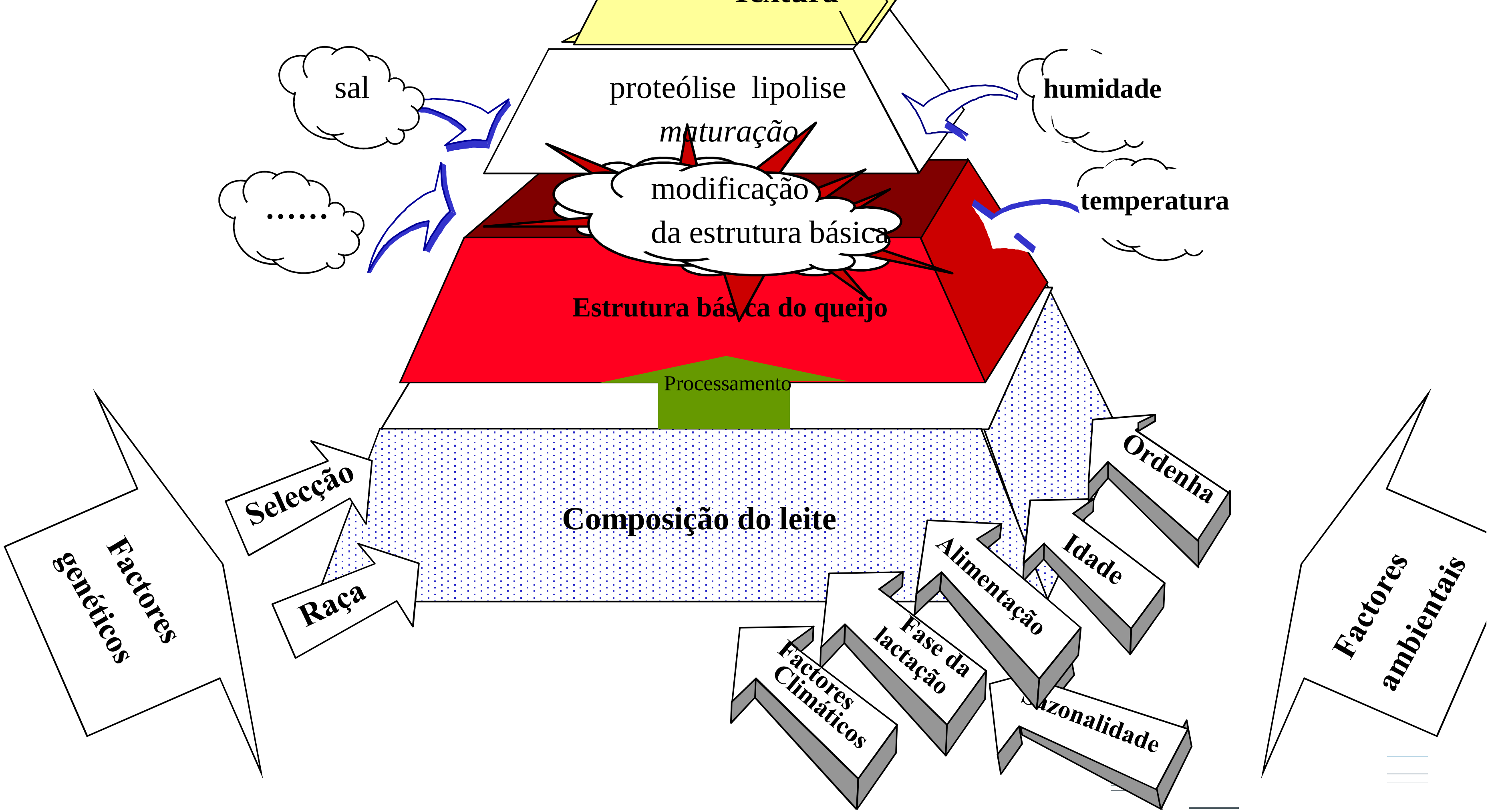
Autenticidade .... DOP--- IGP ...

- Queijo de Cabra Transmontano (do **leite de cabra)**
- Queijo Terrincho **leite cru de ovelha da Raça Churra da Terra Quente (Terrinchas),**
- Queijo Serra da Estrela (**ovelhas da raça Bordaleira Serra da Estrela e/ou Churra Mondegueira**.
- Queijo Castelo Branco **leite cru de ovelha, estreme**
- Queijo Amarelo da Beira Baixa do **leite cru de ovelha, estreme, ou mistura de ovelha e cabra**
- Queijo Picante da Beira Baixa **leite cru de ovelha ou de cabra, estreme ou em mistura**
- Queijo Rabaçal **leites de ovelha e cabra**
- Queijo Nisa **leite cru de ovelha,**
- Queijo Mestiço Tolosa **leites de ovelha e cabra**
- Queijo de Évora **leite cru de ovelha**
- Queijo Serpa **leite cru de ovelha**
- Queijo de Azeitão **leite de ovelha cru**
- Queijo de São Jorge **leite de vaca inteiro**
- Queijo do Pico **leite crú de vaca**

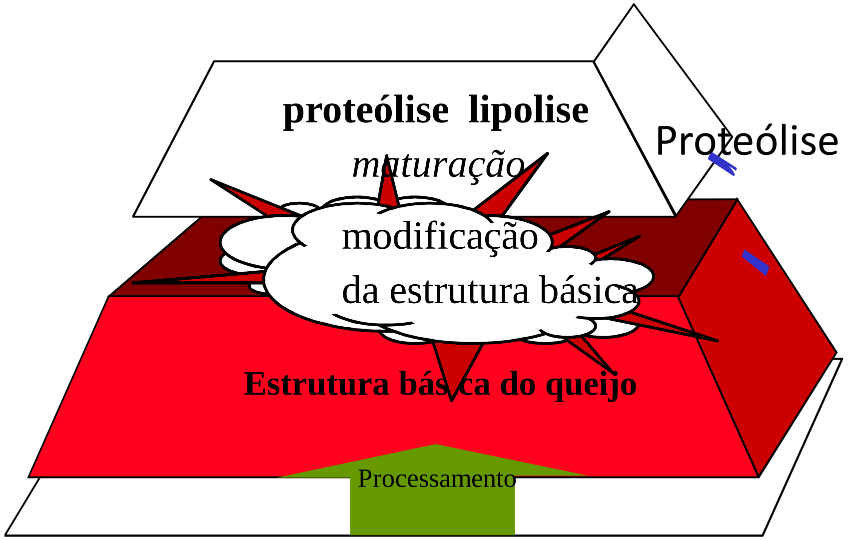


Factores que afectam as características do queijo

O queijo



Métodos para avaliação da Proteólise e Lípolise no Queijo



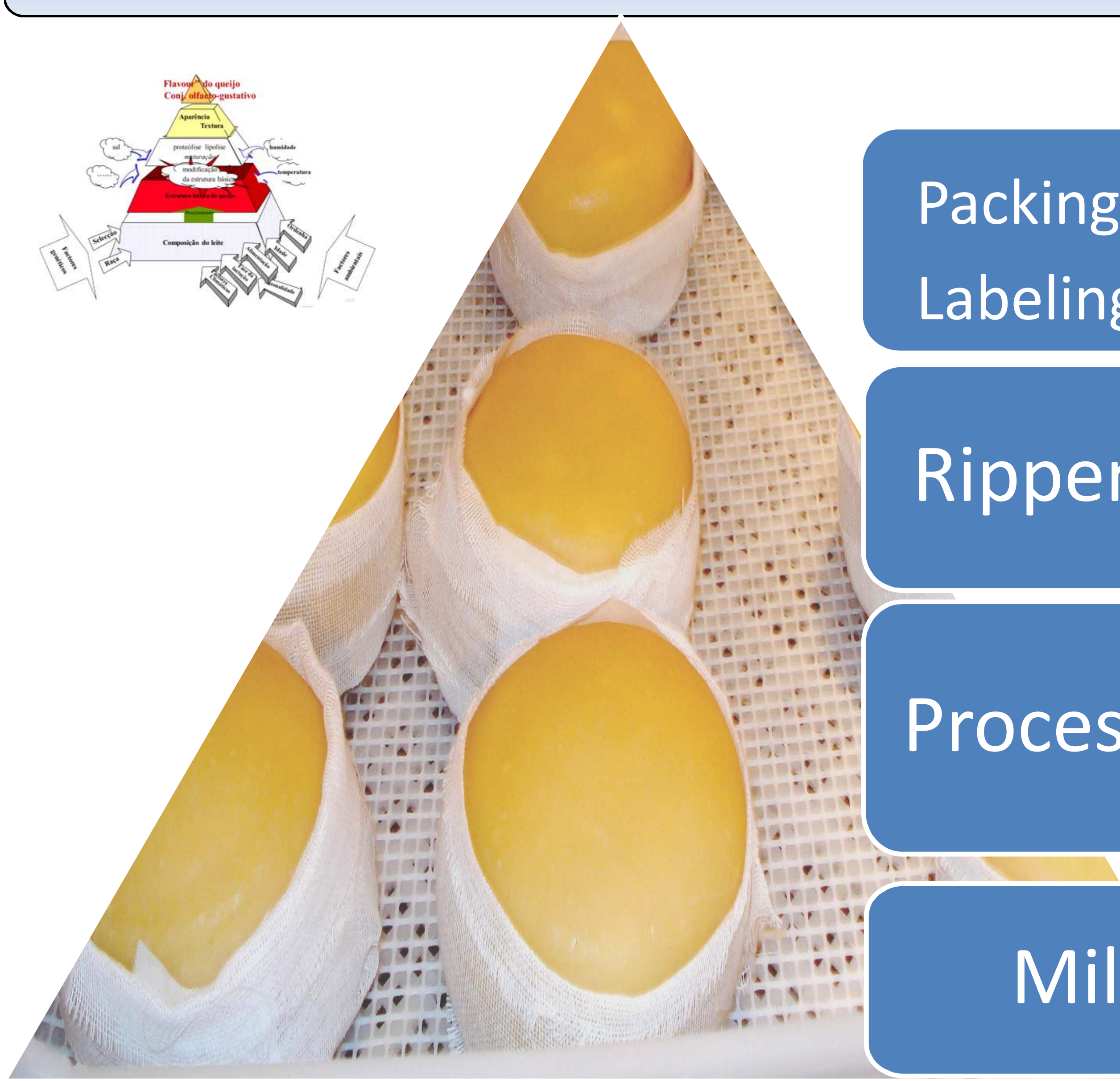
Proteólise

- solubilidade dos peptídeos e aminoácidos em vários solventes ou agentes precipitantes;
- Métodos cromatográfícas- HPLC; RP-HPLC
- Métodos electroforéticos- SDS-PAGE; ureia-PAGE
- electroforese bidimensional
- electroforese capilar
- Focagem isoeléctrica

Lipolise

- Valor de peróxido (POV)
- Ácido tiobarbitúrico (TBA)-
- Quantificação de ácidos gordos livres (1. índice de Ácido; 2. Valor total de ácidos gordos livres(CG...)

Problemas de Autenticidade no Queijo/ Cheese Authenticy



Packing/ Labeling

- Labeling
- material
- Industrial vs . Traditional
- Thickener
- ....

Rippening

- Days
- Preserving agent (antifungal, color..
- Agglutinant
- Thickener
- ....

Processing

- Raw material... Milk
- Milk treatment
- Industrial vs. Traditional
- (Rennet
- Additives
- Fat source
- .....

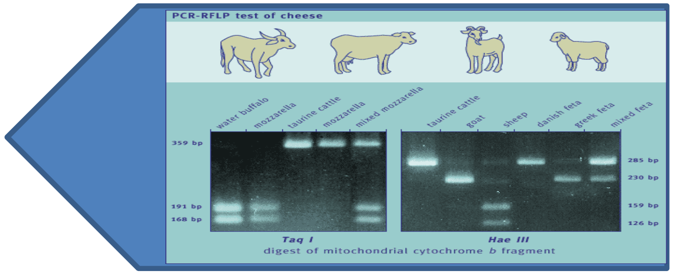
Milk

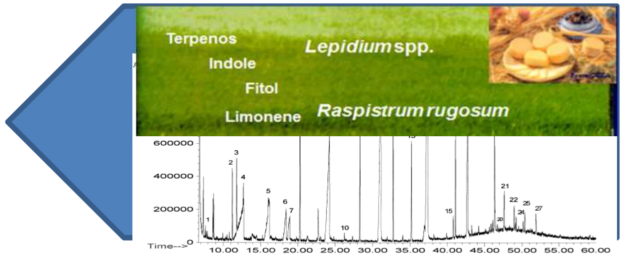
- Origem
- animal specie
- Breed
- Animal feeding
- ....

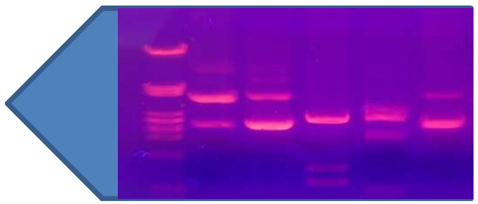
Autenticidade de Queijos: Métodos instrumentais e sensoriais

Methods for Food Authentication
and Adulteration (Romdhane Karoui ,2012)

- ❑ DNA-Based Methods
- ❑ Chromatographic Techniques
    - Electrophoresis
- ❑ Spectroscopic Techniques
    - Isotope analysis
    - Electronic nose
- ❑ Enzymes in Food Authentication
- ❑ Differential Scanning Calorimetry







Autenticidade de Queijos: Métodos instrumentais e sensoriais/Cheese Authenticity Assessment: Chemical, Instrumental and Sensory Techniques

ICAAM – Instituto de Ciências Agrárias e Ambientais Mediterrânicas
Knowledge connecting land, food and people

Instrumentais

- **DNA-Based Methods**
  - PCR
  - **Chromatographic Techniques**
  - GC ; HPLC ; RP-HPLC; HPLC-MS
  - Electrophoresis
- **Spectroscopic Techniques**
  - UV-Vis; Fluorescence; Infrared, NIR,
  - MIR, NMR, Isotope analysis
  - Electronic Nose
- **Enzymes in Food Authentication**
  - lipase, protease, polyphenol oxidase,
  - alkaline
  - phosphatase and peroxidase
- **Differential Scanning Calorimetry (DSC)**
- **Immunological techniques**

Sensoriais

☆ Provas Analíticas ⇨ indicam diferenças entre produtos ou descrevem uma ou várias características

Discriminatórias	Comparação par Triangular Duo-Trio	não permitem quantificar a intensidade das diferenças
Descritivas	Ordenação Escalares Perfis	permitem caracterizar e/ou comparar amostras em relação a uma ou mais características sensoriais e quantificá-las

☆ Provas Afectivas ou Hedónicas ⇨ indicam a preferência/agrado sobre determinado produto

Problemas de Autenticidade no Queijo/ Cheese Authenticy

Joshi *et al.*, IJPSR, 2012; Vol. 3(11): 4184-4191 ISSN: 0975-8232

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HYPHENATED TECHNIQUE- A BOON TO ANALYTICAL WORLD

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ABSTRACT

Keywords:
Chromatography,
spectroscopy
GC-MS,
LC-MS,
LC-FTIR,
LC-NMR,
CE-MS

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QUICK RESPONSE CODE

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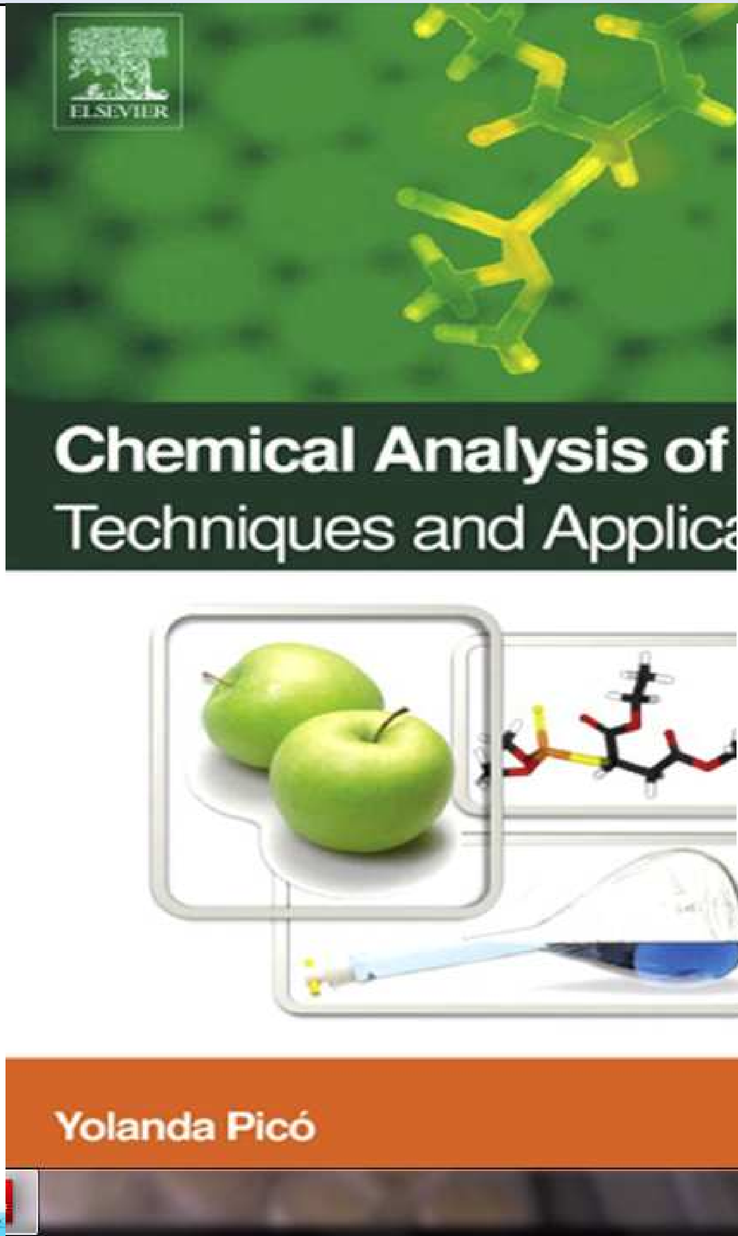
ICV (2011)- 5.07

Website:
www.ijpsr.com

Traditional analytical approaches including HPLC (High-Performance Liquid Chromatograph), GC (Gas Chromatograph), UV (Ultraviolet) detection, etc., have become insufficient to effectively handle the growing number of challenges in analyses of species- specificity and sensitivity. Modern analytical technique referred to as hyphenated techniques, originate from the traditional use of molecule or element specific detection in electrophoresis or chromatography. Currently the most common techniques for trace element speciation include a combination of separation technique coupled with a detection technique that is more sensitive. Earlier such hyphenated techniques were the coupling of separation of a special sample preparation off-line and later adding a detection technique. Presently, the hyphenated technique is developed from the coupling of a separation technique (Chromatography) and an on-line spectroscopic detection technology. Hyphenated techniques combine chromatographic and spectral methods to exploit the advantages of both. Chromatography produces pure or nearly pure fractions of chemical components in a mixture. Spectroscopy produces selective information for identification using standards or library spectra. These hyphenated techniques offer shorter analysis time, higher degree of automation, higher sample throughput, better reproducibility, reduction of contamination because it is a closed system, Enhanced combined selectivity and therefore higher degree of information. The remarkable improvements in hyphenated analytical methods over the last two decades have significantly broadened their applications in the analysis of biomaterials, especially natural products. In this article, recent advances in the applications of various hyphenated techniques, e.g., GC-MS, LC-MS, LC-FTIR, LC-NMR, CE-MS, etc. in the context of pre-isolation analyses of crude extracts or fraction from various natural sources, isolation and on-line

Problemas de Autenticidade no Queijo/ Cheese Authenticy



CHAPTER

15

Food Authenticity and Fraud

Romdhane Karoui

Université d'Artois, Faculté des Sciences Jean Perrin, Rue Jean Souvraz, Lens Cedex, France

OUTLINE

15.1. INTRODUCTION

Product authenticity and adulteration are issues assuming increasing importance within the food industry (Downey and Beauchêne, 1997). They are a major concern not only to consumers, but also to producers and distributors (Fernandez et al., 2003). Indeed, regulatory authorities, food processors, retailers, and consumer groups have interests in ensuring that foods are correctly labeled. Many products may be deliberately mislabeled, especially those that are expensive and/or subject to natural fluctuations. With the harmonization of the European agricultural policy and the emergence of international markets, approaches to authenticating food products have received much attention. This trend is the result of efforts by regional authorities and producers to protect and support local productions. Although grains, bread, milk, and spices have been adulterated since antiquity, fraudulent practices have been extended to other luxurious food commodities such as coffee, tea, and sugar. For example, coffee has been adulterated with chicory, roasted wheat, or burned sugar.

The increasing globalization of the food industry in recent times and the consequent separation of producers and consumers have increased the risk of adulteration. Adulteration is defined as the process by which the quality of the product is reduced through the addition of a base substance or removal of a vital

Chemical Analysis of Food: Techniques and Applications
DOI: 10.1016/B978-0-12-384862-8.00015-7

CHAPTER

14

Traceability

arjolein van der Spiegel, Theo Prins, Vicky Manti,
oot, Monique Bremer, Leo van Raamsdonk,
Ine van der Fels, Saskia van Ruth

stitute of Food Safety, Wageningen University and Research Centre, Wageningen, The Netherlands

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Problemas de Autenticidade no Queijo/ Cheese Authenticy

ELSEVIER

Trends in Food Science & Technology 17 (2006) 344–353

TRENDS IN FOOD SCIENCE & TECHNOLOGY

ELSEVIER

Trends in Food Science & Technology 21 (2010) 582–590

TRENDS IN FOOD SCIENCE & TECHNOLOGY

Review

Recent technologi advances for t determination of fo authentic

Linda M. Reid
Colm P. O'Donr
and Gerard Dowi

[a]Teagasc, Ashtown Food Research Centre, Dub Ireland (Tel.: +353 1 8059500; fax: + 8059550; e-mail: Linda.Reid@teag

[b]Department of Biosystems Engineering, Uni College Dublin, Earlsfort Terrace, Dublin 2, I

The relative potential of various technologie confirmation of food authenticity and quality are Techniques that have found new applications in t

Food forensics: methods for determining the authenticity of foodstuffs

S. Primrose[b], M. Woolfe[c] and S. Rollinson[a,*]

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the description and/or labelling of food must be honest and accurate, especially where the food has been processed and the ability to distinguish one ingredient from another is lost. In the European Union the information that must be given is enshrined in law, and so the food supplied must be exactly what the label or description says it is. That is, the food must be 'authentic' and not misdescribed.

Food labelling legislation

Authenticity research funded by the Food Standards Agency (FSA) is driven by the need to verify compliance with food standards and labelling legislation and to detect food fraud. Method development has therefore been designed to verify legal requirements relating to the name given to foods, the name and quantitative declaration of ingredients, declarations of food processing or treatments, and claims of production and geographic origin. There are several ways in which food can be misdescribed, some examples of which are listed in Table 1.

Problemas de Autenticidade no Queijo/ Cheese Authenticy

ELSEVIER

Available online at www.sciencedirect.com
ScienceDirect

Food Chemistry 102 (2007) 621–640

Food Chemistry

www.elsevier.com/locate/foodchem

A review of the analytical methods coupled with chemometric tools for the determination of the quality and identity of dairy products

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Abstract

There is an increasing demand of the consumers and actors of the food industry sector to have means of measurement allowing the characterisation of raw materials or food. Dairy products (milk, ice cream, yogurt, butter, cheese, etc.) are in considerable demand, command premium prices and are, therefore, vulnerable to economic adulteration. Authenticity of these products is an important issue for food processors, retailers, regulatory authorities and consumers. It is also valuable for ensuring fair competition and as a mean of protecting consumers against fraud due to mislabelling. Conventional chemical methods are not able to determine the regional provenance of dairy products unambiguously. Therefore, alternative techniques such as spectroscopic techniques i.e., near infrared (NIR), mid infrared (MIR), front face fluorescence spectroscopy (FFFS), stable isotope and nuclear magnetic resonance (NMR)-coupled with chemometric tools have many potential advantages as tools for the evaluation of the identity of such products. This review article discusses the potential of destructive and non-destructive techniques for the determination of the quality and the authenticity of dairy products.

Keywords: Dairy products; Identity; Quality; Spectroscopic techniques; Chemometrics

Problemas de Autenticidade no Queijo/ Cheese Authenticy

Food Control 22 (2011) 690–696

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Analytical Metho

Simultaneou
by Real-Tim

Alessandra Dalı

Department of Animal Pat

ARTICLE IN

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Keywords:
Species identification
Real-Time PCR Allelic Di
Mozzarella cheese

Simplex and duplex PCR assays for species specific identification of cattle and buffalo milk and cheese

Sachinandan De[a], Biswajit Brahma[b,*], Shamik Polley[a], Ayan Mukherjee[a], Deepak Bane
Moloya Gohaina[a], Karan Pratap Singh[a], Rameswar Singh[c], Tirtha Kumar Datta[a],
Surender Lal Goswami[a]

[a] Animal Biotechnology Centre, National Dairy Research Institute, Karnal, Haryana 132001, India
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PCR

ARTICLE INFO

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Keywords:
Polymerase chain reaction
Cattle
Buffalo
Milk
Cheese

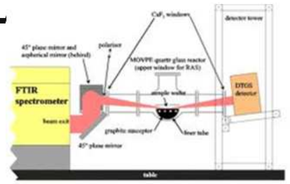
ABSTRACT

A polymerase chain reaction, amplifying a fragment of the mitochondrial DNA D loop region was developed for species specific detection of cattle and buffalo milk. The method was simultaneously extended for detection of HTST pasteurized milk samples and cheeses of bovine and buffalo origin. A common forward primer was used with two different species specific reverse primers that resulted amplification of a 126 bp and 226 bp products for cattle and buffalo, respectively, in simplex as well as in multiplex polymerase chain reaction. The primers successfully amplified DNA extracted by conventional protocol from minimal amount of raw milk, heat treated milk and cheese of either bovine or buffalo origin. The primers showed a high degree of specificity. The sensitivity of the assay was excellent with detection level of 0.1 percent adulteration of cow and buffalo milk or cheese (0.15 ng buffalo and 0.04 ng cattle DNA). The assay represents a sensitive and simple method for identification of adulteration in milk and cheese.

Click to provide additional information.

Problemas de Autenticidade no Queijo/ Cheese Authenticy

Food Bioprocess Technol (2008) 1:117–129
DOI 10.1007/s11947-007-0033-y



Application of Near and Mid-Infrared Spectroscopy to Determine Cheese Quality and Authenticity

Tony Woodcock · Colette C. Fagan ·
Colm P. O'Donnell · Gerard Downey

NIR
MIR

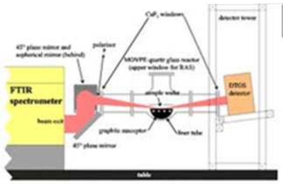
Received: 27 July 2007 / Accepted: 22 October 2007 / Published online: 17 November 2007

Abstract This paper reviews the current state of development of both near-infrared (NIR) and mid-infrared (MIR) spectroscopic techniques for process monitoring, quality control, and authenticity determination in cheese processing. Infrared spectroscopy has been identified as an ideal process analytical technology tool, and recent publications have demonstrated the potential of both NIR and MIR spectroscopy, coupled with chemometric techniques, for monitoring coagulation, syneresis, and ripening as well as determination of authenticity, composition, sensory, and rheological parameters. Recent research is reviewed and compared on the basis of experimental design, spectroscopic and chemometric methods employed to assess the potential of infrared

Introduction

In common with the processed food industry at large, the dairy industry has come under increasing pressure to deliver products of high and constant quality into the market place (Downey et al. 2005). Globally, cheese represents about 30% of total dairy product sales with a forecast of 9.8% sales growth between 2003 and 2007 (Farkye 2004). It is important to determine cheese quality in a rapid and cost-effective manner.

The chemical characteristics of cheeses have been traditionally undertaken by different physico-chemical methods to determine pH, fat content, nitrogen fractions,



ENGINEERING/PROCESSING

Sampling Technique for Cheese Analysis by FTIR Spectroscopy

MANXIANG CHEN and JOSEPH IRUDAYARAJ

FTIR

ABSTRACT

A microtome sampling technique was used prior to cheese analysis with FTIR spectroscopy. Well separated fat- and protein-related bands were obtained in the spectra of Cheddar and Mozzarella cheese samples. The absorbancy intensity of fat- and protein-related bands increased with an increase in fat and protein contents. This technique could be used to study the chemical groups and to rapidly determine fat and protein in cheese samples.

Key words: FTIR spectroscopy, cheese, sampling method, microtome

INTRODUCTION

FOURIER TRANSFORM INFRARED (FTIR) SPECTROSCOPY IS WIDELY used in analytical and research studies (Belton et al., 1987). Most analytical procedures for measuring moisture, fat and protein in cheese are time-consuming and destructive to the sample (Pierce and Wehling, 1994). Rapid techniques for fat, protein, and total solids determinations in milk by IR absorption spectroscopy have been widely adopted in the dairy industry (McGann, 1978). Infrared milk analysis is an approved standard AOAC method (Biggs, 1972).

However, infrared absorption spectroscopy is only suitable for

Sample preparation

Cheese samples for FTIR analysis were prepared using the following procedure: Small pieces of sample (15 mm ht and 15 mm dia) were cut from the center of a cheese block and frozen at -80°C for ≥ 2h. Each frozen sample was then sliced to a thickness of 4, 8 or 16µm using a microtome (IM236, International Equipment Co., Needham Heights, MA) and attached to the surface of a silver chloride crystal and placed in the light path of the FTIR spectrometer light beam.

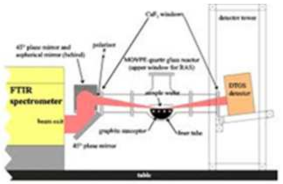
FTIR analysis

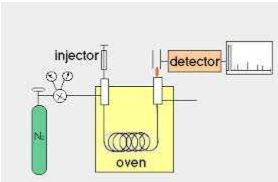
Spectra of the sliced frozen film were collected by a spectrometer (Polaris™ FTIR, Mattson Instruments, INC., Madison, WI) equipped with a triglycine sulfate (TGS) detector. The collected spectroscopic data were processed usinga Polaris Icon software and Bio-Rad Win-IR software. Spectra of samples in the region between 4000 cm^{-1} and 400 cm^{-1} were obtained with a resolution of 1, 4, or 8 cm^{-1} using 16, 32 or 64 scans/sample, at 1, 5, 10, and 15 min after they had been placed in the light path.

Proximate analysis

Percentages of fat, protein, and moisture were determined using standard methods (Marshall, 1993). Fat content was determined us-

Problemas de Autenticidade no Queijo/ Cheese Authenticy





NIR
GC

LWT - Food Science and Technology xxx (2013) 1–8

Contents lists available at ScienceDirect

LWT - Food Science and Technology

journal homepage: www.elsevier.com/locate/lwt

ELSEVIER

Potential of near infrared spectroscopy for the analysis of volatile components in cheeses

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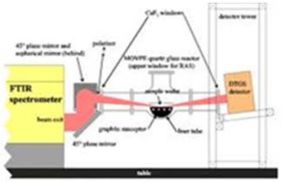
NIRS
Volatile compounds
Cheeses
Determination

A B S T R A C T

Near Infrared Spectroscopy (NIRS) was used for the determination of volatile compounds in cheeses allowed to ripen for different times using a remote fibre-optic reflectance probe. To do so, cheeses with known and varying percentages of cow's, ewe's, and goat's milk were elaborated and used as reference material. The volatile compounds determined were: acetaldehyde, ethanol, 1-propanol, 2-butanol, 2-pentanol, 3-methyl-1-butanol, 2-butanone, 2-pentanone, 2-heptanone and 2-nonanone. The regression method employed was the modified partial least squares (MPLS). The calibration results using 67–72 samples of cheese had a correlation coefficients (RSQ) between 0.600 for the 3-methyl-1-butanol and 0.903 for the 2-nonanone. The robustness of the method was confirmed by applying it to twenty new samples of different compositions and ripening times which did not belong to the calibration group. Likewise, the correlations between the factors of influence studied and the volatile compounds were carried out. The results of the NIRS method are comparable with those of the purge-and-trap-gas chromatography-mass spectrometry.



FT-NIR
FT-MIR

Food Research International 52 (2013) 214–220

Contents lists available at SciVerse ScienceDirect

Food Research International

journal homepage: www.elsevier.com/locate/foodres

ELSEVIER

FT-NIR and FT-MIR spectroscopy to discriminate competitors, non compliance and compliance grated Parmigiano Reggiano cheese

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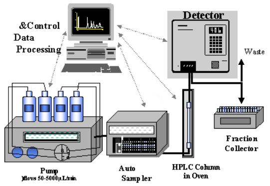
Keywords:
Infrared spectroscopy
Parmigiano-Reggiano
Neural networks
SIMCA

ABSTRACT

In this investigation the potential of infrared spectroscopy, coupled to different statistical methods, were used to estimate the authenticity of grated Protected Denomination of Origin (PDO) Parmigiano Reggiano cheese (P-R). The feasibility of the analytical approach in the prediction of cheese authenticity without the use of wet chemistry was evaluated. A total of 400 plastic-sealed grated cheese samples classified as: compliance P-R, competitors, non-compliance P-R (defected P-R), and P-R with rind content of >18%. PCA was conducted for an explorative spectra analysis. Soft independent modelling of class analogy (SIMCA) analysis and artificial neural networks (ANNs) were used to classify samples, according to different cheese categories. For both the spectroscopic techniques, PCA correctly discriminated compliance P-R from competitors, but not the P-R as a function of the rind percentage and months of ripening. SIMCA analysis accurately classified the compliance and competitors' P-R samples, while samples belonging to the classes of defected P-R and P-R with rind content > 18% were not accurately classified. ANN was more efficient than SIMCA in the classification of all the cheese classes. The results showed that NIR and MIR combined with different statistical approaches can be suitable for a sensitive, non-destructive, rapid and inexpensive screening of grated P-R cheese authenticity.



RP-HPLC
Urea-P

Food Chemistry 136 (2013) 1526–1532

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Food Chemistry

journal homepage: www.elsevier.com/locate/foodchem

Principal component analysis of proteolytic profiles as markers of authenticity of PDO cheeses

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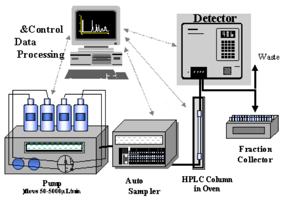
PCA
PDO cheeses
RP-HPLC
Urea-PAGE
Authenticity

ABSTRACT

The casein fraction of 13 Portuguese PDO cheeses were analysed using Urea-PAGE and reverse phase-high performance liquid chromatography (RP-HPLC) and then subjected to chemometric evaluation. The chemometric techniques of cluster analysis (CA) and principal component analysis (PCA) were used for the classification studies. Peptide mapping using Urea-PAGE followed by CA revealed two major clusters according to the similarity of the proteolytic profile of the cheeses. PCA results were in accordance with the grouping performed using CA.

CA of RP-HPLC results of the matured cheeses revealed the presence of one major cluster comprising samples manufactured with only ovine milk or milk admixtures. When the results of CA technique were compared with the two PCA approaches performed, it was found that the grouping of the samples was similar.

Both approaches, revealed the potential of proteolytic profiles (which is an essential aspect of cheese maturation) as markers of authenticity of PDO cheeses in terms of ripening time and milk admixtures not mentioned on the label.



RP-HPLC
Urea-P

Available online at www.sciencedirect.com
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ELSEVIER
Food Chemistry 87 (2004) 289–295
Food Chemistry
www.elsevier.com/locate/foodchem

Analytical, Nutritional and Clinical Methods

Evaluation of cheese authenticity and proteolysis by HPLC and urea–polyacrylamide gel electrophoresis

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Abstract

Chromatographic and electrophoretic methods have been established as useful tools in characterising cheese ripening and in the detection of milk adulteration. The purpose of this work was to evaluate casein proteolysis of cheeses made from bovine, ovine or mixtures of bovine and ovine milks, as well as ovine cheese authenticity, for 30 days of ripening by HPLC and urea–polyacrylamide gel electrophoresis.

Complementary information was obtained by both techniques when applied to the study of casein proteolysis during 30 days of ripening of ovine milk cheeses, ovine milk cheeses with 10% and 20% of bovine milk and bovine milk cheeses, manufactured according to the traditional Terrincho technology. For ovine cheeses, α-casein was the fraction that showed the higher degradation during cheese ripening. A similar behaviour was observed for ovine milk cheese with 10% of bovine milk. The profile for ovine milk cheese with 20% of bovine milk was more similar to that obtained for bovine cheese. Concerning bovine milk cheeses, electro-

Problemas de Autenticidade no Queijo/ Cheese Authenticy

U.PORTO
FACULDADE DE FARMÁCIA
UNIVERSIDADE DO PORTO

Mestrado em Controlo de Qualidade

CONTRIBUTO PARA A CARACTERIZAÇÃO DO QUEIJO TERRINCHO: ESTUDO DA PROTEÓLISE E AVALIAÇÃO DA AUTENTICIDADE POR HPLC/UV

CARLA BEATRIZ RODRIGUES VEIROS

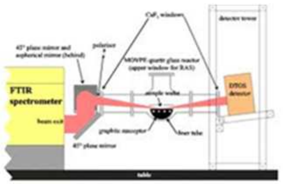
origem do leite na proteólise do queijo Queijo DOP *Terrincho*

Utilizando
leite cru de vaca
e misturas de leite de vaca cru e de leite de ovelha.

- HPLC / UV NA ANÁLISE DAS CASEÍNAS
- ANÁLISE DAS CASEÍNAS POR UREIA-PAGE
- RP-HPLC (CROMATOGRAFIA LÍQUIDA DE ALTA PERFORMANCE EM FASE REVERSA PARA SEPARAÇÃO DAS CASEÍNAS)

A análise discriminante aplicada aos dados de RP-HPLC indicou que as diferenças nas fracções de caseína do queijo *Terrincho* e queijos de mistura se deviam, sobretudo, ao conteúdo em p-caseína. A função assim obtida permitiu classificar correctamente todas as amostras, de acordo com o tipo de queijo.

Problemas de Autenticidade no Queijo/ Cheese Authenticy



HRM

Food Chemistry 141 (2013) 835–840

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Food Chemistry

journal homepage: www.elsevier.com/locate/foodchem

Analytical Methods

A novel closed-tube method based on high resolution melting (HRM) analysis for authenticity testing and quantitative detection in Greek PDO Feta cheese

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Keywords:
HRM analysis
PDO Feta cheese
Mitochondrial region
Authentication test
Quantitative detection

A B S T R A C T

Animal species identification of milk and dairy products has received increasing attention concerning food composition, traceability, allergic pathologies and accurate consumer information. Here we sought to develop an easy to use and robust method for species identification in cheese with emphasis on an authenticity control of PDO Feta cheese products. We used specific mitochondrial DNA regions coupled with high resolution melting (HRM) a closed-tube method allowing us to detect bovine, ovine and caprine species and authenticate Greek PDO Feta cheese. The primers successfully amplified DNA isolated from milk and cheese and showed a high degree of specificity. HRM was proven capable of accurately identifying the presence of bovine milk (not allowed in Feta) down to 0.1% and also of quantifying the ratio of sheep to goat milk mixture in different Feta cheese commercial products. In conclusion, HRM analysis can be a faster, with higher resolution and a more cost effective alternative method to authenticate milk and dairy products including PDO Feta cheese and to quantitatively detect its sheep milk adulterations.

Problemas de Autenticidade no Queijo/ Cheese Authenticy

Isotope analyses

Analytica Chimica Acta 711 (2012) 54–59

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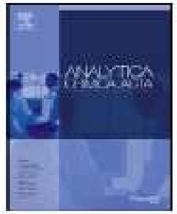
Analytica Chimica Acta

journal homepage: www.elsevier.com/locate/aca



H, C, N and S stable isotopes and mineral profiles to objectively guarantee the authenticity of grated hard cheeses

Federica Camin[a,*], Ron Wehrens[a], Daniela Bertoldi[a], Luana Bontempo[a], Luca Ziller[a], Matteo Perini[a], Giorgio Nicolini[a], Marco Nocetti[b], Roberto Larcher[a]

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IRMS
ICPMS
Traceability model
Parmigiano Reggiano
Mislabelling

ABSTRACT

In compliance with the European law (EC No. 510/2006), geographical indications and designations of origin for agricultural products and foodstuffs must be protected against mislabelling. This is particularly important for PDO hard cheeses, as Parmigiano Reggiano, that can cost up to the double of the no-PDO competitors.

This paper presents two statistical models, based on isotopic and elemental composition, able to trace the origin of cheese also in grated and shredded forms, for which it is not possible to check the logo fire-marked on the rind. One model is able to predict the origin of seven types of European hard cheeses (in a validation step, 236 samples out of 240 are correctly recognised) and the other specifically to discriminate the PDO Parmigiano Reggiano cheese from 9 European and 2 extra-European imitators (260 out of 264 correct classifications). Both models are based on Random Forests. The most significant variables for cheese traceability common in both models are $\delta^{13}C$, $\delta^{2}H$, $\delta^{15}N$, $\delta^{34}S$ and Sr, Cu, Mo, Re, Na, U, Bi, Ni, Fe, Mn, Ga, Se, and Li. These variables are linked not only to geography, but also to cow diet and cheese making processes.

Accepted Manuscript

Analysing Cheese Microstructure: A Review of Recent Developments

Mamdouh El-Bakry, Jeremiah Sheehan

PII: S0260-8774(13)00546-3
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Reference: JFOE 7610

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Problemas de Autenticidade no Queijo/ Cheese Authenticy

Agroscope Liebefeld-Posieux ALP
Milk and Meat Processing Research Department
Cheese Quality Research Group

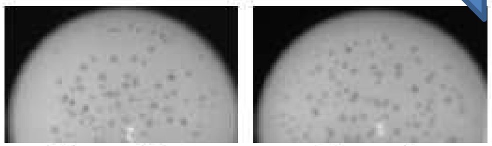
Status 2011

Analysis of cheese using X-ray computed tomography (CT)

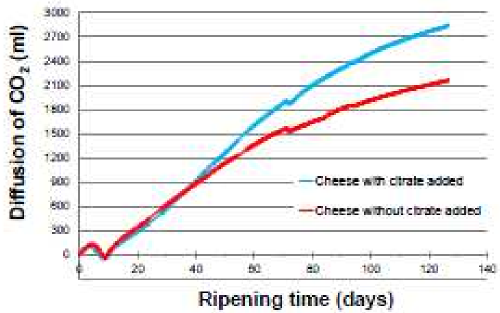
1. Cheese market 2011 - an overview

In 2011 42% of the milk produced in Switzerland was used to produce cheese. A total of 181,675 tonnes of cheese was produced. This was made up of 26% fresh cheese, 4% soft cheese, 32% medium hard cheese, 36% hard cheese and 1% extra hard cheese. To date, 11 cheeses in Switzerland have received AOC certification (certified indication of origin), which represents around one third of total cheese production. Cheese is Switzerland's most important agricultural export product. In spite of the extremely difficult market environment (Euro crisis, strength of the Swiss Franc) in 2011, the Swiss cheese industry was able to export an extra 1.4% (+920.8 tonnes) of Swiss cheese. A total of 64,528 tonnes of Swiss cheese was exported, which is 35.5% of the total amount of cheese produced in Switzerland. The well-known varieties of Emmentaler AOC, Le Gruyère AOC and Appenzeller® made up more than half of the cheese exports. The medium hard cheese sector has witnessed an increasing number of smaller speciality cheese contribute to the growth in exports, which is a very promising development.

Swiss cheeses are primarily made from unpasteurized milk without additives. Thanks to their naturalness, security and quality, they enjoy great confidence by consumers at home and abroad. The Swiss population consumed an average of 21.55 kg of cheese in 2010. Thereof, 72.8 per cent came from Switzerland. The consumption of cheese is not only a culinary pleasure but it also provides important nutrients and thereby makes an important contribution to a healthy and balanced diet.
The ALP Cheese Quality Research Group supports the Swiss



Cheese without citrate added — Cheese with citrate added

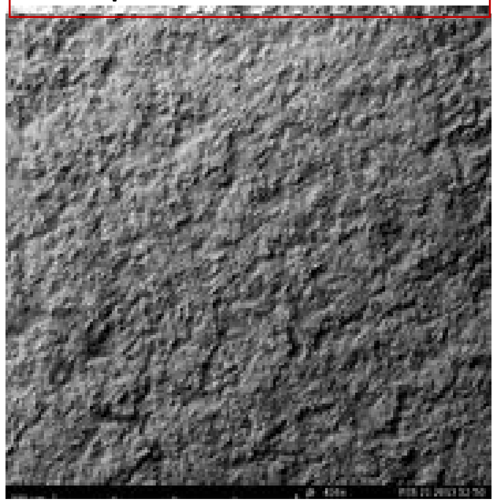


A strong formation of CO_2 in trial cheeses, caused by the addition of citrate and the use of an eye forming culture does not necessarily lead to an increased number of eyes as CO_2 is increasingly diffused from the cheese.

2. Eye formation in cheese

The reproducible control of eye formation in cheeses such as Emmentaler AOC, Appenzeller and Tilsiter is extremely important for differentiating and marketing the different types of cheese. Products that have few or no eyes are subject to

Electronic Microscopy
HP cheese Évora samples



Isotope analyses

Published in International Dairy Journal 15, issues 6-9, 547-556, 2005
which should be used for any reference to this work 1

Geographic origin of European Emmental cheese: Characterisation and descriptive statistics

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[c] *University of Neuchâtel, Neuchâtel CH-2007, Switzerland*

Abstract

To survey the authenticity of Emmental cheese from some of the main European countries of origin, samples of cheeses manufactured during winter (110 samples) and summer (73 samples) were collected. From a preliminary study, a series of promising analytical methods were selected and applied: total nitrogen, water soluble nitrogen (WSN), 12% TCA soluble nitrogen (TCA-SN), pH-value, volatile short-chain acids, chloride, organic acids, enterococci, obligate heterofermentative lactobacilli (OHL), *Lactobacillus helveticus*, sodium, copper, zinc, magnesium and stable isotope ratios (δ^2H, $\delta^{13}C$, $\delta^{15}N$, $\delta^{34}S$). The data were analysed by univariate statistical methods according to the geographic origin and the season of production. Significant differences between the regions of origin were found for all parameters investigated ($P \leqslant 0.001$). Cheeses from some regions showed very specific properties. Seasonal differences were observed in certain regions for acetate, propionate, caproate, WSN, TCA-SN, pyruvate, OHL, zinc and $\delta^{13}C$ levels.

Keywords: Authenticity; Emmental cheese; Season effect; Stable isotope

Calorimetry

Differential Scanning Calorimetry of Water Buffalo and Cow Milk Fat in Mozzarella Cheese

Michael H. Tunick* and Edyth L. Malin

ERRC, ARS, USDA, Wyndmoor, Pennsylvania 19038

ABSTRACT: The thermal profiles of the fat in mozzarella cheeses made from cow milk (CM) and water buffalo milk (WBM) were obtained by differential scanning calorimetry (DSC). The DSC curves of mozzarella cheese made from WBM were distinguishable from those of CM. The curves resembled those of the corresponding milk fats and could be divided into low-, medium-, and high-temperature melting regions. The valley in the curve between the low- and medium-temperature melting regions was at 10.8°C in WBM cheese and below 10°C in CM cheese. In the WBM cheese, the area of the low-melting region was larger than the area of the medium-temperature melting region, but the two areas were equal in the CM cheeses. Mixtures of the two cheeses exhibited temperature and area values between those of the pure cheeses. Milk-fat mixtures showed similar behavior. The contrasting DSC melting profiles provide a way of distinguishing between the two mozzarella cheese types and for detecting mixtures of the two fats in mozzarella cheese.
JAOCS 74, 1565–1568 (1997).

KEY WORDS: Cheese, cow milk, DSC, melting profile, milk fat, mozzarella, water buffalo milk.

gels (Malin, E.L., J.J. Shieh, and B.C. Sullivan, unpublished data), is based on sequence differences in β-caseins of the two species.

There are major differences in the fat contents of WBM and CM and the cheeses made from them. CM from the United States averages 3.9% fat (5), compared with 7.2 to 7.9% for WBM from Italy (6), and the fat globules in WBM are larger and more numerous than those in CM (7). WBM fat contains more palmitic, stearic, and oleic acids than CM fat (6,7).

The melting properties of a fat can be obtained by differential scanning calorimetry (DSC). Taylor *et al.* (8) separated CM fat into low-, medium-, and high-molecular weight (MW) fractions and obtained DSC curves for each. They attributed almost all of the melting below 30°C to low-MW and unsaturated high-MW triglycerides, which melt at lower temperatures than high-MW saturated triglycerides. The low-MW triglycerides contained butyric (and some caproic) acid esterified at position 3 on the glycerol molecule, and the high-MW unsaturated triglycerides contained oleic acid at position 3.

Problemas de Autenticidade no Queijo/ Cheese Authenticy

EN
GC

Food Chemistry 129 (2011) 1315–1319

Contents lists available at ScienceDirect

Food Chemistry

journal homepage: www.elsevier.com/locate/foodchem

Analytical Methods

Classification of Pecorino cheeses using electronic nose combined with artificial neural network and comparison with GC–MS analysis of volatile compounds

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A R T I C L E   I N F O

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Keywords:
Electronic nose
Artificial neural network
Classification
Volatile compounds
Pecorino cheese

A B S T R A C T

An electronic nose based on an array of 6 metal oxide semiconductor sensors was used, jointly with artificial neural network (ANN) method, to classify Pecorino cheeses according to their ripening time and manufacturing techniques. For this purpose different pre-treatments of electronic nose signals have been tested. In particular, four different features extraction algorithms were compared with a principal component analysis (PCA) using to reduce the dimensionality of data set (data consisted of 900 data points per sensor). All the ANN models (with different pre-treatment data) have different capability to predict the Pecorino cheeses categories. In particular, PCA show better results (classification performance: 100%; RMSE: 0.024) in comparison with other pre-treatment systems.

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International Journal of Food Microbiology 90 (2004) 139–159

INTERNATIONAL JOURNAL OF Food Microbiology

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Review article

Flavours of cheese products: metabolic pathways, analytical tools and identification of producing strains

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Received 5 December 2002; received in revised form 30 April 2003; accepted 30 May 2003

Abstract

Aroma development in cheese products results from the metabolic activities of cheese bacteria, by glycolysis, lipolysis and proteolysis. To respond to the increasing demand for products with improved aroma characteristics, the use of bacterial strains for cheese ripening with enhanced flavour production is seen as promising. In this review, the catabolism of amino acids, presumably the origin of some major aroma compounds, is discussed. The techniques of detection of flavour-producing strains are then presented. Their detection may be achieved either by genotyping, by enzymatic analysis, or by physico-chemical analysis such as HPLC, TLC, GC, and electronic nose.

Keywords: Cheese; Flavour; Lactic acid bacteria; Metabolic pathways; Catabolism of amino acids; Analysis; Electronic nose; Molecular profiling; Enzymatic activity; Review

Problemas de Autenticidade no Queijo/ Cheese Authenticy

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Review

Prediction of the type of milk and degree of ripening in cheeses by means of artificial neural networks with data concerning fatty acids and near infrared spectroscopy

CrossMark

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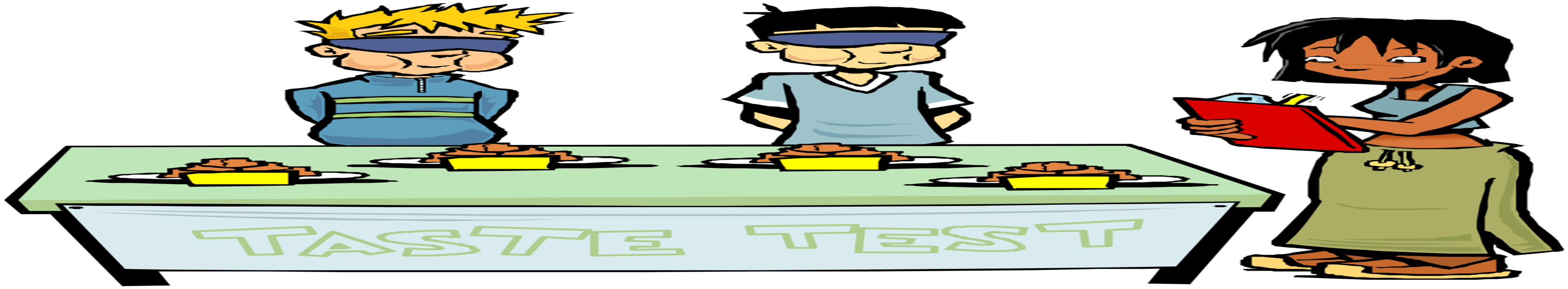
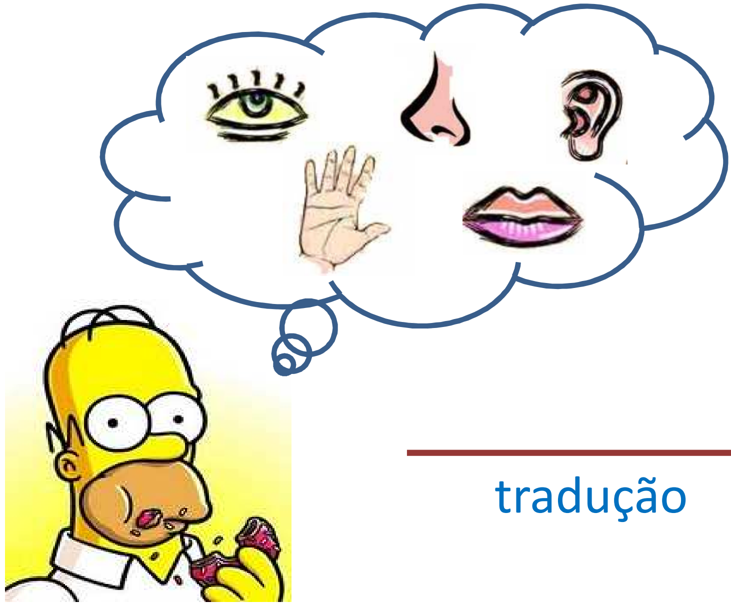
A B S T R A C T

The present study addresses the prediction of the time of ripening and type of mixtures of milk (cow's, ewe's and goat's) in cheeses of varying composition using artificial neural networks (ANN). To accomplish this aim, neural networks were designed using as input data the content of 19 fatty acids obtained with GC-FID of the cheese fat and scores obtained from principal component analysis (PCA) of NIR spectra. The best model of neuronal networks for the identification of the type of mixtures of milk was obtained using the information concerning the fatty acid concentration (80% of correct results in the training phase and 75% in the validation phase). Regarding the information of the near-infrared (NIR) spectra a neural network was designed. The aforesaid neural network predicted the ripening of cheeses with 100% accuracy in both training and in validation.


TASTE TEST

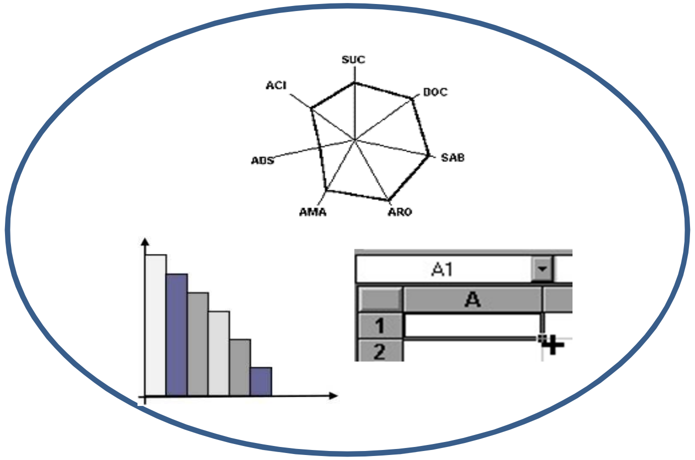
ANÁLISE SENSORIAL

<u>Conjunto de técnicas</u> (método) de medida que permitem a **quantificação** e **interpretação** das características dos alimentos que são percebidas pelos **sentidos humanos**



Instrumentos de medida

tradução



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Review

Odour Detection Methods: Olfactometry and Chemical Sensors

Magda Brattoli [1], Gianluigi de Gennaro [1,*], Valentina de Pinto [1], Annamaria Demarinis Loiotile [1], Sara Lovascio [1] and Michele Penza [2]

ANÁLISE SENSORIAL

Instrumento de medida....

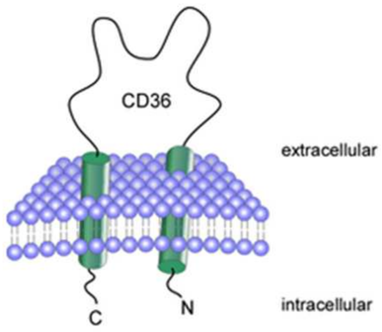
(Institute of Food Technologists, 1981).

ANÁLISE SENSORIAL

<u>5 gostos básicos</u>

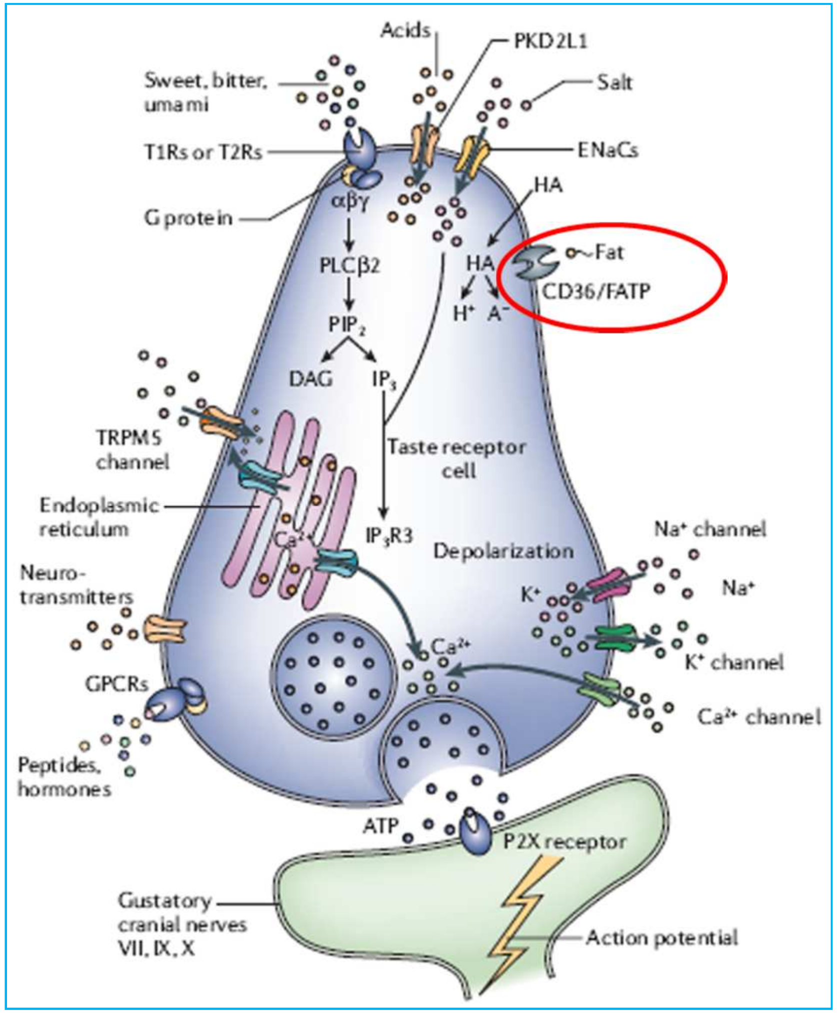
Doce
Salgado
Ácido
Amargo
Umami

...Gordura...



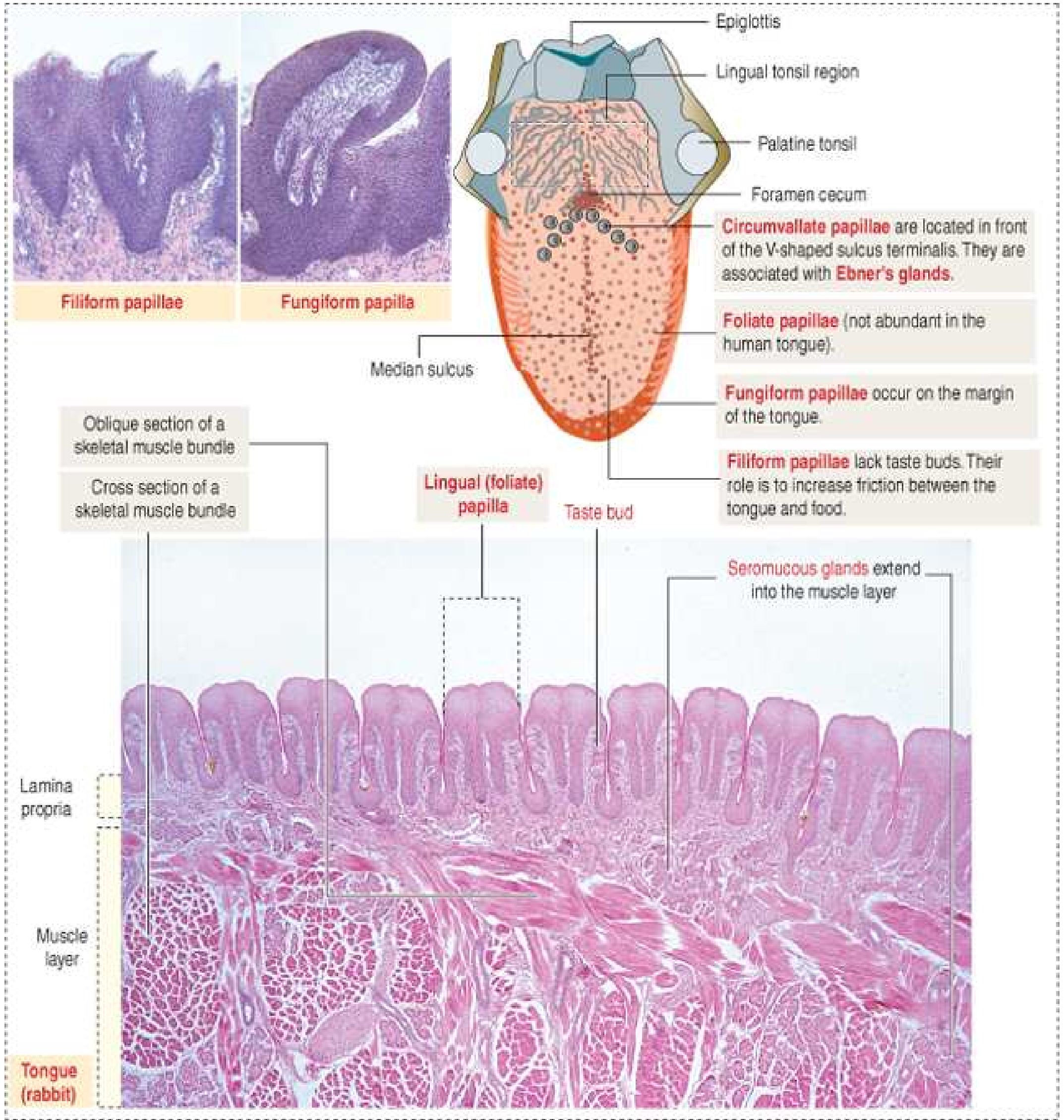
ANÁLISE SENSORIAL

A percepção gustativa ocorre quando as moléculas químicas dos alimentos alcançam as microvilosidades localizadas na porção apical das células receptoras do gosto (TRCs)

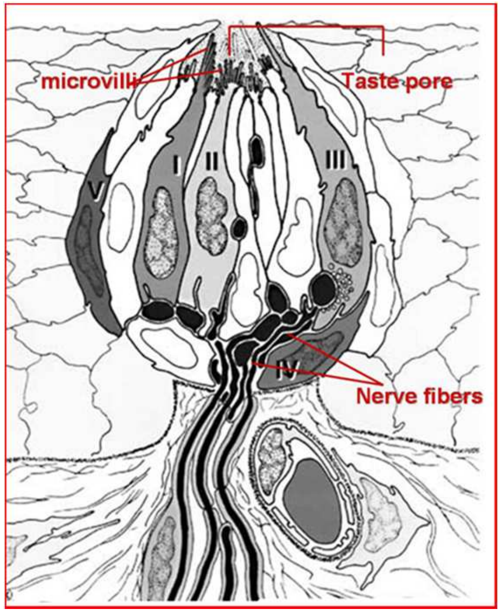


Papilas gustativas

- ✓ Fungiformes
- ✓ Circunvaladas
- ✓ Foliadas
- ✓ Filiformes (mecânica)



ANÁLISE SENSORIAL



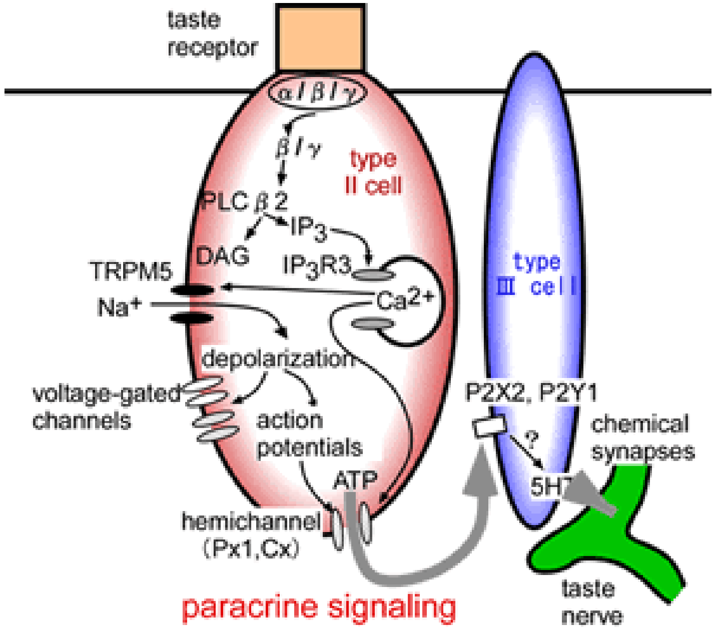
Gomos gustativos

<u>Receptores gustativos</u>
(presentes nas membranas das células gustativas):

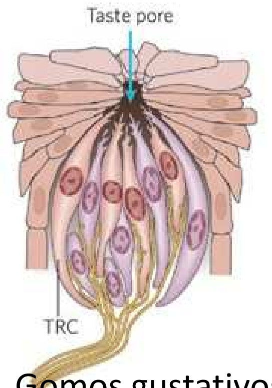
Familia T2R – **Amargo**
Familia T1R – **Doce** e **Umami**
Canais iónicos (PKD1L3 e PKD2L1) – **Ácido**
Canais epiteliais de sódio e receptor vaniloide (TRPV1) - **Salgado**

Gostos doce, amargo e umami

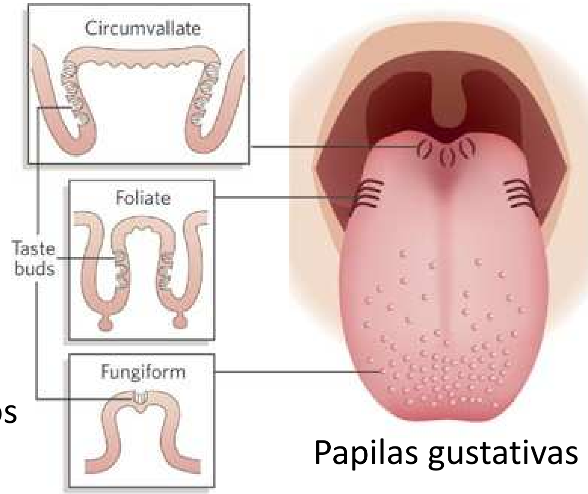
Estímulo químico



Célula receptora do gosto



Gomos gustativos com diferentes tipos celulares

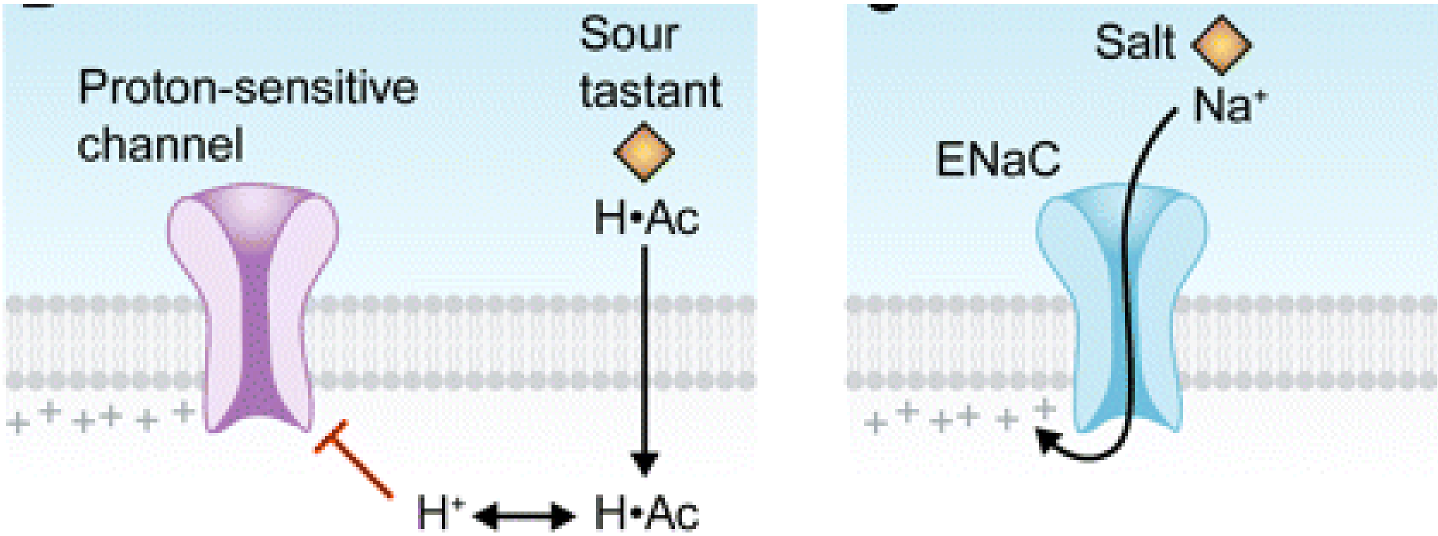


Papilas gustativas

- ✓ Grande diversidade de receptores para o amargo, alguns dos quais respondendo a moléculas específicas
- ✓ Menor diversidade de receptores de doce e umami

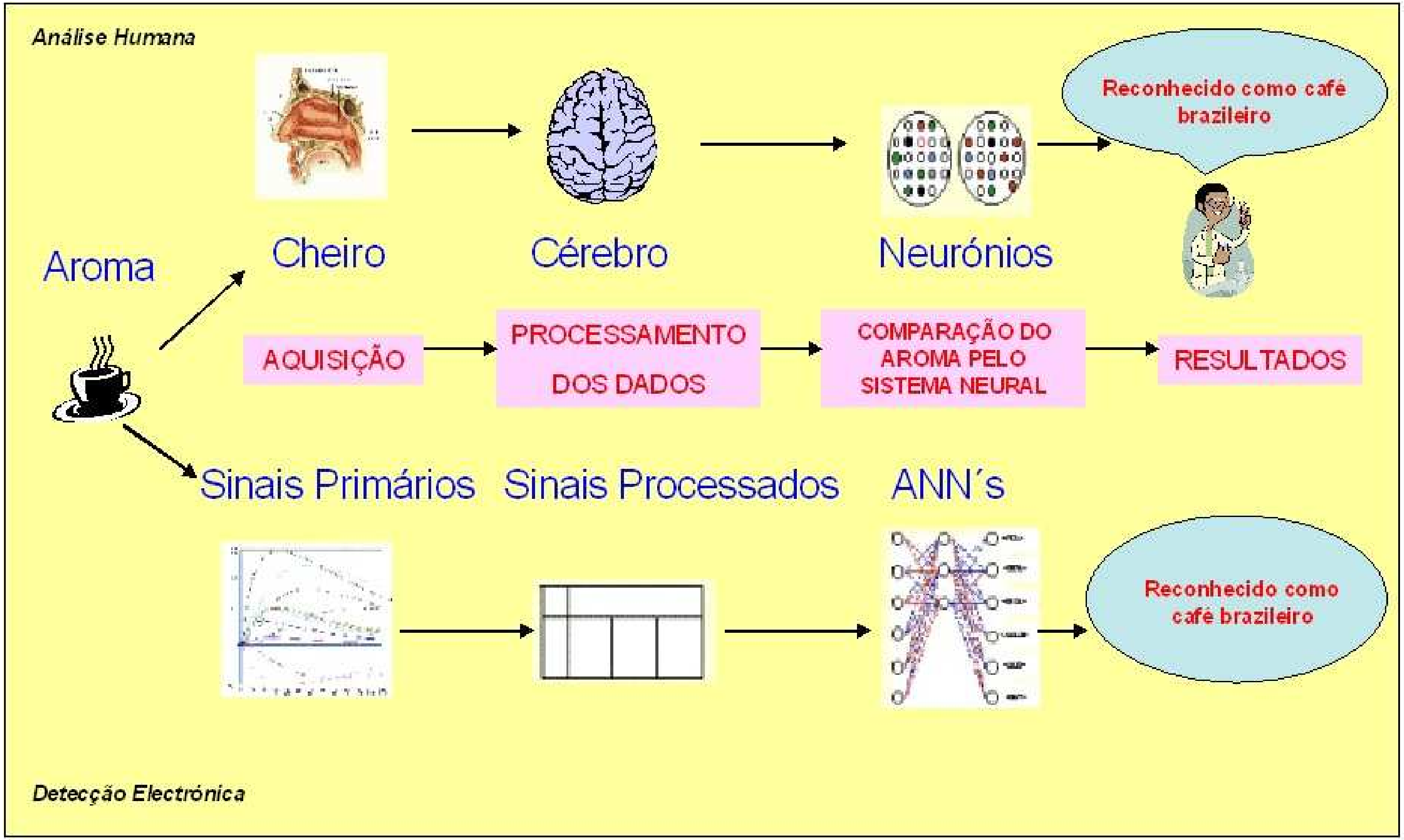
Gostos salgado e ácido

Estímulo químico



- O gosto ácido deve-se à entrada de H^+ através da membrana da célula, com um consequente bloqueio de canais de potássio sensíveis ao H^+
- O gosto salgado é detectado através de permeabilização directa de iões Na^+ através de canais iónicos

Analogia do nariz electrónico ao sistema olfactivo humano



Software

• Fornecimento ao sistema da informação necessária para a realização de uma análise

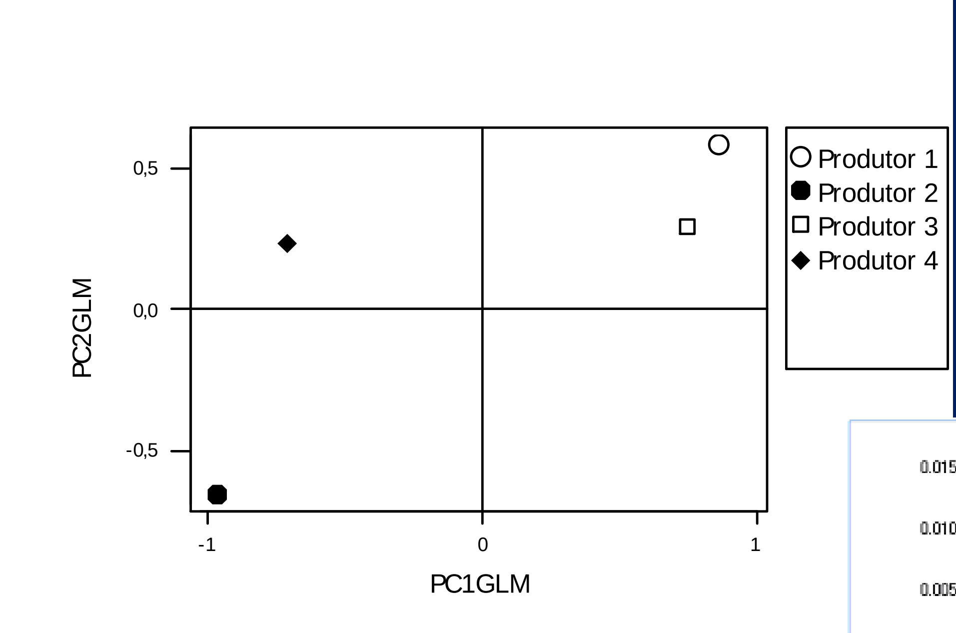
• Definição do método a utilizar – Conjunto de parâmetros

• Ordem das amostras e respeitante método - Sequência

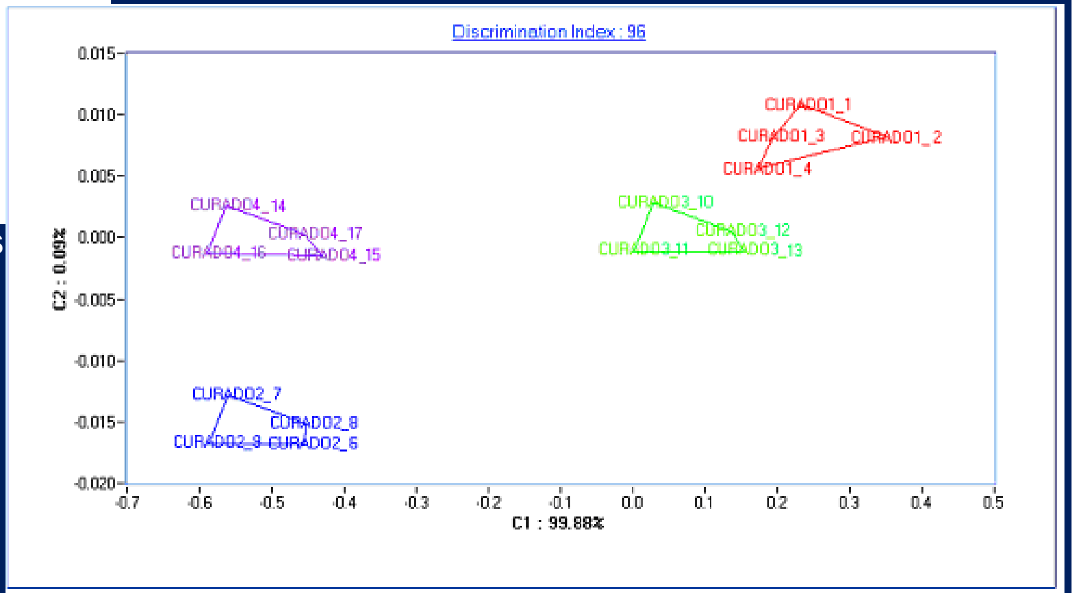
• Criação de bibliotecas com o objectivo de comparação entre amostras

• Tratamento estatístico da informação e visualização de resultados

Resultados:



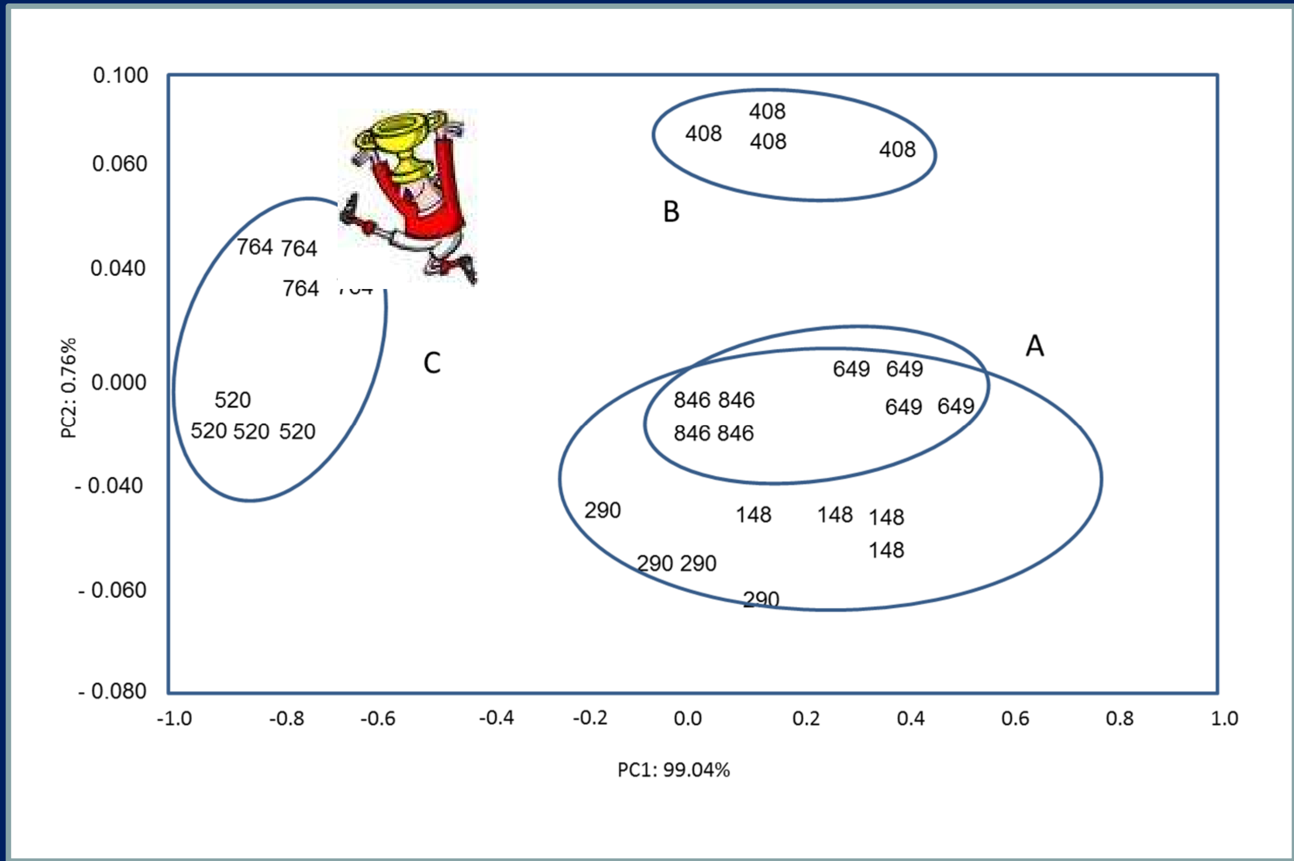
Diferenciação entre os queijos dos produtores 1, 2, 3 e 4 respeitantes à fase de cura 3 (PC1GLM e PC2GLM)

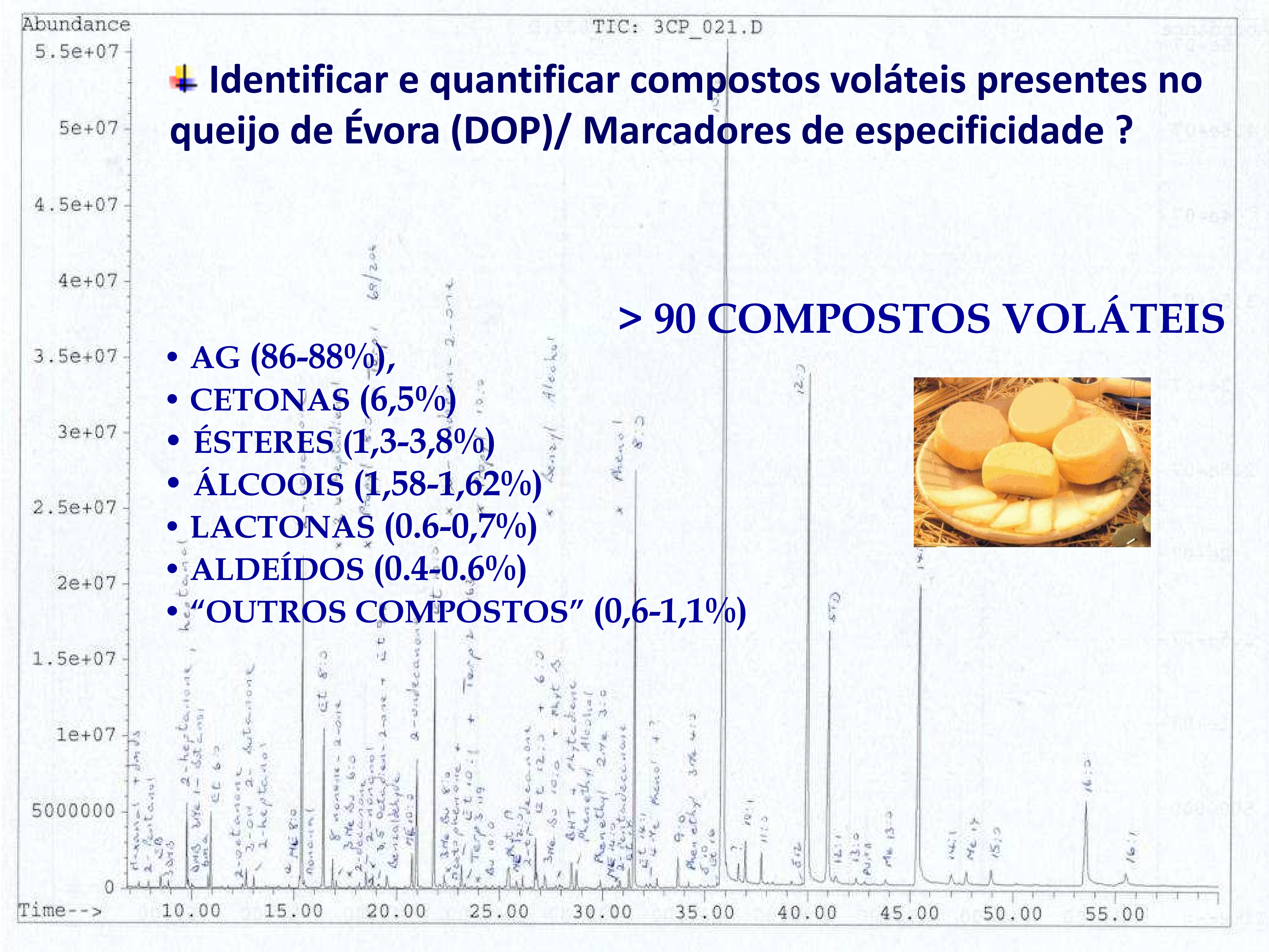


Discriminação obtida pela análise (PCA) no nariz electrónico, às amostras de queijo dos produtores 1,2,3 e 4 respeitantes à fase de cura 3

Resultados:

Score plot from PCA of electronic nose for Serpa Cheese from different manufacturers





Identificar e quantificar compostos voláteis presentes no queijo de Évora (DOP)/ Marcadores de especificidade ?

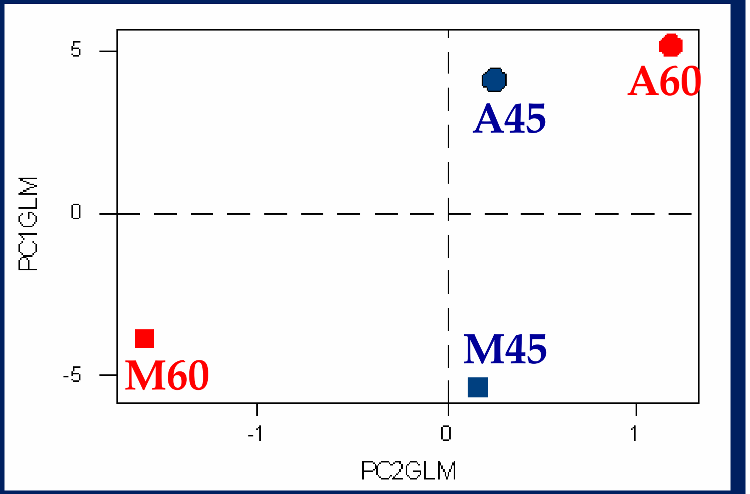
> 90 COMPOSTOS VOLÁTEIS

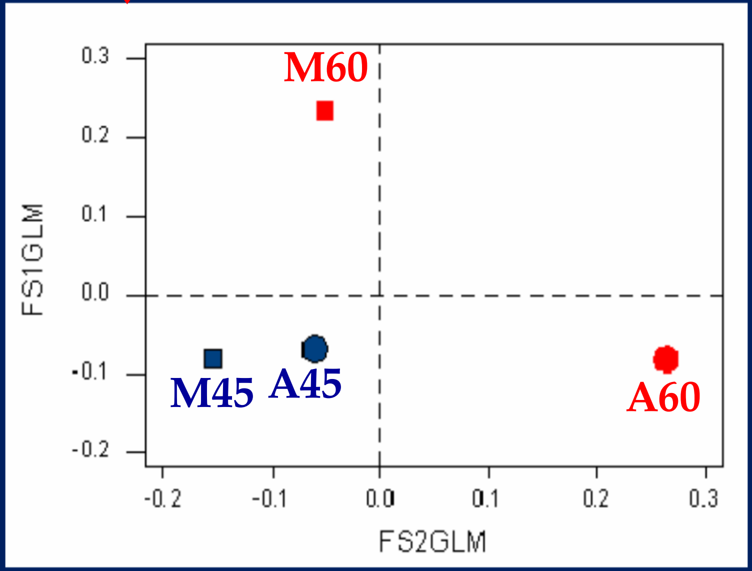
- **AG (86-88%),**
- **CETONAS (6,5%)**
- **ÉSTERES (1,3-3,8%)**
- **ÁLCOOIS (1,58-1,62%)**
- **LACTONAS (0.6-0,7%)**
- **ALDEÍDOS (0.4-0.6%)**
- **“OUTROS COMPOSTOS” (0,6-1,1%)**

ENSAIO 1

Resultados:

COMPOSTOS VOLÁTEIS E AVALIAÇÃO SENSORIAL





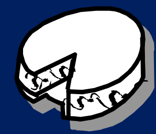
A análise dos atributos do *"flavour"* e do perfil de ácidos gordos livres tornam relevante

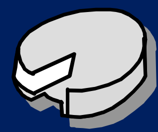
a separação dos queijos com 60 dias de maturação, essencialmente os queijos fabricados em Maio,

que mostram uma >>>> intensidade dos atributos *mofo, ranço* e *ovelha*, que podem ser associados a uma **maior concentração** de **ácido butanóico, 2-metil-propanóico e 2-metilbutanóico.**

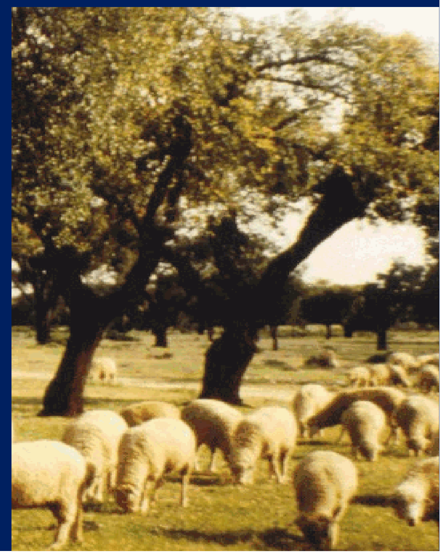
Conclusões

O queijo de Évora é caracterizado por uma elevada lipólise, associada ao elevado teor em ácidos gordos livres e consideráveis de ésteres e cetonas, o que se verifica igualmente nos queijos de crosta com bolores e nos queijos com bolores azuis, podendo ser indicador do papel determinante das leveduras e bolores na actividade lipolítica.





Foram também detectados compostos como terpenos, fitol e seus derivados, limoneno e indol que estão normalmente associados aos queijos produzidos a partir de leite de ovelhas em pastoreio, podendo ser considerados compostos que contribuem para definir a especificidade do sistema de produção do queijo produzido na região de Évora.



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The ability to protect the integrity of the food supply chain is a massive challenge but one which is of the utmost importance to protect the consumer.
The conference to be held in Belfast will concentrate on three key themes:

1) Reviewing recent progress in delivering safe and authentic food to the consumer

Muito obrigada.....