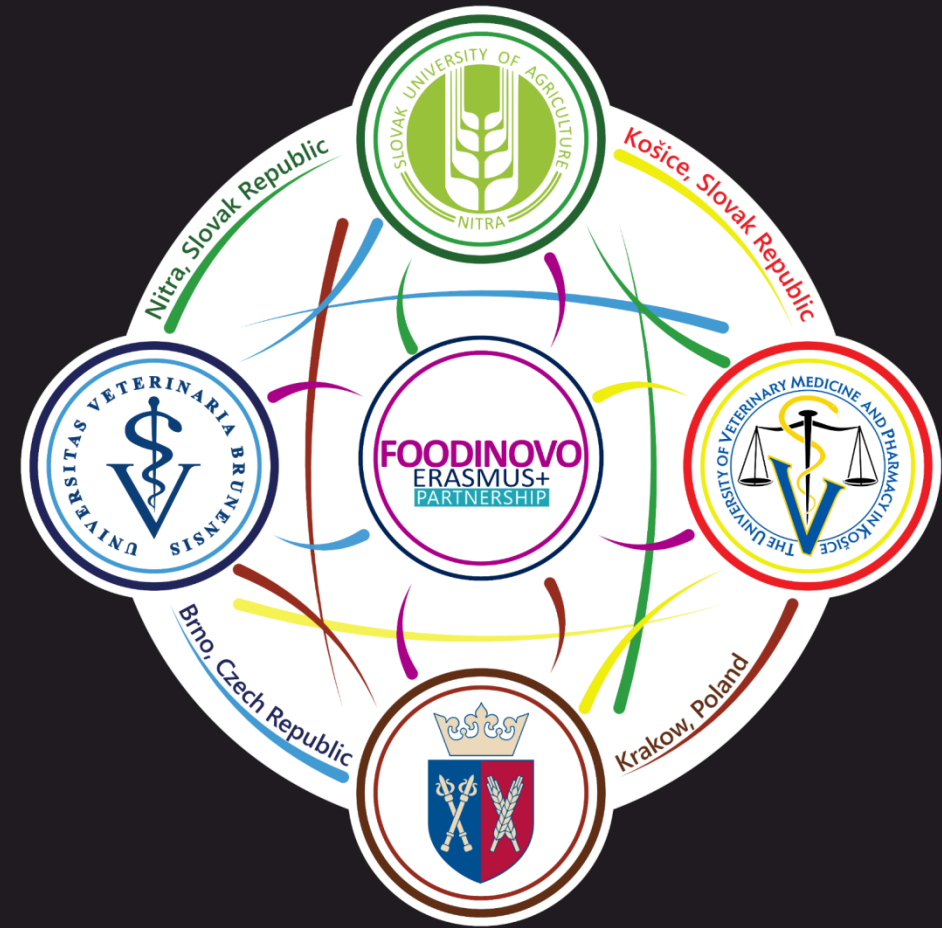


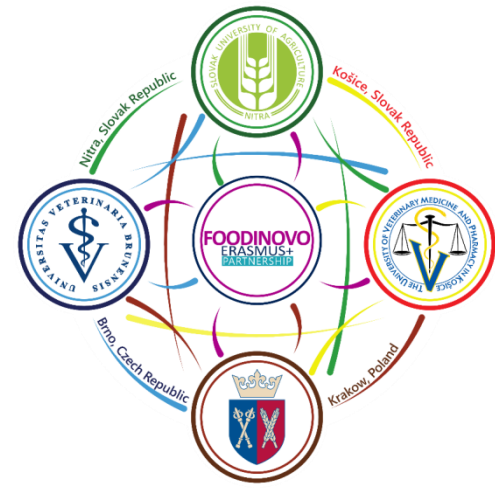
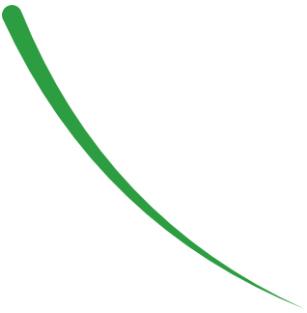
Condiments



Introduction

- ❖ Vinegar
- ❖ Mustard
- ❖ Salt





Vinegar



Vinegar

Types of vinegar according to substrate:

- ❖ Grape
 - wine vinegar, balsamic vinegar, red and white vinegar, sherry vinegar, traditional balsamic vinegar
- ❖ Apple
 - cider vinegar
- ❖ Rice
 - rice vinegar, kurosu
- ❖ Malt
- ❖ Coconut
- ❖ Fruits (mango, persimmon, berries)



Vinegar

Raw materials for vinegar production

□ ethanol, water and nutrients

The most important acetic bacteria:

- ❖ *Acetobacter aceti* subspecies *aceti*, *Acetobacter aceti* subspecies *orleanensis*
 - ❖ *Acetobacter rancens*, *Acetobacter pasteurianus*
-
- Wine vinegars (France, Italy)
 - Fruit vinegars (Great Britain, Germany, USA, France) - apple cider vinegar
 - Malt vinegars (Great Britain)
 - Alcohol vinegars (Czech Republic, Poland, Germany, Russia)
 - Rice vinegars (Japan)



Vinegar

PRODUCTION OF VINEGAR:

- ❖ Alcoholic fermentation
 - transforms sugars into ethanol by *Saccharomyces cerevisiae* yeast
- ❖ Acetification
 - „acetification“ by acetic acid bacteria (e.g. *Acetobacter pasteurianus*)

Vinegar fermentation:

ethanol → *acetaldehyde* → *acetic acid*

- ❑ As the ethanol concentration decreases, acetic acid may decompose into carbon dioxide and water



Vinegar

PRODUCTION METHODS OF VINEGAR:

❖ The Orleans Process (surface culture)

- starting material (wine) is inoculated with vinegar bacteria → aging in barrels
- uses side aperture for air circulation
- wine is added at the bottom of the barrel (preventing the alteration of the "mother of vinegar")
- "mother of vinegar" - biofilm formed by the transforming microorganisms
- especially wine vinegars (France, Italy)
- very slow process (months to years) → **high quality vinegar**



Vinegar



PRODUCTION METHODS OF VINEGAR:

❖ The Generator Process (generator fermentation or quick process)

- reduce the acetification time
- vinegars with higher concentration (over 10% acetic acid)
- **bacteria are immobilized** on wood chips or charcoal
- the liquid constantly bubbles through the wood chips and raw vinegar flows out at the bottom
- the process takes cca 1 week

Vinegar

PRODUCTION METHODS OF VINEGAR:

❖ Submerged Fermentation

- the oxidative process occurs in the air-liquid interfaces of the air bubbles
- bacteria are dispersed in the fluid, where they propagate
- the airflow contributes to a considerable loss of the volatile compounds (a less complex product from a sensory point of view)
- faster alternative process (24 hours)
- significantly lower costs



Vinegar

VINEGAR TREATMENT:

- ❖ clarification
 - reduction of the content of substances causing turbidity (proteins, pectins, metal complexes etc.)
- ❖ filtration
 - separation of mucus and tannins
- ❖ dilution
- ❖ pasteurization
- ❖ finishing
 - clarification, dyeing and bottling



Vinegar

DEFECTS OF VINEGAR:

- ❖ iron, copper or tin ions
 - worsen the taste of vinegar
 - form toxic compounds
 - turbidity
- ❖ pests



Vinegar

USE OF VINEGAR IN FOOD INDUSTRY:

- ❖ Flavouring agent
 - ❖ Acidulant
 - ❖ Preserving agent (retards microbial growth)
-
- in processed foods (salad dressings, mayonnaise, mustard, ketchup, bread and bakery products, canned foods, marinades)
-
- medicine, corrosive agent, pickling agent



Types of Vinegar

- ❖ Balsamic vinegar
- ❖ Cane vinegar
- ❖ Champagne vinegar
- ❖ Cider vinegar
- ❖ Coconut vinegar
- ❖ Distilled vinegar
- ❖ Malt vinegar
- ❖ Rice wine vinegar
- ❖ Sherry vinegar
- ❖ Spirit vinegar
- ❖ White vinegar
- ❖ Wine vinegar or grape vinegar



Vinegar – labelling



PDO (Protected Designation of Origin)

❖ Sherry vinegars

- derive from Sherry wines
- aged in wood barrels for at least six months

❖ Aceto Balsamico Tradizionale di Modena

❖ Aceto Balsamico Tradizionale di Reggio Emilia

- cooking of grape must (increases sugar concentration) → alcoholic fermentation (osmophilic yeasts) → „sweet wine“ → mother of vinegar is added → left to be acetification → aging by a dynamic system (i.e., passage through different barrels containing vinegar from different vintages or different ages)

Vinegar – labelling

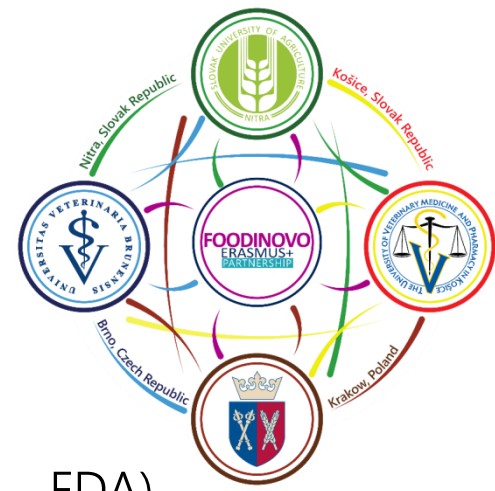
PGI (Protected Geographical Indication)

❖ Aceto Balsamico di Modena

- obtained from grape must (min. 20% of the volume) → the addition of at least 10% of wine vinegar + max. 2 % of caramel (colour stability) → aged at least 2 months (not necessarily in barrels)
 - a cheaper version of Aceto Balsamico Tradizionale
- “Invecchiato” (Aged) – aged for more than three years



Vinegar – legislation

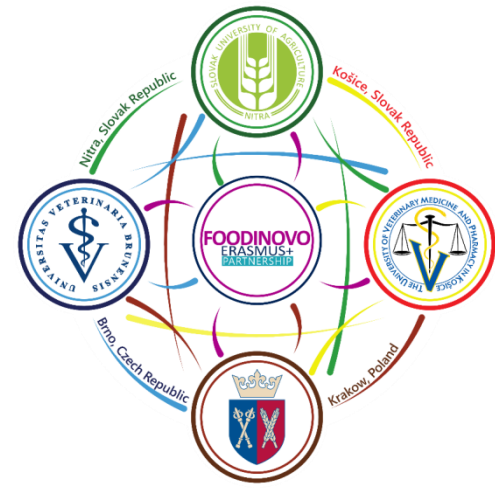
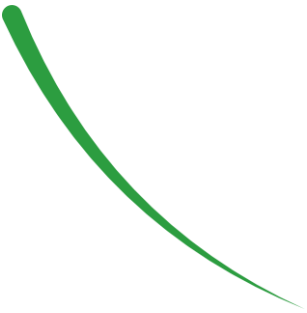


USA legislation:

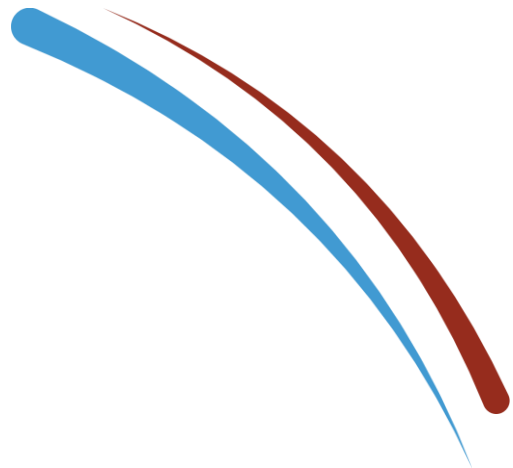
- vinegar products have to contain min. 4 of % acids (Food and Drug Administration - FDA)
- the labelling requirements for cider, wine, malt, sugar, sugar and vinegar blends (Compliance Policy Guides)

EU legislation:

- Commission Regulation (EU) 2016/263 amending Annex II to Regulation (EC) No 1333/2008 of the European Parliament and Council
- **Vinegars and diluted acetic acid (diluted with water to 4-30% by volume),**
 - „vinegars“ – vinegars obtained from the fermentation of agricultural products (in some Member States)
 - „vinegars“ – products obtained from the dilution with water of acetic acid and vinegars obtained from the fermentation of agricultural products (in other Member States)



Mustard



Mustard

- ❖ condiment made from the seeds of *Sinapis alba*, *Brassica juncea* or *Brassica nigra*
- ❖ family *Brassicaceae*

The basic types:

- ❖ *Brassica (Sinapis) alba* → white or yellow mustard (Mediterranean origin)
- ❖ *Brassica juncea* → brown Indian mustard (Himalayan origin)
- ❖ *Brassica nigra* → black mustard
- **Pungency level and flavour** of mustard depends on the variety of mustard seed, the preparation method and other ingredients
- seeds – pungent taste, odourless
- Brassica (Sinapis) alba* → less pungent flavour than *Brassica juncea* and *Brassica nigra*



Mustard

Composition of mustard seeds:

- 30-40% oil
- proteins
- carbohydrates
- P, Fe, Ca, K, Na, thiamin, niacin, riboflavin, ascorbic acid,
- fatty acids (linoleic acid)
- glucosinolates
 - ❖ **Sinalbin** (*Brassica (Sinapis) alba*) → *p*-hydroxy benzyl-isothiocyanate; *p*-hydroxy benzylamine
 - ❖ **Sinigrin** (*Brassica juncea, Brassica nigra*) → allyl isothiocyanate
- enzyme myrosinase



Mustard

Chemical composition:

- ❖ **brown mustard** – contains glucosinolate **sinigrin** → hydrolysis by enzyme myrosinase
→ **allyl isothiocyanate** + glucose + potassium bisulphate
- ❖ **white mustard** – contains glucosinolate **sinalbin** → hydrolysis by enzyme myrosinase
→ **p-hydroxybenzyl-isothiocyanate** + glucose + sinapine acid sulphate
- **allyl isocyanate** – bacteriostatic and bactericidal properties



Mustard



- ❑ dry or ground seeds → odourless
- ❑ chewing/by mixing with water → reaction of an enzyme and a glucoside
 - *brown mustard* → volatile oil of mustard with pungent, irritating odour and an acrid taste
 - *white mustard* → little odour and sensation of heat on the tongue

Production of mustard:

- ❑ cold water → hot mustard
- ❑ hot water → milder mustard



- hotter liquids and stronger acids denature the enzymes → the pungency of mustard is reduced

Mustard

Production of mustard:

- ❑ harvesting (12–13% moisture) and artificial drying
- ❑ swathing – 75% of the seeds have mature colour
– to promote the drying process
- ❖ Seeds can be stored if moisture content is less than 10%
- ❖ While drying → the seed temperature may not exceeds 52°C (damage to endogenous enzymes → impairing hydrolysis of glucosinolate to isothiocyanate)



Mustard

Ingredient for mustard production:

- ❑ water, mustard seeds, vinegar, sugar and salt

PRODUCTION:

- ❖ crushing of dried mustard seeds, milling → adding of crushed seeds to other ingredients (water, sugar, vinegar, salt) → mixing in vats → milling and homogenization → cooling (20-25°C) → maturation → filling and packaging

- ❑ the degree of fineness of milling depends on the type of mustard
- ❑ raw mustard has a pungent taste

Allyl isothiocyanate content:

- ❖ Freshly milled mustard – approx. 0.35%
- ❖ After 6 weeks of maturation – approx. 0.1%
- ❖ After 5 months of maturation – approx. 0.04%



Mustard

Preservatives:

- ❑ benzoic acid
- ❑ sulphur dioxide

Coloring agents:

- ❑ natural:
 - turmeric, beta carotene, lutein
- ❑ synthetic:
 - tartrazine (E102), yellow SY (E110), ponceau 4R (E124)



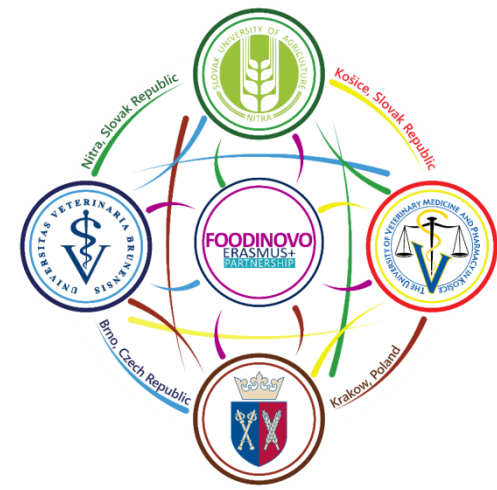
Mustard

Types of Mustard:

- ❖ French-type mustard – pungent (*Brassica juncea*)
- ❖ American or German-type mustard – milder (*Sinapis alba*)
- ❖ English mustard – both species (*Sinapis alba* and *Brassica juncea*)

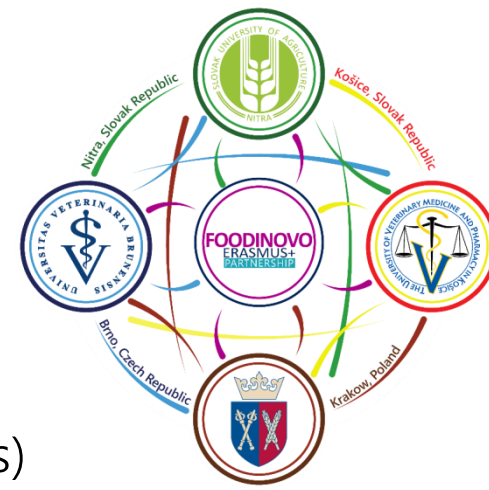
Storage:

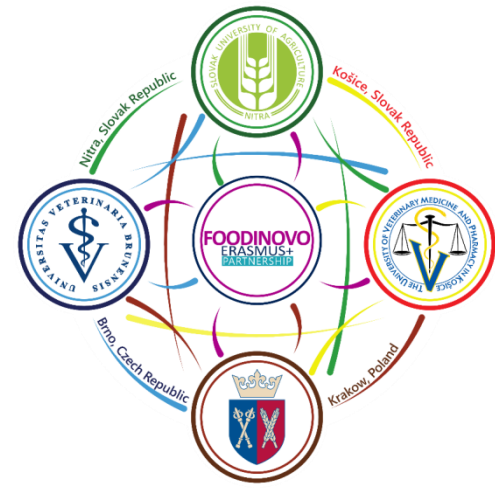
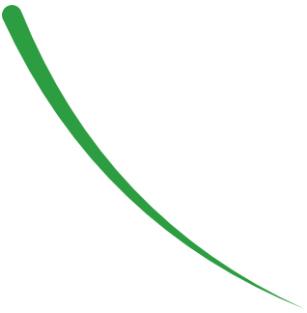
- up to 18 °C
- closed lid
- darkness



Use of Mustard

- ❖ as condiment – in form of seeds, as dry powder (mixed with water), as a paste with other spices (herbs, vinegar, wine, starch or flour to tone down the sharpness)
- ❖ as ingredient in mayonnaise, sauces, pickles
- ❖ antimicrobial effect – preservation
- ❖ **formerly** used in medicine – mustard plasters for their counterirritant properties
- ❖ manufacture of blown oil (oxidized and viscous oil) - incorporated in the hides
- ❖ food for honeybees
- ❖ feed
- ❖ manure
- ❖ cover crop
- ❖ technical purposes – soap making, lubricating oils





Salt



Salt

The common salt:

- sodium chloride (NaCl)
- min. 97% sodium chloride (using for food)
- 40% sodium and 60% chloride
- Halite – the natural rock form of NaCl

The basic methods of obtaining salt:

- ❖ Rock salt mining
- ❖ Extracting salt from salt brines
- ❖ Evaporating salt water from oceans, seas, and salt lakes



Salt

Rock salt mining:

- Excavation / surface mining (underground blasting) → deepening
 - mined in large lumps
 - bringing the crystals to the surface
 - crushing, sorting and cleaning
 - dissolving in water
 - evaporation
-
- ❖ loaded into bags for further handling
 - ❖ use of anticaking agents (allow the salt to be stored)



Salt



Extracting salt from salt brines:

- ❖ water is pumped into the underground rock salt deposits → creates **brine**
- ❖ brine is pumped back out to the surface → removing Ca, Mg and other impurities (by sodium bicarbonate, → evaporation (200 °C) → crystallization → salt (purity 98%)
- ❖ purification by sodium bicarbonate, carbon dioxide

Evaporated brine:

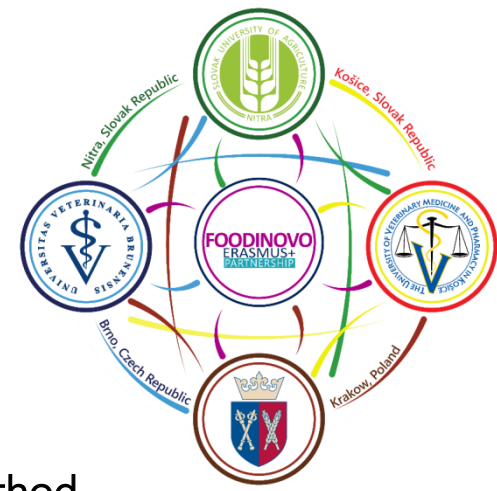
- by sun
- in pressure vessels (Vacuum Evaporation)

Vacuum Evaporation:

Brine boiling and water evaporation (crystals grow) → thick salt slurry → centrifugation (undried vacuum salt used in chemical industry) → drying and cooling → sieving and grading → distribution (food industry)

- ☐ **Use:**
 - food manufacturers

Salt



Evaporating salt water from oceans, seas, and salt lakes:

- ❑ Evaporation of seawater by sun → seawater in shallow pools (or 'pans') - **Solar Salt Production Method**
- ❑ maritime countries - amount of evaporated water exceeds the amount of rainfall by at least 75 cm
- ❑ aqueous solution is evaporated - salts precipitate (as it reaches its point of saturation in the solution)
 - ❖ different salts in seawater will precipitate at different times, the order of deposition is - calcium carbonate, calcium sulfate, sodium chloride, magnesium sulfate, potassium magnesium chloride, and magnesium chloride
 - ❖ water evaporation from Dead sea is hastened by dye (permits more heat to be absorbed from sunlight)
- ❑ the concentrated salt solution is cleared from impurities
 - ❖ solution is concentrated (a specific gravity of about 1.22) → impurities (sand, clay, etc.) are removed
- ❑ crystallization in crystallizing pan (usually 4, according to specific gravity) and the salt is deposited
 - ❖ the final solution can be used to produce potash, bromine, epsom salts (magnesium sulfate), and magnesium chloride (USA and Israel)

Types of Salt

- ❖ Table salt
- ❖ Kosher salt
- ❖ Sea salt
- ❖ Rock salt
- ❖ Fleur de sel
- ❖ Flake salt
- ❖ Himalayan salt
- ❖ Hawaiian salt
- ❖ Celtic sea salt (Grey salt)
- ❖ Smoked salt
- ❖ Pickling salt
- ❖ Curing salt
- ❖ Truffle salt
- ❖ Persian blue diamond salt



Types of Salt

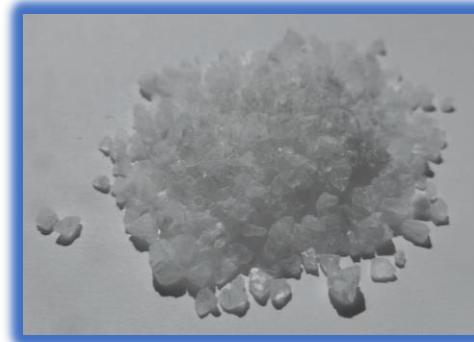
Table salt

- ❖ 97 to 99 % sodium chloride
- ❖ anti-caking agents may be added
- ❖ fortification – I, F
- ❖ hygroscopic



Rock salt

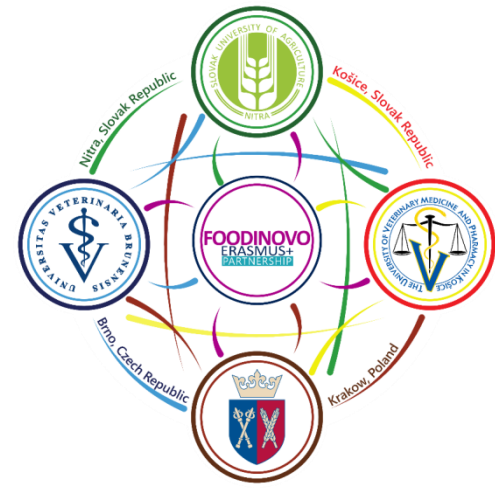
- ❖ natural form of salt (halite)



Types of Salt

Kosher salt

- ❖ large flake size (for the koshering)
- ❖ should be kosher certified
- ❖ usually doesn't contain additives or iodine
- ❖ suitable for seasoning, cooking, pickling, curing or smoking meat



Types of Salt

Sea salt

- ❖ varies depending on
 - mineral content
 - the area of the sea
 - method used for evaporation
- ❖ contains more minerals (e.g. magnesium, calcium) than rock salt

Flake salt

- ❖ Maldon salt
- ❖ natural sea salt
- ❖ boiling seawater (remove impurities) → crystallization → collection → drying (in the sun) → very fine, thin and crunchy flakes
- ❖ seasoning of dishes in the cold kitchen, grilled meat and especially fish



Types of Salt

Fleur de sel

- ❖ originally from the Brittany coast in France
- ❖ a rare type of salt from France, Italy, Spain, Portugal
- ❖ at certain temperatures, humidity and wind force, salt crystals form on the water surface → collected within a few hours (so that they do not sink to the bottom)
- ❖ all processing is manual, chemically and microbiologically pure → not subject to any refining (contains all minerals that are contained in water)
- ❖ lower in sodium than table salt
- ❖ higher mineral content (magnesium, potassium and iodine)
- ❖ a delicate, briny flavor
- ❖ preparation of cold dishes and seasoning of cooked meals (enhances the taste of food)



Types of Salt



Gray salt (Celtic salt, Sel gris)

- ❖ the same salt pans as fleur de sel
 - ❖ allowed to fall to the bottom of the salt pan → higher mineral content and a gray color
 - ❖ lower in sodium than table salt
 - ❖ trace amounts of sulfur, magnesium, iodine etc.
 - ❖ contains 13% of moisture
-
- flavor and use → between basic sea salt and fleur de sel
 - sel gris-velvet → ground very finely with volcanic rocks

Types of Salt

Himalayan black salt (Kala namak, Black salt)

- ❖ purple-red in solid form
- ❖ after grinding → a pinkish hue
- ❖ the color → from the mineral greigite
- ❖ pungent smell → from sulfur
- egg resembling taste

Himalayan pink salt (Pink salt)

- ❖ mined in the Punjab region of Pakistan
- ❖ purple-red salt → trace amounts of iron oxide
- ❖ amount of NaCl → similar as table salt



Types of Salt



Hawaiian black lava salt

- ❖ harvesting in the Hawaiian Islands
- ❖ evaporated sea water from pools situated on hardened lava flow → dries on lava rocks (black color)
- ❖ mixed crystals with activated carbon ("detoxifying" effects)
- ❖ earthy flavor and slight sulfur aroma
- ❖ sea salt taste with delicious smoky flavor with hints of sulfur
- used in the cosmetics industry for the production of bath salts

Hawaiian *alaea* red salt

- ❖ Hawaiian sea salt
- ❖ contains red volcanic clay alaea (detoxifying effect)
- ❖ rich in minerals and iron oxide
- ❖ used in religious ceremonies
- ❖ lower sodium content than normal table salt

Types of Salt



Smoked salt

- ❖ slow-smoking of sea salts over several days
- ❖ taste influenced by smoking and specific woods → oak, maple, hickory or alder wood
- ❖ condiment suitable for fish and vegetarian dishes

Curing salt (Pink salt, Prague powder)

- ❖ mixture of table salt with sodium nitrate and a pink dye
- ❖ used to preserve meat

Pickling salt

- ❖ pure sodium chloride (without iodine or anti-caking agents)
- ❖ added ingredients can cause cloudiness or gather at the bottom
- ❖ very fine salt → speed up the pickling process (faster dissolving)

Types of Salt

Truffle salt

- ❖ salt flavored by truffle
- ❖ version with black and/or white truffles

Persian blue diamond salt

- ❖ small flecks of blue on crystals
- ❖ salt mines in Iran (former Persia)



Other Types of Salt



Potassium chloride (KCl)

- ❖ derived from the ground or sea
- ❖ substitutes sodium chloride or table salt (lower health risk than sodium-based salts)
- ❖ lowers sodium levels in processed foods (disadvantage – metallic aftertaste)

Epsom salt

- ❖ form of magnesium sulfate → it is not salt !!
- ❖ mineral springs at Epsom (England)
- ❖ bitter taste (not salty usage)
- ❖ usage:
 - as laxative agent
 - for baths (eliminates toxins from the body, relieves pain and muscle cramps, eases stress and relaxes the body...)

Salt



WHO recommendations:

- ❖ **adults:** less than 5 g of salt of per day
- ❖ **children:** 2 to 15 years – salt should be iodized or “fortified” with iodine
 - lower intake based on their energy requirements relative to those of adults
- Excessive salt consumption: 9–12 grams per day
- ❑ Exceeding the recommended daily amount of salt:
 - high blood pressure (hypertension) → increased risk of cardiovascular diseases (including coronary heart disease)
 - higher risk of incidents stroke
 - possible increased risk of stomach cancer
 - the risk of kidney stones

Salt

The importance of salt in human nutrition:

- ❖ stimulates nerve impulses
- ❖ maintains balance of electrolytes and fluid
- ❖ sodium ions
 - heart activity
 - some metabolic functions

Storing salt:

- clean, cool and dry place



Use of Salt

- ❖ for seasonings and in condiments
- ❖ food preservation
- ❖ deicing highways (lowers the melting point) – non-toxic to the environment
- ❖ manufacturing of PVC pipes or plastics
- ❖ tanning hides
- ❖ fired pottery glaze production
- ❖ employed in the production of soap, glaze, and porcelain enamel
- ❖ used in the production of:
 - chemicals (sodium bicarbonate, sodium hydroxide, hydrochloric acid, chlorine etc.)
 - soap
 - water-softening (removes calcium and magnesium compounds)
- ❖ as flux in metallurgical processes



Labelling of Salt



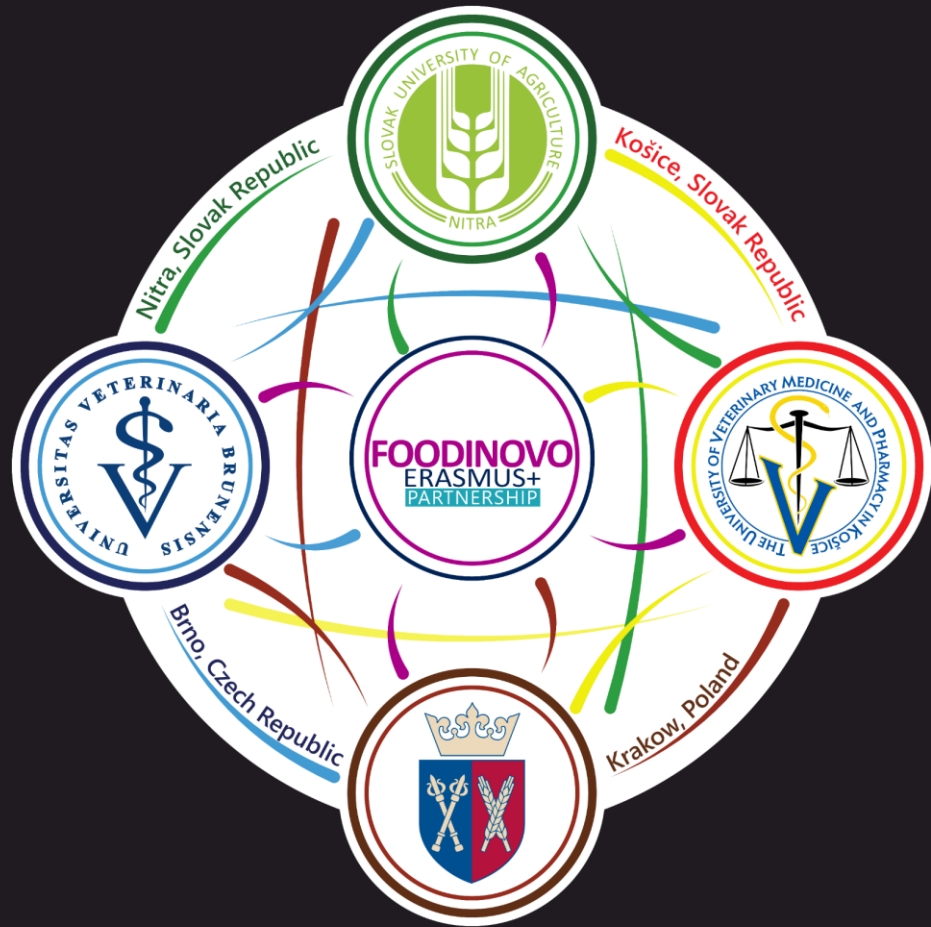
Regulation (EU) 1169/2011 on the provision of food information to consumers.

- mandatory **nutrition declaration** of the salt content

Regulation (EU) 1924/2006 on nutrition and health claims.

- permitted nutrition claims:

- ❖ **Low sodium/salt** claims, 'may only be made where the product contains no more than 0.12 g of sodium, or the equivalent value for salt, per 100 g or per 100 ml.'
- ❖ **Very low sodium/salt** claims, 'may only be made where the product contains no more than 0.04 g of sodium, or the equivalent value for salt, per 100 g or per 100 ml. This claim shall not be used for natural mineral waters and other waters.'
- ❖ **Sodium-free or salt-free** claims, 'may only be made where the product contains no more than 0.005 g of sodium, or the equivalent value for salt, per 100 g.'
- ❖ **No added sodium/salt** claims, 'may only be made where the product does not contain any added sodium/salt or any other ingredient containing added sodium/salt and the product contains no more than 0,12 g sodium, or the equivalent value for salt, per 100 g or 100 ml.'



Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Financované Európskou úniou. Vyjadrené názory a postoje sú názormi a vyhláseniami autora(-ov) a nemusia nevyhnutne odrážať názory a stanoviská Európskej únie alebo Európskej výkonnej agentúry pre vzdelávanie a kultúru (EACEA). Európska únia ani EACEA za ne nepreberajú žiadnu zodpovednosť.

Co-funded by the
Erasmus+ Programme
of the European Union



FOODINOVO | 2020-1-SK01-KA203-078333



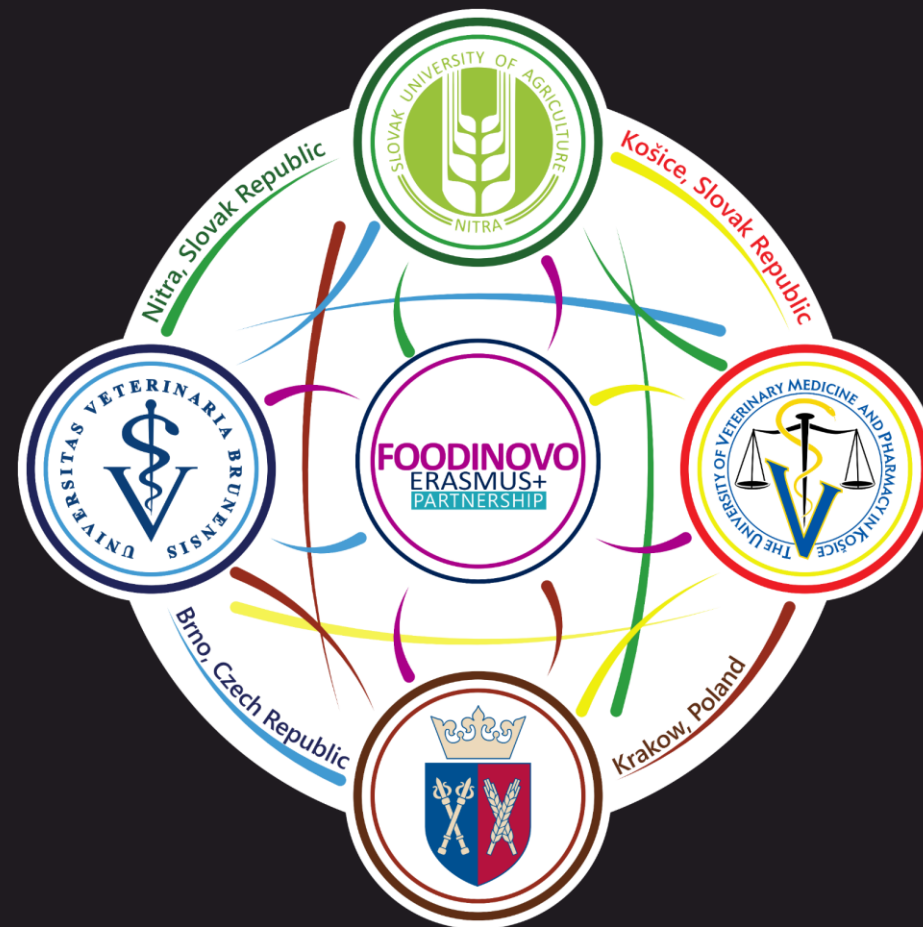
This work was co-funded by the Erasmus+ Programme
of the European Union

Innovation of the structure and content of study
programs profiling food study fields with a view to
digitizing teaching

Táto publikácia bola spolufinancovaná programom
Európskej Únie Erasmus+

Inovácia štruktúry a obsahového zamerania študijných
programov profilujúcich potravinárske
študijné odbory s ohľadom na digitalizáciu výučby

FOODINOVO | 2020-1-SK01-KA203-078333



Co-funded by the
Erasmus+ Programme
of the European Union

