Food Fraud

Consumer Chemistry (CH419)

Presented By,

KARAN RABIDAS : 210107040

SURAJ KUMAR YADAV : 210107086

RAJENDRA PRASAD SARASWAT : 210107068

Introduction

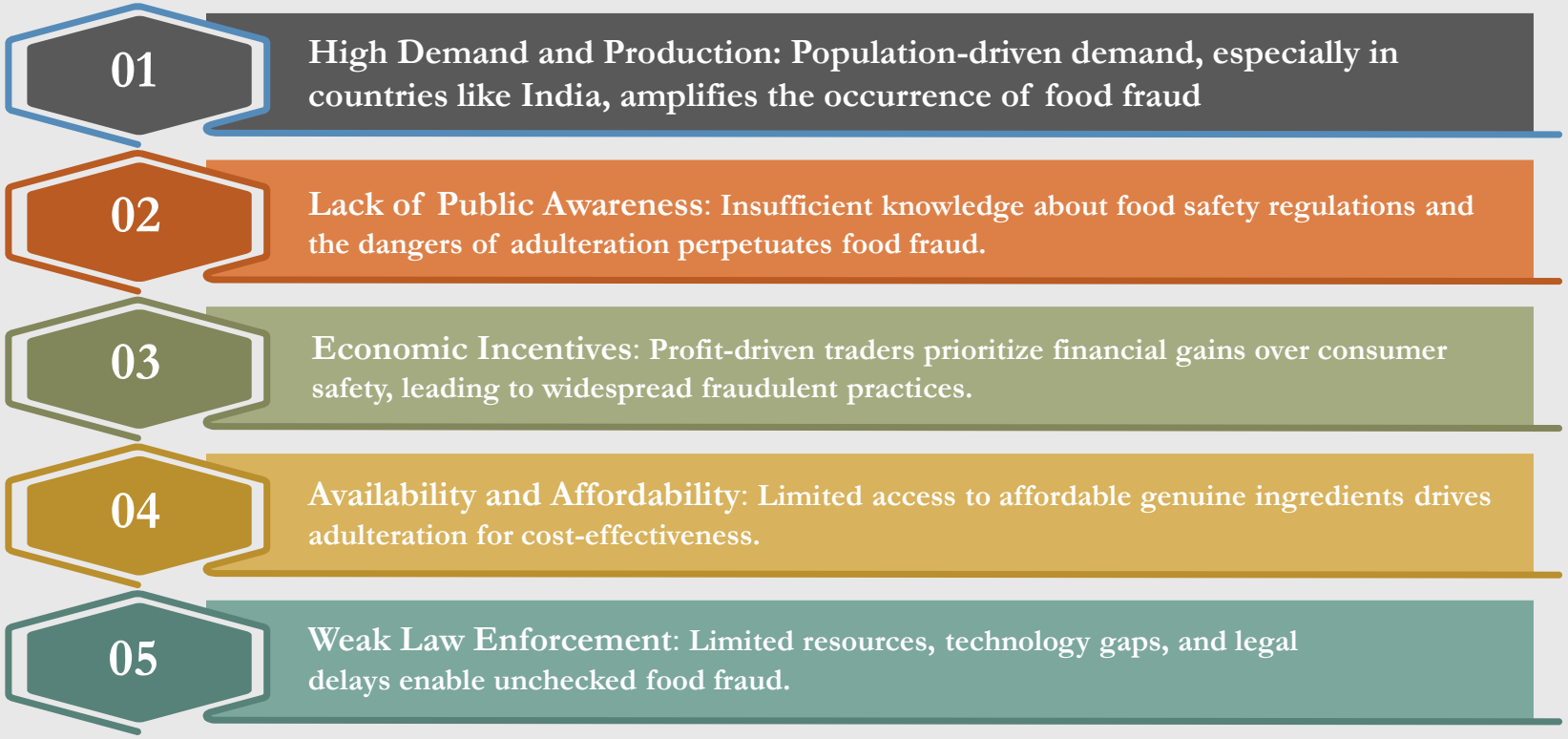
“Food Fraud” is the act of purposely altering, misrepresenting, mislabeling with any food product at any point along the farm-to-table food supply chain.

Driven by economic motives, Food fraud deceives consumers, strains regulators, and risks health and economic losses. Notable incidents like tainted milk and toxic olive oil underscore its severity. Solutions require transparency, robust regulation, and unified action.

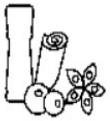
Types of Food Fraud

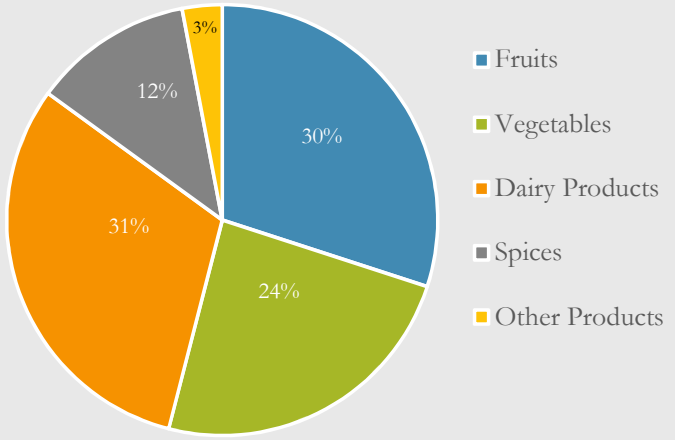
Term	Definition	Example
Adulteration	A component of the finished product is fraudulent	Melamine Added to milk
Tampering and Mislabelling	Legitimate products and packaging are used in a fraudulent way	Changed expiry information; false description of production method
Over-Run	The legitimate product is made in excess of production agreement	Under-reporting of production
Diversion	The distribution of legitimate products outside of intended markets	Relief food redirected to markets where aid is not required
Simulation	Illegitimate product is designed to look like but not exactly copy the legitimate product	"Knock-offs" (duplicate) of popular foods not produced with same food safety
Counterfeit	All aspects of the fraudulent product and packaging are fully replicated	Copies of popular foods not produced with same food safety

Factors Contributing to Food Fraud



Products Most at Risk of Food Fraud

Olive oil	Fish	Organic foods	Milk	Grains
				
Honey & maple syrup	Coffee and tea	Spices	Wine	Certain fruit juices
				



Impacts of Food Fraud

1. Threats To Health:

Food adulteration poses severe risks to public health, leading to a range of ailments such as diarrhea, abdominal pain, and vomiting, as well as more serious conditions including cancer, kidney stones, and liver damage

2. Economy:

Food fraud leads to financial losses due to recalls, legal actions, and damage to brand reputation, impacting producers and retailers alike.

3. Consumer Trust:

Food fraud erodes trust in supply chains and labeling accuracy, reducing consumer confidence in brands. Rebuilding trust demands transparent communication.

Adulteration in Dairy Industry

Adulterants Used	Purpose	Effects on Health
Water	Increase the quantity	Drops down the nutritive value
Sugar	Increase density	Cu deficiency, Ovarian Cancer ???
Starch	Increase Solid Content	Irritation of eyes , cough, chest pain ???
Hydrogen Peroxide	Reduce Cost of Process	Enhance ageing
Exc. Preservatives	Preserve for longer time	Diarrhoea, Extreme case-death
Urea	Whiteness	Indigestion, Ulcers, Cancers
Detergent and Soap	Emulsify	Gastrointestinal Problems

Adulteration in Fruits and Vegetables

ARTIFICIAL COLOURING

Synthetic dyes like tartrazine (E102) or sunset yellow (E110) and malachite green disguise old vegetables, but their accumulation in the body poses health risks.

MISREPRESENTATION OF QUALITY

Deceptive coatings alter produce appearance with wax, potentially trapping harmful residues. Inferior quality may lack essential nutrients, impacting health.

ARTIFICIAL RIPENING

Carbide, used for fruit ripening, releases unsafe acetylene gas (C_2H_2) due to arsenic and phosphorous hydride impurities.

PRICE MANIPULATION

Price-fixing practices lead farmers to use cheaper pesticides and premature harvesting, raising chemical residue levels in produce and compromising safety.

Adulteration in Grocery Items

Products	Adulterants Used	Effects On Heath
Sugar	Chalk Powder	Stomach Infection
Chilli Powder	Artificial Colour, brick Powder, Sudan Dye	Blood And Lung Cancer
Turmeric	Lead Chromate, Sawdust, metal yellow	Carcinogenic
Food Grains and Pulses	Sand, stone, marble chips, and filth	Damage digestive tract
Vegetable Oil	Argemone Mineral Oil	Heart disease, cancer
Butter	Margarine and starch	Food Poisoning
Rice And Wheat	Mud grits, soapstone bits, sand, Ergot	Cancer
Sea Food	Mercury and arsenic	Stomach and brain disorder

Why is argemone oil added to mustard oil?

It is used as an adulterant mixed with edible oils like sunflower oil, mustard oil to increase the oil quantity. The consumption of adulterated oil can lead to health disorders like **Dropsy.** Prolonged use causes **neural degeneration and paralysis**.

ResearchGate

Plant and flower of Argemone ochroleu…

Wikipedia

Argemone mexicana - Wikipedia

Hindustan Times

Argemone poisoning claims life in ...

India Today

10-year-old Punjab girl dies after eating her birthday cake ordered online

2 days ago

Notable Incidents Around The World

1985

•Diethylene glycol
•added to wine in
•Austria to add
•desired
•sweetness.

2003

•Insecticide
•mixed into group
•beef by a
•supermarket
•employee in
•Michigan, USA

2007

- Pufferfish
- mislabeled as
- monkfish in
- California and
- Hawaii, USA

2012

- Vodka laced
- with methanol
- in Czech
- Republic

2013

- Food containing
- horsemeat were
- mislabeled as
- beef

2015

•Maggi Ban in
•India due to
•excessive
•lead levels and
•alleged
•mislabeling

2017

- Aluminum foil
- used in place of
- edible silver leaf
- on sweetmeats in
- India

2018

❿Imported honey
❿in Canada
❿adulterated with
❿foreign sugars

2020

- Unsafe ketchup
- produced
- illegally without
- proper labeling
- or licensing in
- Punjab, India.

Some Headlines From India

Sand-clay adulteration in wheat, video went viral so case on 6 including manager of silo bag india

The video of adulteration in wheat purchased at support price in Bandha village in Rampur Baghelan area of Satna district was going viral.

adulteration in wheat. In this case of adulteration of wheat, Rampur filed a case against station...

• NEWS18

• LAST UPD

REPOR

EDITED

2,060kg of paneer made with sulphuric acid seized

Health Team Raids Factory, Arrests Owner

SUPPLIED ITEMS TO SHOPS IN CHANDIGARH, MOHALI, ZIRAKPUR

NDTV

Home | Live TV | Video | All India | South | Cities | World | Sports | People | Cheat Sheet | Polls | Forum

You are here: Home » All India »

More than 60 per cent milk in country unsafe, adulterated with paint, detergent: Government

₹1.5cr pepper coated with cancer-causing oil seized

TIMES NEWS NETWORK

Chennai: The food safety department on Wednesday seized 18 tonnes of adul... pepper...

...mineral oil was used as a fungicide and polishing agent. This is the first such sei... ...ve the spice. But black pepper coated with mineral oil gives out a kerosene-like smell," said a trader.

Experts say pepper coated ... ...ons but it can ... be identified by the colour."

He said traders engaged in the malpractices were not aware of the health risks. "No awareness campaigns are conducted to sensitise them."

SC cautions Patanjali against making 'false' claims about its medicines in advertisements

'1/3 of food samples tested in '18-19 found adulterated'

Dipak.Dash@timesgroup.com

OVER 6,400 CONVICTED IN 2 YRS

New Delhi: Almost one

How To Prevent

Mitigation strategies

Mitigation strategies should be implemented effectively to prevent or minimise vulnerabilities to food fraud. They must be specific to each company, manufacturing site and product.

Strategies 01

Comprehensive Training

Provide thorough food fraud training across all departments to ensure awareness and understanding of mitigation strategies.

02

Supplier Monitoring

Regularly monitor and approve source suppliers to minimize the risk of fraud in procurement processes.

03

Detailed Specifications

Develop precise ingredient and product specifications to ensure accurate sourcing and production.

04

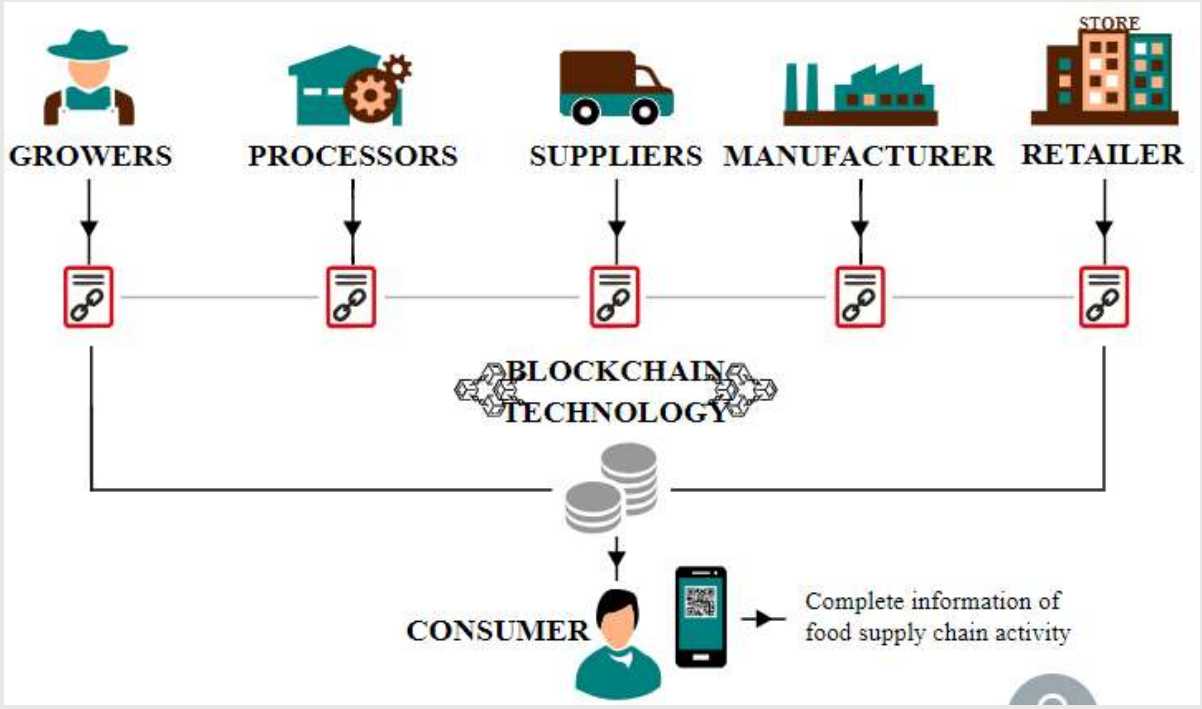
Reliable Testing

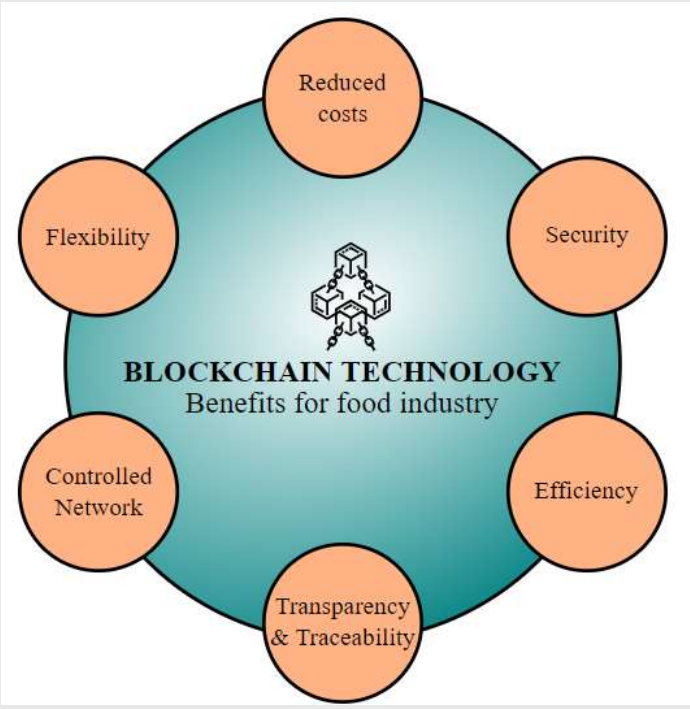
Implement robust sampling and testing protocols to verify authenticity and compliance consistently.

05

Collaboration

Foster partnerships with regulatory authorities and industry peers to share information and report suspected cases of food fraud promptly.


GROWERS
PROCESSORS
SUPPLIERS
MANUFACTURER
STORE
RETAILER
BLOCKCHAIN TECHNOLOGY
CONSUMER
Complete information of food supply chain activity


Reduced costs
Flexibility
Security
BLOCKCHAIN TECHNOLOGY
Benefits for food industry
Controlled Network
Efficiency
Transparency & Traceability

Methods To Detect Adulterants

Chemical/ Biochemical Techniques

- Chromatography Based: (Separate and detect components within food samples)
  - Technologies: High Performance Liquid Chromatography (HPLC), Thin Layer Chromatography (TLC), Gas
  - Chromatography (GC)
- Spectroscopy Based: (Analyse the interaction between electromagnetic radiation and food samples)
  - Technologies: Nuclear Magnetic Resonance (NMR), Gas Chromatography Mass Spectroscopy (GCMC), Liquid
  - Chromatography Mass Spectroscopy (LCMC)
- Electrophoresis Based: (Separate and analyze molecules based on size, charge, and mobility in electric field) Technologies: Polyacrylamide Gelectrophoresis (PAGE), Capillary Electrophoresis.

Physical Techniques

- Macroscopic and Microscopic
- Visual Structural Evaluation

Blockchain Technology

- Blockchain technology allows for the secure and transparent recording of food supply chain data.
- Blockchain tracks food products from farm to fork, aiding in adulteration detection by flagging
- inconsistencies or unauthorized alterations.

Food Safety in India

Food Safety and Standards Authority of India (FSSAI) is responsible for setting standards and regulating food in India. FSSAI conducts inspections, audits, and sampling to ensure compliance. It is mandatory for food businesses to obtain licenses or register with FSSAI.

Food Safety and Standards Act, 2006:

The Act consolidates food laws, establishes the Food Safety and Standards Authority of India, and regulates food manufacturing, storage, distribution, sale, and import. It sets science-based standards for food articles, ensuring safe and wholesome food availability for human consumption.

Conclusion

“Food fraud” significantly impacts public health, economy, and consumer trust, hindering progress towards SDGs like No Poverty and Zero Hunger by deceiving consumers and exacerbating food insecurity. It marginalizes small-scale farmers economically and erodes trust in food systems, affecting SDG 12 (Responsible consumption and production) too. Collaboration among governments, industries, and consumers is vital to enhance regulation, transparency, and awareness. By prioritizing these actions, we can mitigate food fraud's impact, advancing towards a future where safe, nutritious food is accessible to all, promoting well-being and sustainable development.

Thank You

Presented By,

Karan Rabidas : 210107040

Suraj Kumar Yadav : 210107086

Rajendra Prasad Saraswat : 210107068

Name : Rajesh Muhal
Roll NO.:1901106045
Topic : Nail Polish

What is nail polish?

- **Nail polish** (also known as **nail varnish**) is a lacquer that can be applied to the human fingernails or toenails to decorate and protect the nail plates.
- The formulation has been revised repeatedly to enhance its decorative effects and to suppress cracking or flaking.

Preparation of NAIL-POLISH: Raw materials

(1)FILM-FORMERS

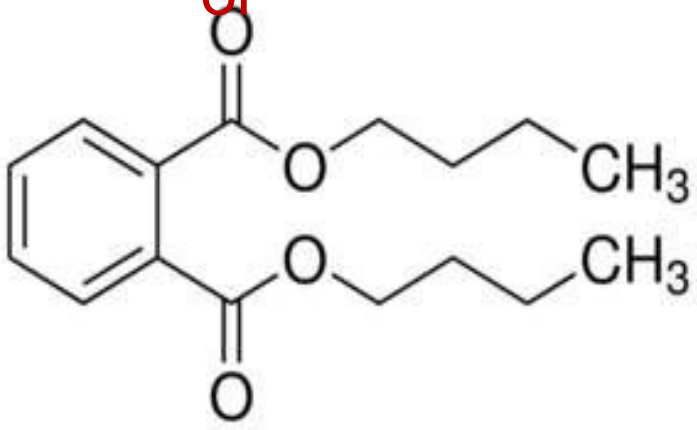
- A film-former is defined as the agent that forms the nonsticky, flexible, and glossy coat adhering to the surface of the nail after the solvents have evaporated.
- Nowdays cellulose nitrate, better known as nitrocellulose, is widely used in nail polish formulations, as it gives an excellent film transparency. It has a very low solvent retention and a quick dry-time.The film obtained is hard and exhibits good water and abrasion resistance.
- Nitrocellulose (NC) is an ester and is obtained by reaction of an acid with an alcohol. The acid is a mixture of nitric and sulfuric acid; the alcohol is one of the several hydroxy groups on the cellulose heterocycles. The simplified reaction is:

$$ROH + HN0_3 \rightarrow RONO_2 + H_20$$

(2)PLASTICIZERS

- Nitrocellulose forms a very bright and transparent film, but it is very tough and can be brittle. The nail plate is flexible and grows, and the film must adapt to this flexible, moving, and changing surface.
- The nail polish formulator has to include components that will make the film more flexible: the plasticizers.
- They must remain in the film; hence they have a very high boiling point. They must be compatible with the solvents and other components.
- E.g. Dibutyl phthalate, Camphor

Camph
or



Dibutyl
phthalate

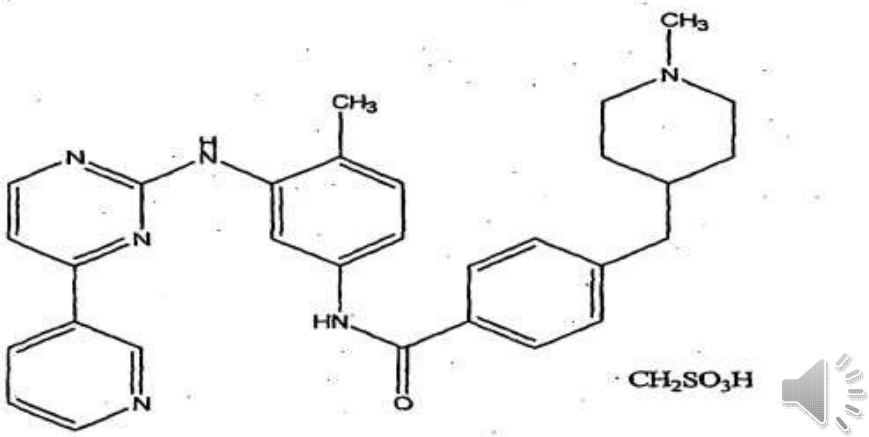
(3)RESINS

- Any polymer that remains in the dry film and improves film properties (film formation, evaporation of solvents, hardness, flexibility, resistance to abrasion, gloss, etc.) is commonly identified as a resin.
- The natural resins are benzoin, dewaxed dammar gum.
- Nowdays most commonly used families of resins are aryl sulfonamide resins, acrylic copolymers, vinyl esters, vinyl acetates/vinyl chloride copolymers, and polyesters.

vinyl esters

(4)THICKENING AGENTS

- Thickening agents are added to maintain the sparkling particles in suspension while in the bottle.
- E.g. Stearalkonium hectorite.
- Thickening agents exhibit thixotropy, their solutions are viscous when still but free flowing when agitated.
- This duality is convenient for easily applying the freshly shaken mixture to give a film that quickly rigidifies

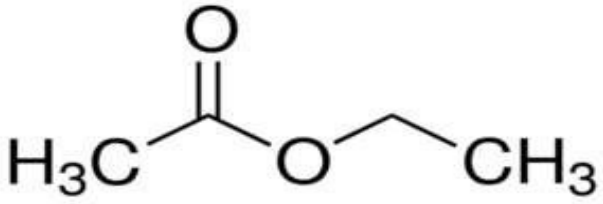


(5)PIGMENTS

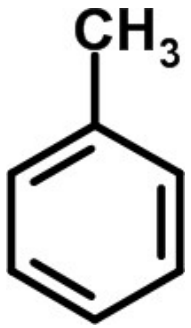
- The DCMA (Dry Color Manufacturers Association) defines a pigment as a colored particulate organic or inorganic solid that is usually insoluble and unaffected by, the vehicle or substance into which it is incorporated.
- pigments are divided into three categories:
- 1)mineral pigments or inorganic pigments, e.g. iron oxides
- 2)organic pigments, e.g. barium sulfate
- 3)nacreous pigments e.g. coated mica.

(6)SOLVENTS

- Solvents are liquids that allow a nail polish to flow and make it applicable.
- They also play a primary role in the dry-time of the film and in the characteristics of the dry film.
- The first criteria that these products must meet is innocuousness.
- All the solvents used in modern nail polishes belong to one of the categories of esters(ethyl acetate, butyl acetate, etc.), aromatics (toluene, xylene, etc.), alcohols(ethyl alcohol, butyl alcohol, etc.) or silicones.

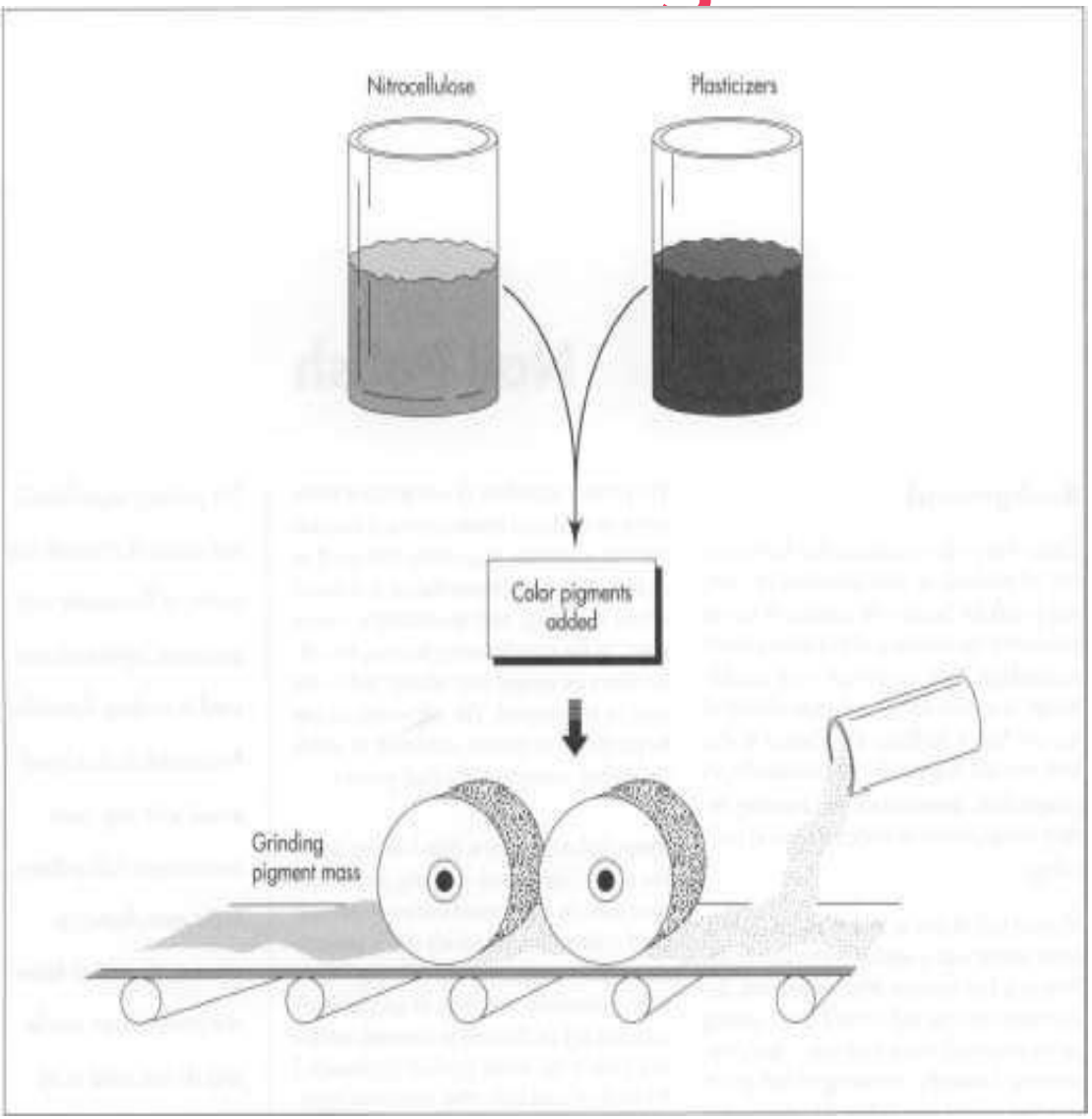


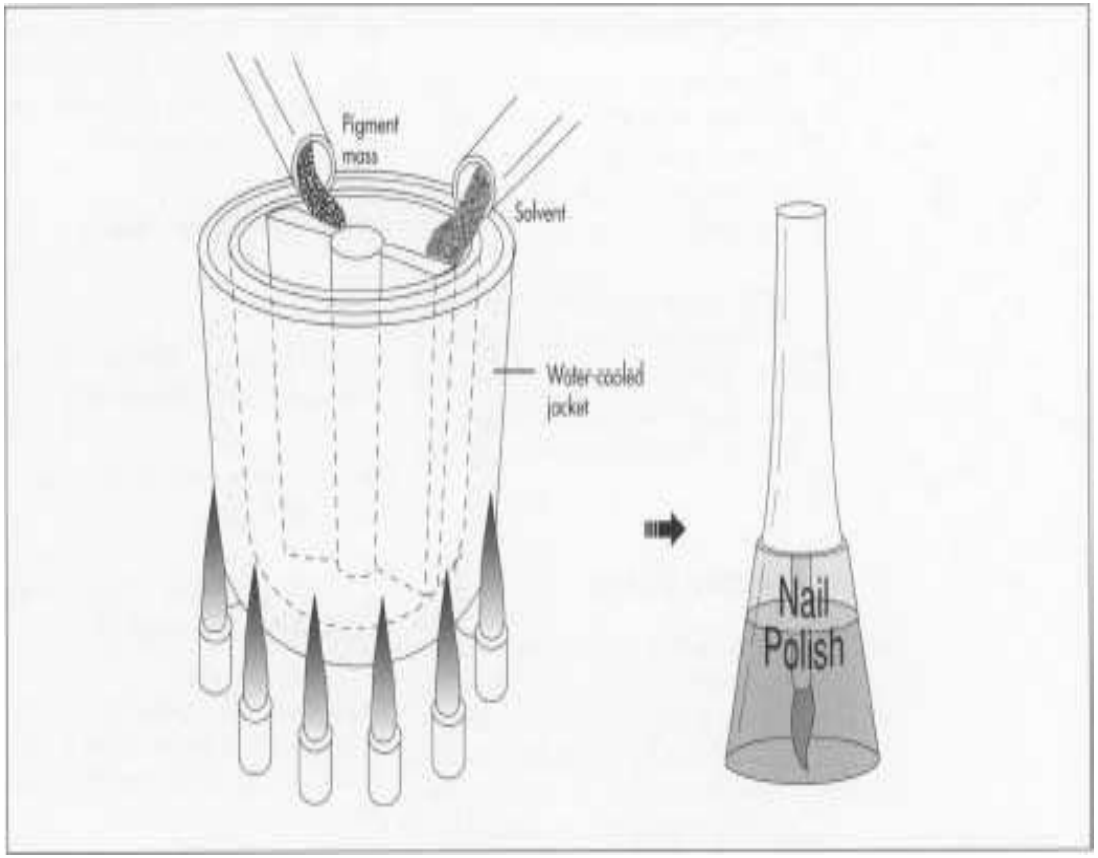
Ethyl acetate



Toluene

Manufacturing Process





Simple Formula

No.	Ingredients	Quantity(%)	Use
1	Nitrocellulose (30% IPA)	13.0	Film former
2	Formaldehyde resin	11.0	To make film adhere
3	Dibutyl phthalate	5.0	Plasticizer
4	Ethyl acetate	22.0	Solvent
5	Butyl acetate	41.0	Solvent
6	Isopropyl alcohol (IPA)	6.0	Solvent
7	Stearalkonium hectorite	2.0	Thickening agent
		100.0	

ADVANTAGES

- Prevent nail from scratches
- Improve strength of nails

DISADVANTAGES

- Cause cancer(majorly skin cancer)
- Nails become weak and brittle
- With continuous use nail not receive natural light so effect the growth of it
- Gaps develop between polished nails and cuticles
- Long time uses cause yellow nails
- Not easily removable without use of nail lacquer remover


Thank you
SAY IT WITH
POLISH

FOOD PRESERVATIVES

Safeguarding Freshness and Quality

CH-419

CONSUMER CHEMISTRY

Chinmoyee Sonowal 210107021
Mokshika Kureti 210107053
Sonali Tudu 210107083

What is Food Preservation?

Food preservation can be defined as the process of treating and handling food in such a way as to stop or greatly slow down spoilage.

Prevent foodborne illness while maintaining nutritional value, texture and flavour.

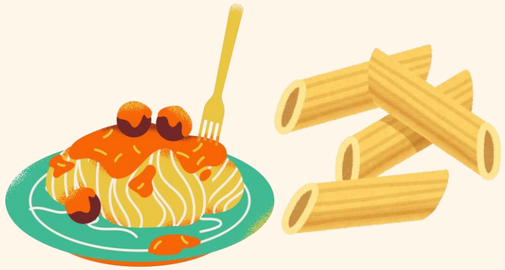
Food preservatives are substances employed to ensure safety and avoid quality loss derived from microbial, physical–chemical, or enzymatic reactions

Food preservation methods

Traditional method

Drying

Sun drying
eg. Pasta, rice, and powdered milk



Fermentation

Microbial preservation (in absence of oxygen)
eg. Cheese, yogurt, and wine

Sugaring

Sealing food with sugar
eg. Jam, jelly, and marmalade

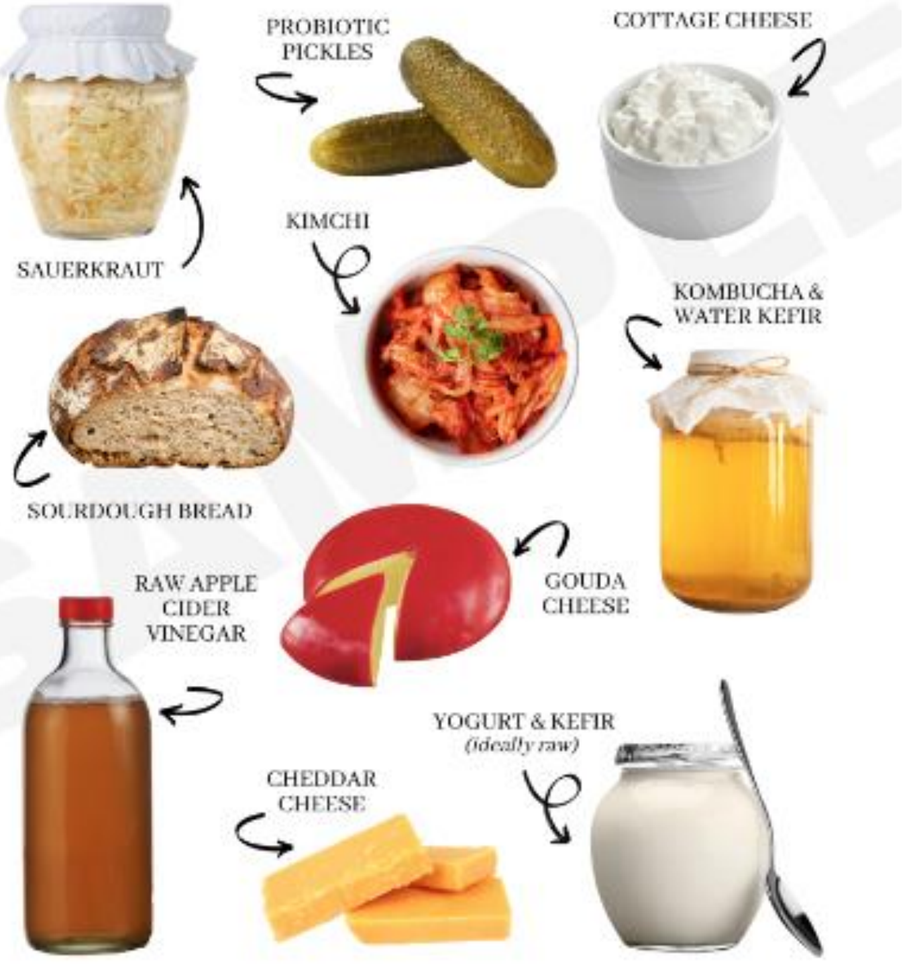
Salting

Sealing food with salt
eg. Salted fish and eggs

vinegar

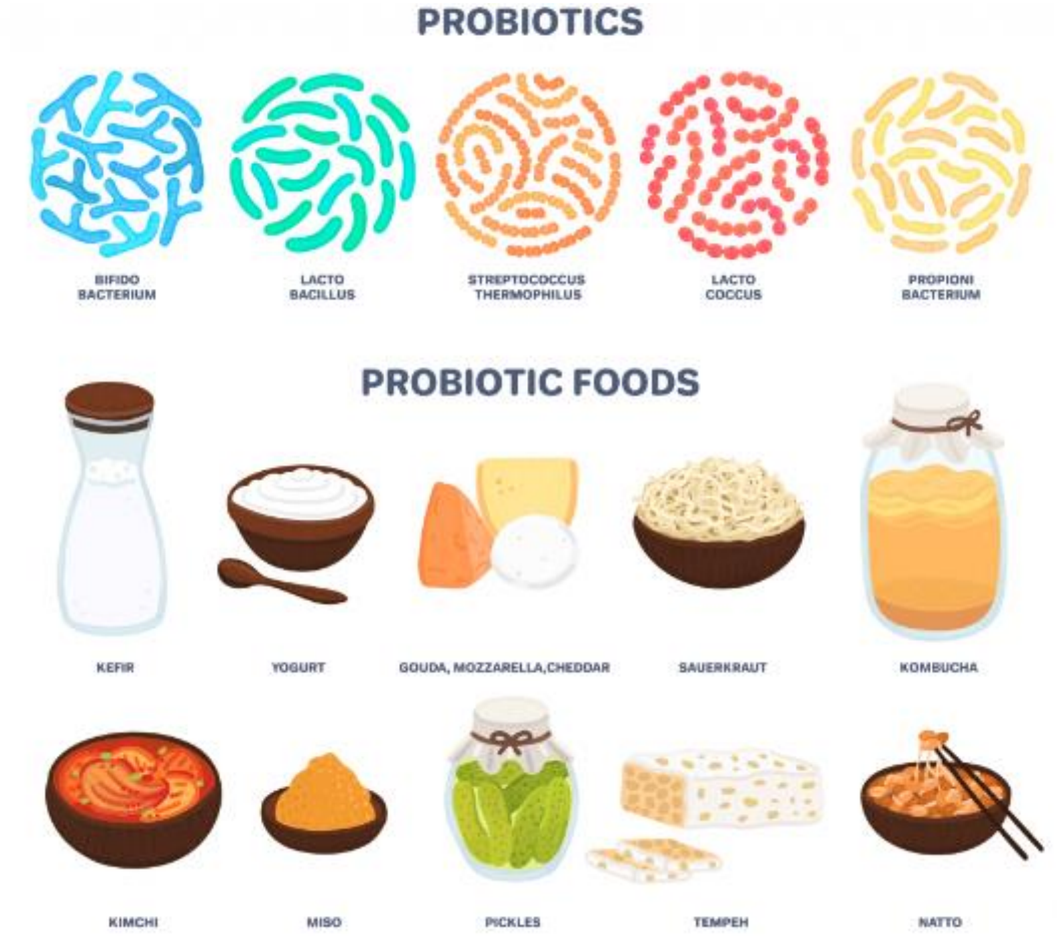
Pickling
eg. Pickled fruit and vegetables

Fermented Foods



Examples of Common Fermented Foods

- Saurekraut
- Kimchi
- Sour Pickles
- Olives
- Capers
- Dilly Beans
- Water Kefir (aka Tibicos)
- Kombucha
- Yogurt
- Milk Kefir
- Almond Milk Kefir
- Creme Fraiche
- Buttermilk
- Farmstead cheese
- Miso
- Tempeh
- Fish Sauce
- Soy Sauce
- Fermented Black Bean



Food preservation methods

Modern method

Vacuum packing

Vacuum-sealed bag
eg. Vacuum-sealed seafood and meat

Refrigeration

Cold storage
eg. Refrigerated meat, fruit, and vegetables

Freezing

Food freezing
eg. Frozen meat and seafood

Pasteurization

Heating food at a set temperature
eg. Skim milk, cider, and eggs

Canning

Pressure canning
eg. Pickles, jam, and canned fish

Types of food preservatives

Natural Preservatives

Examples include salt, sugar, vinegar, and plant extracts like rosemary and citrus oils.

Chemical Preservatives

Commonly used synthetic compounds such as benzoates, sulfites, and nitrites.


Rosemary Extract is a natural preservative that's high in antioxidants and calms the skin.
USED IN UNDERCOVER FACE CREME

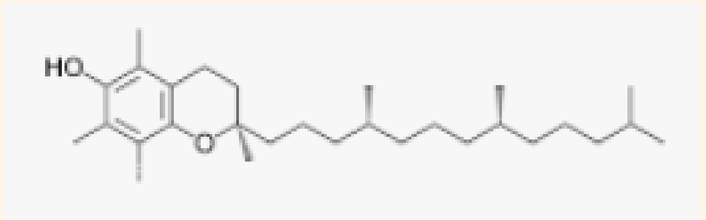

गुलमेंहदी के स्वास्थ्य लाभ
मूड में सुधार करता है
लाल रक्त कोशिकाओं के उत्पादन को बढ़ाता है
जीवाणिक संक्रमण से लड़ता है
पीड़ानाशक/ दर्दनाशक गुण
रोगों और रोगजनकों से लड़ता है
प्रज्वलनरोधी गुण
स्टैफाइलोकॉकी संक्रमण से बचता है
त्वचा के लिए गुणकारी है
पेट खराब होने का घरेलू उपाय है
मुखवास के रूप में काम करता है


Rosemary
- Cancer prevention
- Improved memory
- Mood elevator
- Migraine relief
- Pain relief
- Anti-inflammatory
- Immune booster
- Antibacterial
- Digestive health
- Hair growth
- Improved circulation
- Fresh breath
- Diuretic properties
- Respiratory health
- Liver Detoxification

Types of food preservatives

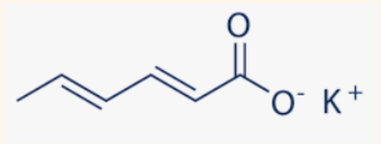
Antioxidants

Compounds like vitamin E and vitamin C that prevent oxidation and rancidity.



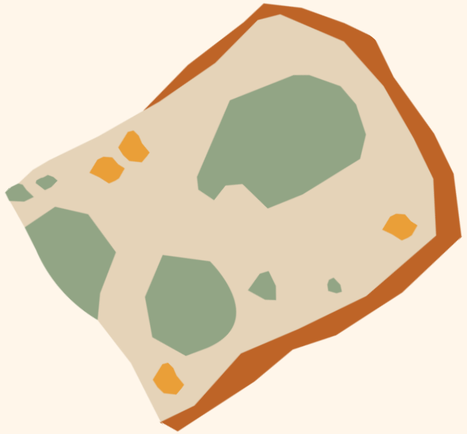
Microbial Inhibitors

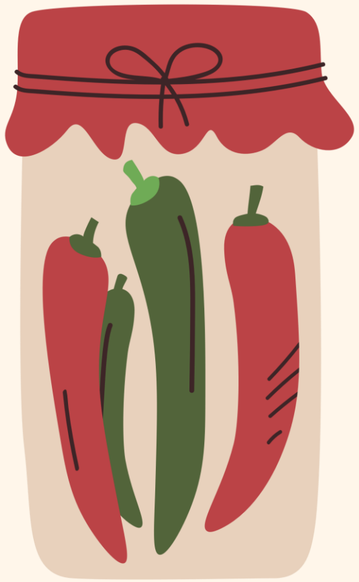
Substances like Potassium Sorbate and Sodium Benzoate that inhibit microbial growth.

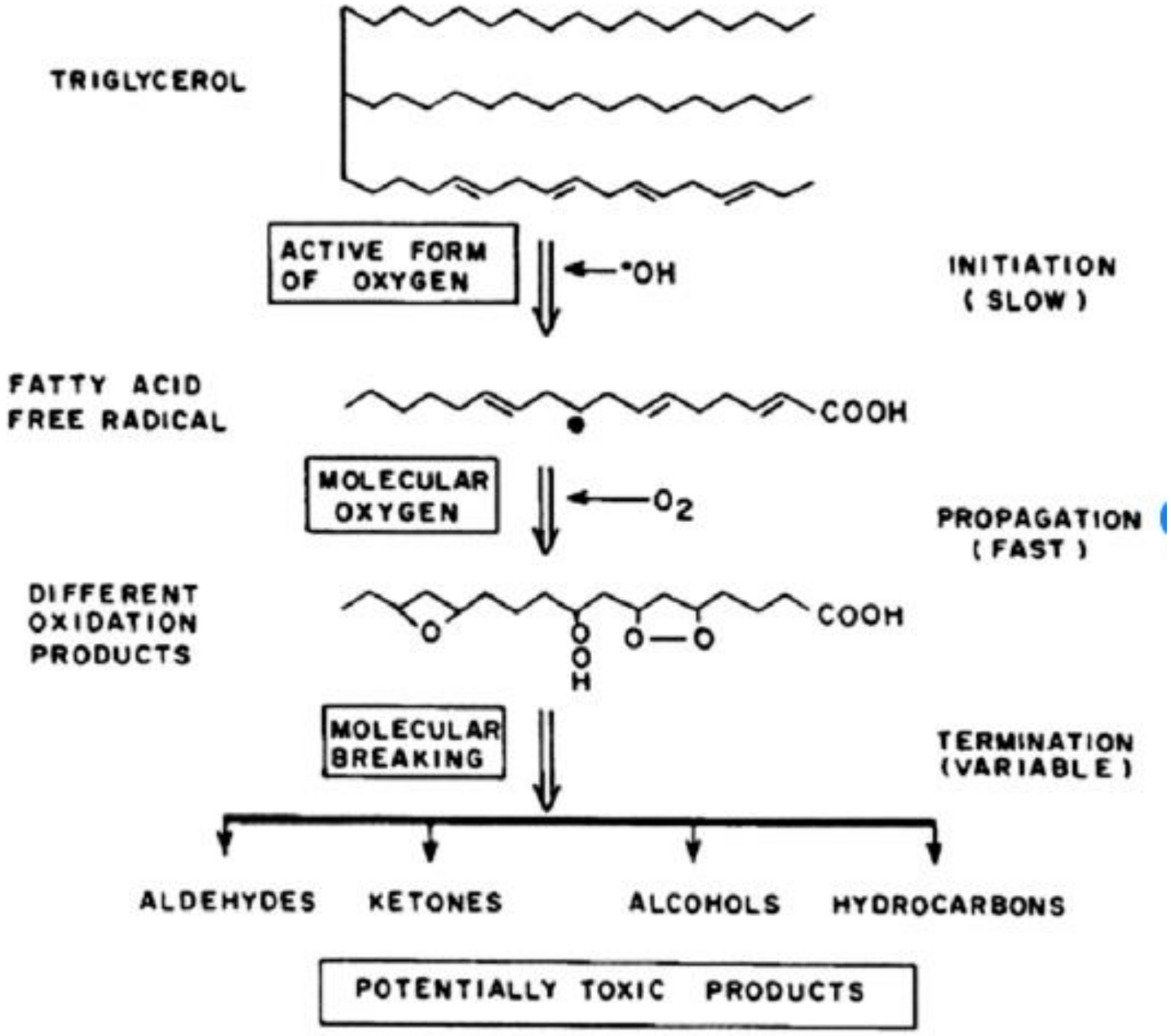


Functions of Food Preservatives

- Inhibit Microbial Growth: Prevent bacteria, yeast, and mold from proliferating in food.
- Delay Oxidation: Protect fats and oils from becoming rancid due to exposure to oxygen.
- Maintain Flavor and Texture: Preserve the sensory qualities of food over time.
- Extend Shelf Life: Prolong the period during which food remains safe and palatable for consumption.







How to Tell If an Oil Is Rancid

0 comments

Oil doesn't keep forever. To learn when it's time to ditch the bottle, read on.

By Kathleen Brennan

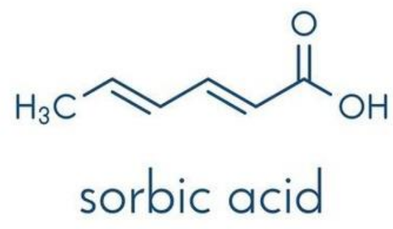
Published Feb. 18, 2021.

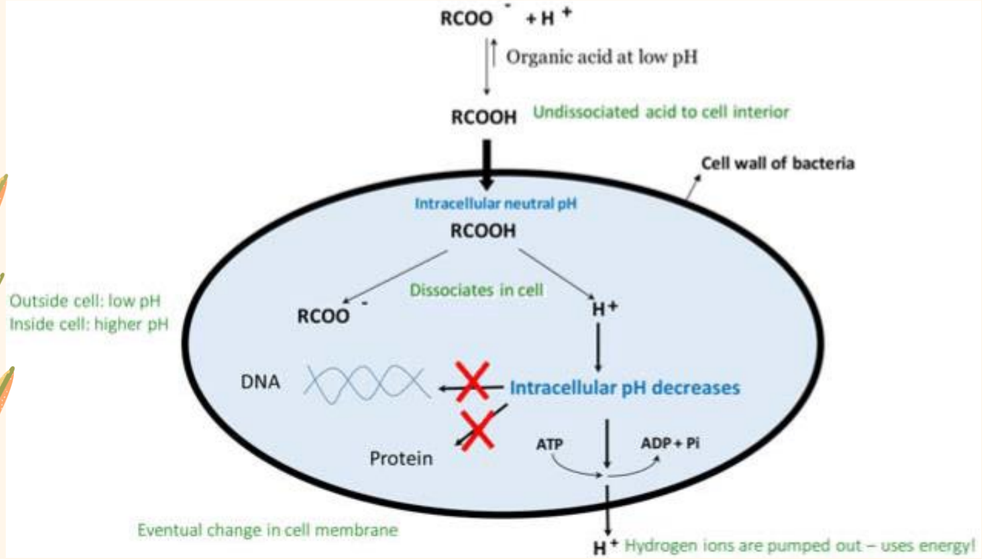
PRINT SAVE

Mechanism

1. Acidification:

Mechanism: Organic acids such as Sorbic acid and Benzoic acid, as well as their salts (e.g., potassium sorbate, sodium benzoate), dissociate in aqueous environments to release hydrogen ions (H+), thus lowering the pH. This decrease in pH creates an acidic environment, which inhibits the growth of many microorganisms.





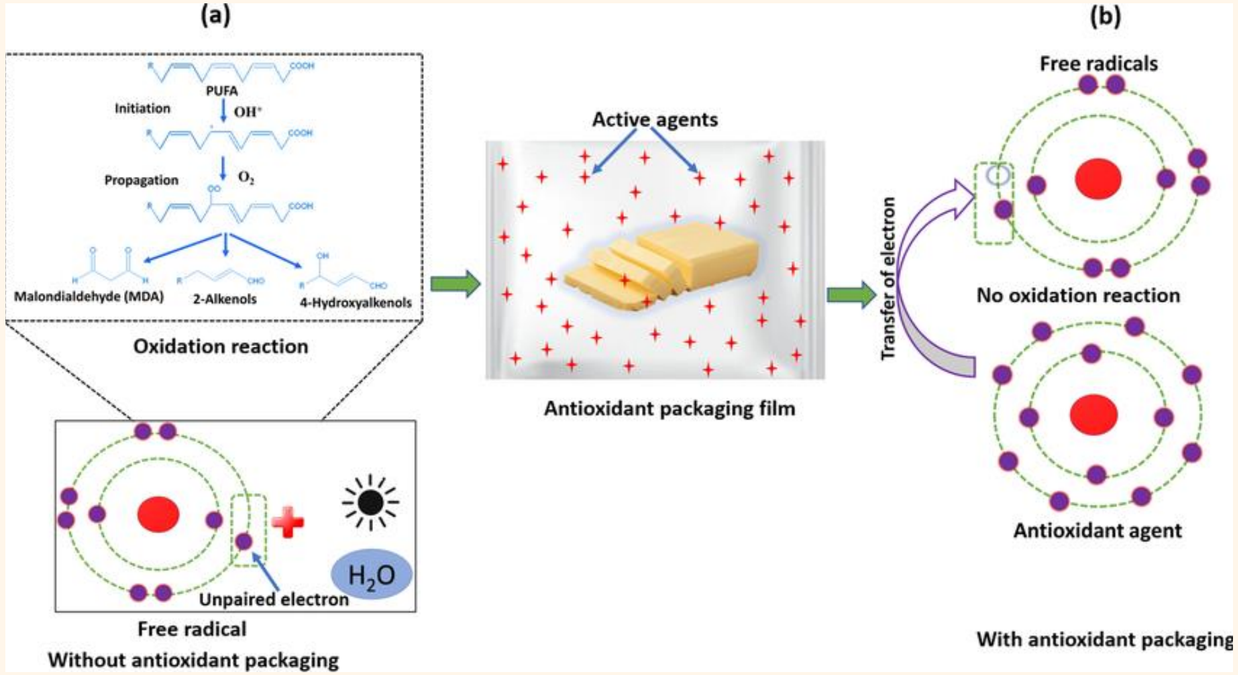
Effect: Most microorganisms thrive within a narrow pH range around neutrality. Lowering the pH disrupts their internal pH balance, impeding enzymatic activity and metabolic processes crucial for growth and survival.

Applications: Acidic preservatives are commonly used in food products, beverages and personal care items to prevent spoilage by bacteria, yeasts, and molds.

Mechanism

2. Oxidation :

Mechanism: Antioxidants such as Butylated Hydroxyanisole (BHA) and Butylated Hydroxytoluene (BHT) inhibit oxidation reactions by scavenging free radicals or interrupting chain reactions involved in lipid peroxidation.



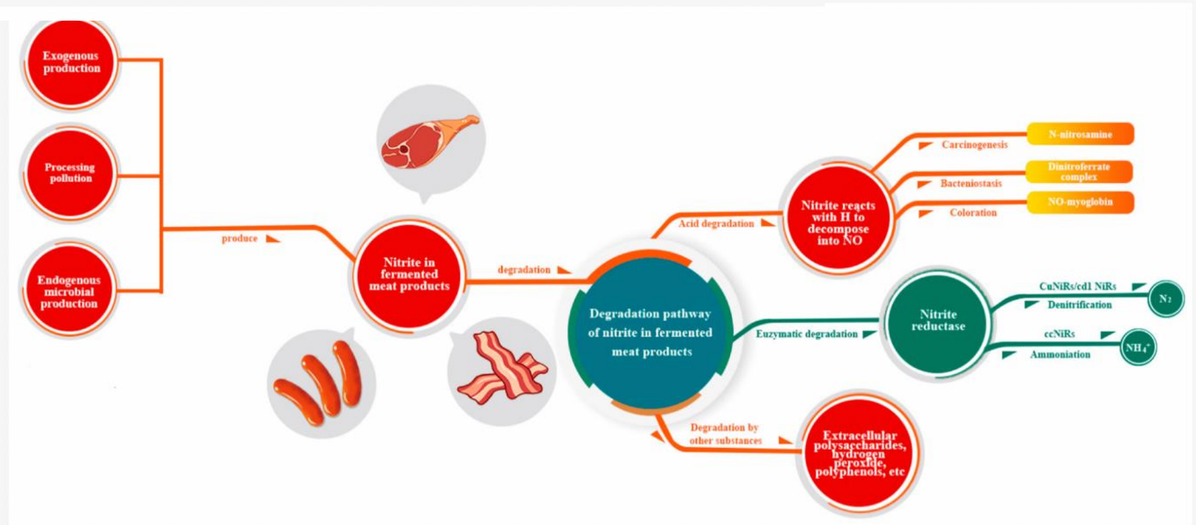
Effect: Oxidative processes contribute to the degradation of fats, oils, and other susceptible molecules, leading to rancidity, off-flavors, and loss of product quality. Antioxidants prevent or delay these reactions, thus extending the shelf life of products.

Applications: Commonly used in fatty foods, oils, snacks, and cosmetics to prevent oxidative deterioration.

Mechanism

3. Inhibition of Enzymatic Activity:
   - Mechanism: Preservatives like Sulfites and Nitrites inhibit specific enzymes involved in microbial metabolism,
   - particularly those essential for cellular respiration and energy production.

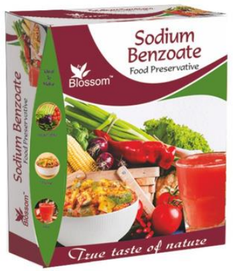
. Metabolic pathway of nitrite in fermented meat products.



- Effect: Without functional enzymatic pathways, microorganisms are unable to generate ATP (adenosine triphosphate), the primary energy currency of cells, leading to growth inhibition and eventual cell death.
- Applications: Commonly employed in food preservation, particularly in meat products, to prevent the growth of spoilage bacteria and pathogens like Clostridium botulinum.

Commonly Used Food Preservatives

- Sodium Benzoate: Widely used in acidic foods like soft drinks, fruit juices, and condiments.
- Sulfites: Prevent browning in dried fruits and wines, but may trigger allergic reactions in some individuals.
- Nitrites/Nitrates: Preserve color and inhibit bacterial growth in processed meats like bacon and deli meats.
- Sorbic Acid: Found in cheese, baked goods, and dairy products to prevent mold growth.



Safety and Regulation of Food Preservatives

- Regulatory Oversight: Government agencies like the FDA and EFSA set safety standards and maximum allowable limits for preservatives in foods.
- Consumer Awareness: Educating consumers about the risks and benefits of food preservatives to make informed dietary choices.
- Adverse Effects: Excessive consumption or sensitivity to certain preservatives may lead to allergic reactions or other health issues.

Alternatives to Synthetic Preservatives

- Clean Label Movement: Growing consumer demand for natural and minimally processed foods has led to the development of alternative preservation methods.
- Natural Antimicrobials: Research into natural compounds with antimicrobial properties, such as essential oils and plant extracts.
- Packaging Innovations: Advances in packaging materials and technologies to extend shelf life without the need for added preservatives.

Conclusion

- Summary: Food preservatives play a vital role in ensuring food safety, reducing food waste, and extending shelf life.
- Balance: Striking a balance between the convenience of processed foods and the desire for natural, minimally processed alternatives.
- Future Trends: Continued innovation in preservation techniques and increased consumer awareness of food ingredients and labeling.

Thank you for tuning in!

CHEMISTRY OF EMBALMING AND ITS WORKING PRINCIPLE

PRESENTED BY:

VINEET R JAGGA, 210107096

SHIVARAJ R KOLLI, 210107080

TARUN, 210107088

TABLE OF CONTENTS

INTRODUCTION

- Embalming, the practice of preserving human remains, has been a longstanding tradition in various cultures throughout history. While the methods and materials used in embalming have evolved over time, the fundamental principles remain rooted in chemistry. This report delves into the role of chemistry in embalming, exploring the various chemical processes and substances involved in preserving human remains.

CHEMICAL AGENTS USED IN EMBALMING

- **Formaladehyde:**

Formaldehyde is the most widely used chemical in embalming fluid formulations. It acts as a primary preservative by cross-linking proteins in the tissues, thus preventing the breakdown of organic matter. Formaldehyde also exhibits antimicrobial properties, inhibiting the growth of bacteria and fungi that contribute to decay.

- **Methanol and Ethanol:**

Methanol and ethanol are commonly added to embalming solutions as co-solvents or stabilizers. These alcohols aid in maintaining the stability of the formaldehyde solution and help control the rate of fixation during the embalming process.

- **Phenol Compounds:**

Phenol compounds, such as phenol and cresol, are used as supplemental disinfectants in embalming fluids. They serve to enhance the antimicrobial activity of the solution and provide additional protection against decay-causing microorganisms.

- **Buffers and pH Adjusters:**

Buffering agents like sodium phosphate or sodium bicarbonate are included in embalming solutions to control pH levels. Maintaining an optimal pH is crucial for ensuring the effectiveness of formaldehyde fixation and preventing tissue damage.

- **Glycerin:**

Employed as a humectant and tissue-dehydrating agent, glycerin helps maintain tissue pliability while extracting excess moisture from the cells.

CHEMICAL PROCESS IN EMBALMING

- **Fixation:** The primary objective of embalming is to halt the decomposition process by fixing the tissues of the body. This is achieved through the use of chemical fixatives, such as formaldehyde. Formaldehyde works by cross-linking proteins in the tissues, preventing bacterial degradation and preserving the structural integrity of the body.

- **Disinfection:** In addition to preservation, embalming serves to disinfect the body, preventing the spread of infectious diseases. Formaldehyde and other embalming fluids possess antimicrobial properties, effectively killing bacteria and other pathogens present in the body.

- **Dehydration:** Another crucial aspect of embalming is the removal of excess moisture from the tissues, which helps prevent microbial growth and tissue deterioration. Dehydrating agents, such as alcohol and glycerin, are commonly used to extract water from the cells, aiding in the preservation process.

- **pH Balance:** Maintaining the pH balance of the embalming fluid is essential for optimal preservation. pH-adjusting chemicals, such as buffers, are incorporated into embalming solutions to ensure a stable environment that inhibits microbial growth and tissue breakdown.

- **Tissue Restoration:** In cases where trauma or injury has occurred to the body, chemical agents may be employed to restore the appearance of damaged tissues. Adhesive sealants, tissue builders, and cosmetic dyes are utilized to conceal imperfections and create a more lifelike appearance.

BASIC PRINCIPLES OF EMBALMING

- **Sanitization and Disinfection:** Before embalming begins, the body is thoroughly cleaned and sanitized to remove any contaminants. Disinfectants are applied to eliminate bacteria, viruses, and other pathogens that could contribute to decomposition or pose a health risk.

- **Arterial Embalming:** The primary method of embalming involves arterial injection, where embalming fluid is introduced into the body's circulatory system through an artery, typically the carotid or femoral artery. This process ensures thorough distribution of embalming fluid throughout the body, reaching all tissues and organs.

- **Cavity Embalming:** In addition to arterial embalming, the body's internal cavities, such as the abdominal and thoracic cavities, may be treated with concentrated embalming fluid to preserve internal organs and tissues.

- **Tissue Preservation**: Embalming fluids contain chemical agents, such as formaldehyde, that act as fixatives to preserve tissue structure. These chemicals cross-link proteins in the cells, inhibiting decomposition and maintaining the body's natural appearance.

- **Moisture Removal:** Excess moisture within tissues can accelerate decomposition. Embalmers use dehydrating agents, such as alcohol and glycerin, to remove moisture from the cells, preventing microbial growth and tissue breakdown.

- **Restoration:** In cases of trauma or damage to the body, embalmers may utilize cosmetic techniques and tissue-building materials to restore a natural appearance. Adhesive sealants, tissue fillers, and cosmetic dyes are applied to conceal wounds and create a lifelike appearance for viewing.

- **pH Regulation:** Maintaining the pH balance of the embalming fluid is crucial for preservation. Buffering agents are added to adjust the acidity or alkalinity of the solution, creating a stable environment that inhibits microbial growth and tissue deterioration.

- **Ethical Considerations:** Embalmers adhere to ethical standards and cultural practices when handling human remains. Respect for the deceased and sensitivity to the wishes of the family are paramount throughout the embalming process.

- By adhering to these basic principles, embalmers are able to effectively preserve and prepare human remains with dignity and respect, ensuring a meaningful and dignified farewell for the deceased.

MODERN TECHNIQUES AND ADVANCEMENTS IN EMBALMING

- **Bio-Embalming Agents:**
  - Utilization of biologically derived embalming fluids, reducing environmental impact and health risks.

- **Minimally Invasive Procedures:**
  - Adoption of techniques such as needle aspiration embalming, reducing tissue trauma and improving cosmetic results.

- **Nanotechnology Applications:**
  - Integration of nanoparticles for targeted delivery of embalming agents, enhancing tissue preservation while minimizing fluid usage.

- **Digital Imaging and Reconstruction:**
  - Implementation of 3D scanning and reconstruction technologies to digitally preserve and recreate facial features, aiding in restoration.

- **Post-Mortem Imaging:**
  - Adoption of advanced imaging techniques such as CT scans and MRI to guide embalming procedures and ensure thorough preservation of internal structures.
- **Bioplastics and Biodegradable Materials:**
- Development of eco-friendly alternatives to traditional embalming materials, reducing environmental impact and promoting sustainability.

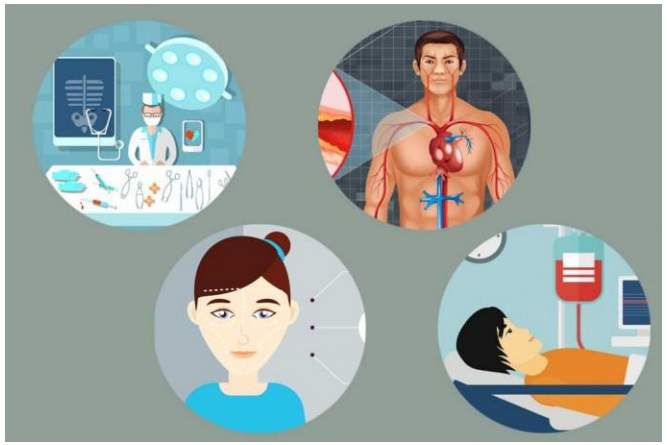
ENVIRONMENTAL IMPACT AND HEALTH CONSIDERATIONS

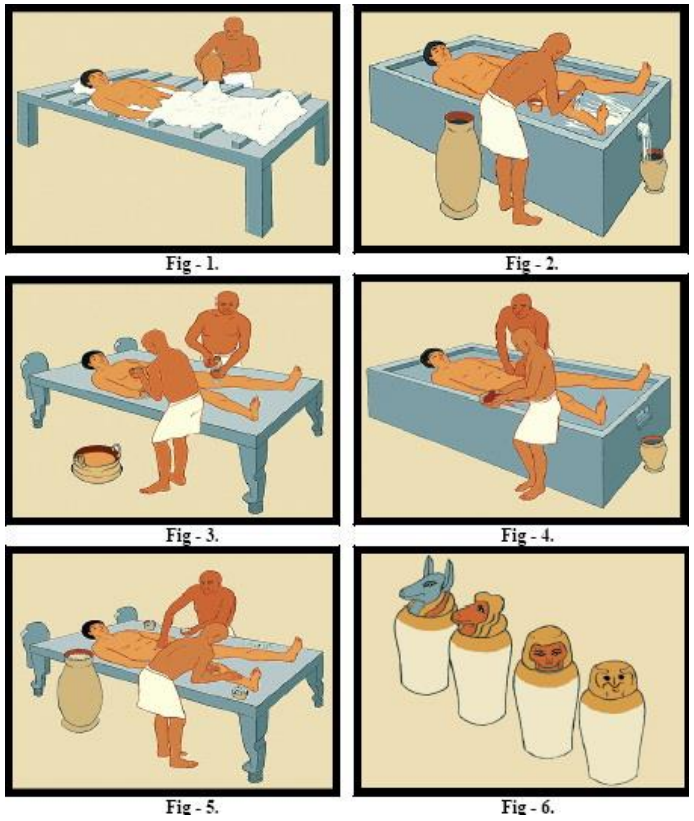
- **Environmental Impact**:

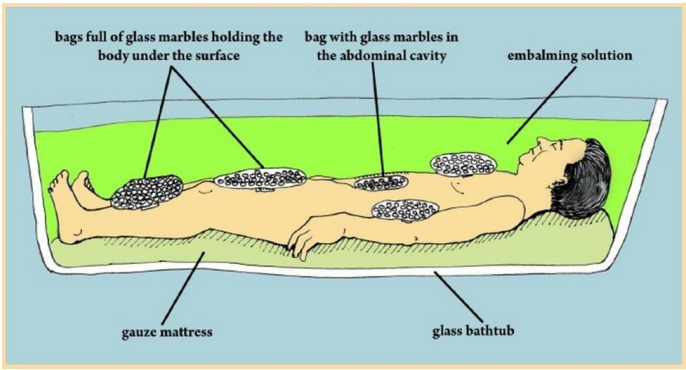
The use of embalming chemicals, particularly formaldehyde, has raised environmental concerns due to its potential toxicity and persistence in the environment. Efforts are being made to develop alternative embalming methods and eco-friendly formulations to mitigate these issues.

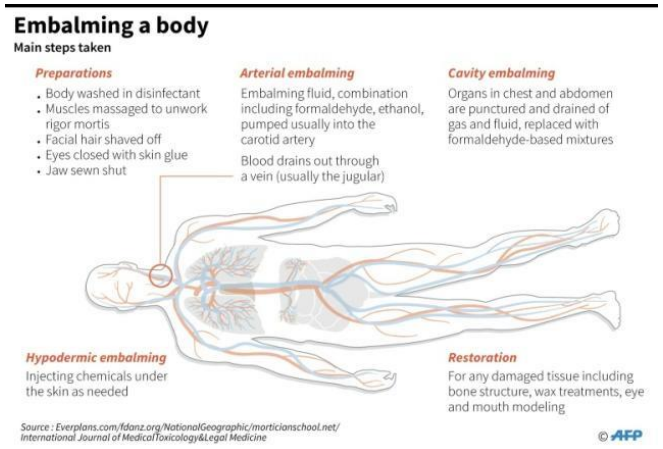
- **Occupational Health Risks**:

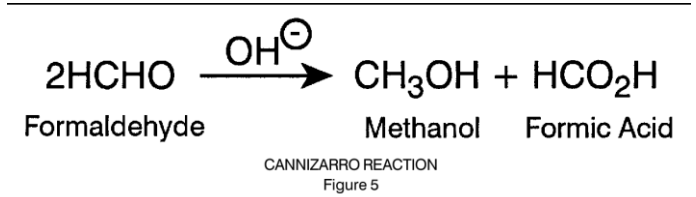
Embalmers and funeral home workers may be exposed to chemical hazards during the embalming process. Proper ventilation, personal protective equipment (PPE), and adherence to safety protocols are essential for minimizing occupational health risks associated with handling embalming chemicals.











CANNIZARRO REACTION
Figure 5

THE CHEMISTRY OF MUMMIFICATION

Dressing up as a mummy for Halloween is easy; actually becoming one is a little more complicated. This graphic looks at the chemistry behind embalming.

DRYING THE BODY

Na_2CO_3 — SODIUM CARBONATE

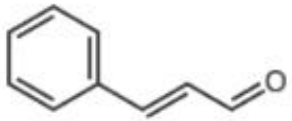
$NaHCO_3$ — SODIUM BICARBONATE

$NaCl$ — SODIUM CHLORIDE

Na_2SO_4 — SODIUM SULFATE

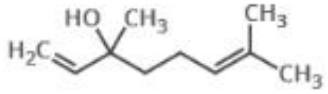
After the organs were removed, the empty cavities were stuffed with natron, a naturally occurring mixture of sodium carbonate and sodium bicarbonate, and small quantities of sodium chloride and sodium sulfate. This caused rapid desiccation of the body and saponification of fats, preventing decomposition.

FILLING BODY CAVITIES



CINNAMALDEHYDE

Present in cinnamon and cassia



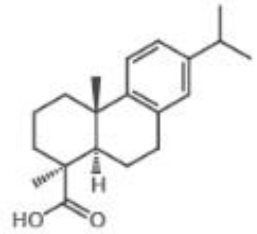
LINALOOL

Present in cassia and mastic

After drying the body could be stuffed with a range of materials before embalming. Along with sawdust and linen, these included myrrh, cinnamon, frankincense, cassia, mastic resin, and even onions! Some of these substances contained compounds with antimicrobial activity that could aid the preservation of the body.

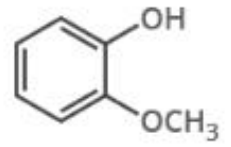
EMBALMING MATERIALS

Mummies were bandaged with linen, and after every layer oils, resins and balms were applied. Compounds found in mummy wrappings give hints as to some substances used, which included coniferous, cedar, and pistacia resins, beeswax, and bitumen. When dried, these materials formed a water-resistant seal.



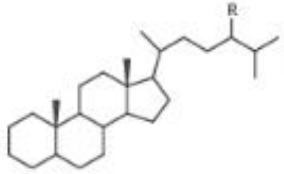
DEHYDROABIETIC ACID

Derivatives of abietic acid are common indicators of the use of coniferous resins in the embalming process.



GUAIACOL

Phenolic compounds found in some resins, such as cedar oil, have bactericidal effects and inhibit decomposition.

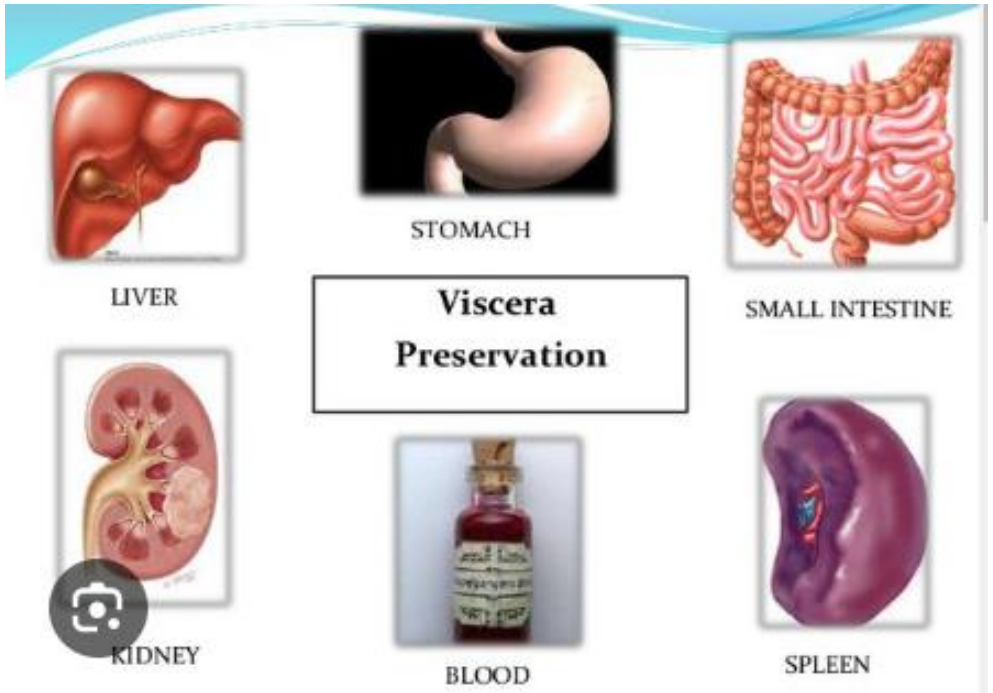


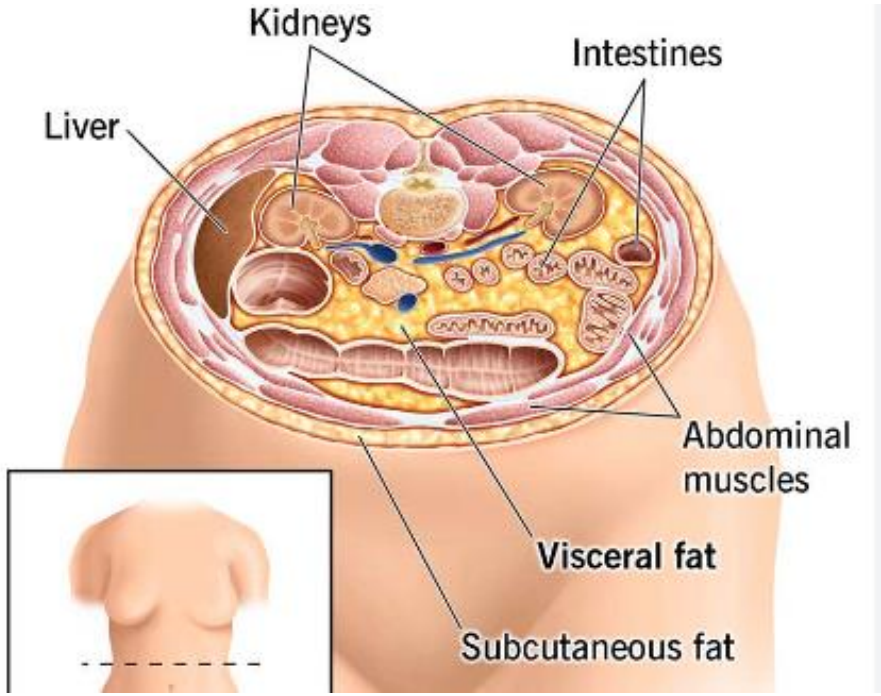
STERANE (GENERAL STRUCTURE)

Compounds called steranes and hopanes can show whether bitumen was used during embalming.

The use of bitumen is often linked to the black appearance of some mummies, but this can also be caused by resin degradation products.

What Is Viscera Report? Know Everything About This.





THANK YOU

TEA VS COFFEE

COFFEE IS NOT, MY CUP OF TEA

CONTENT

- INTRODUCTION
- TEA (Key Compounds)
- COFFEE (Key Compounds)
- TEA VS COFFEE
- AROMA AND FLAVOUR CHEMISTRY
- BREWING METHODS
- CONCLUSION

Utkarsh Raja-210107091
Anshika Meshram-210107050
Siddhant Srivastava -210107081

INTRODUCTION

Tea and coffee are two of the most beloved and widely consumed beverages globally.

Tea has a rich cultural heritage, with origins in ancient China, India, and Japan.

Coffee, on the other hand, has a more recent history, originating in the Arab world and spreading across Europe and the Americas.

Both beverages have become integral parts of daily life, connecting people across continents.

TEA

Tea is deeply entrenched in cultures worldwide, with around 2.5 million tons of dried tea manufactured annually.

The leaves come from the tea shrub, a variety of Camellia.

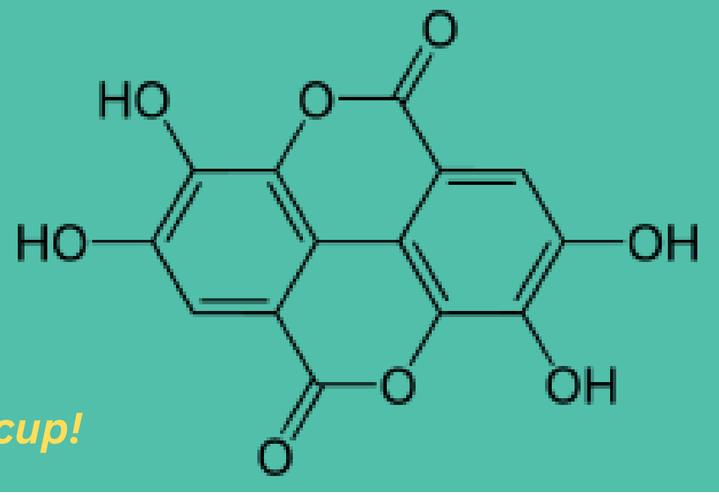
Tea, or cha is an aromatic beverage prepared by pouring hot or boiling water over cured or fresh leaves of Camellia sinensis.

Key Compounds in Tea

- **Polyphenols** (catechins) -

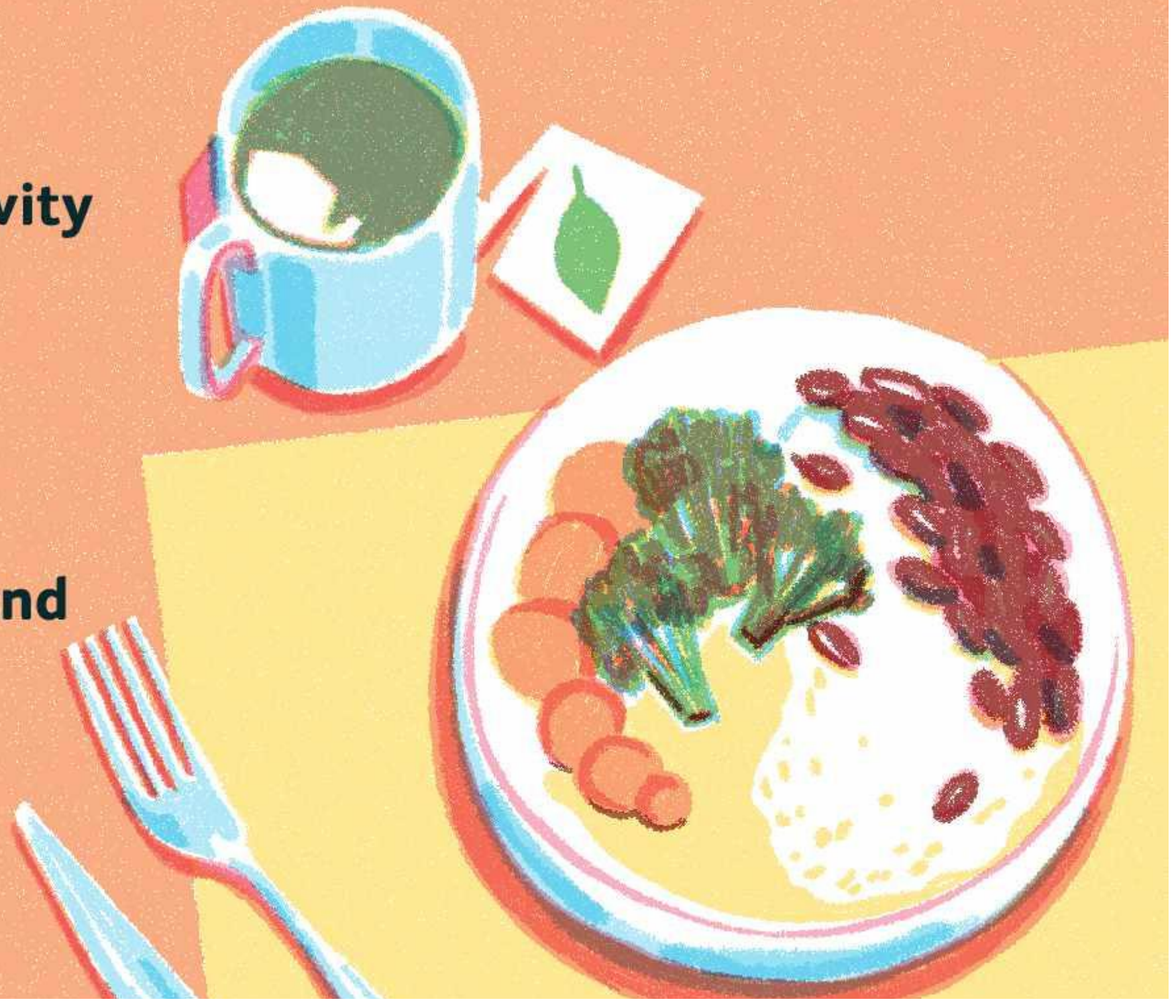
- These make up 39% of the dry weight of fresh tea leaves.
- They add a bit of bite to your brew and pack a punch of antioxidants for your health.

Polyphenols are the superheroes of your cup!



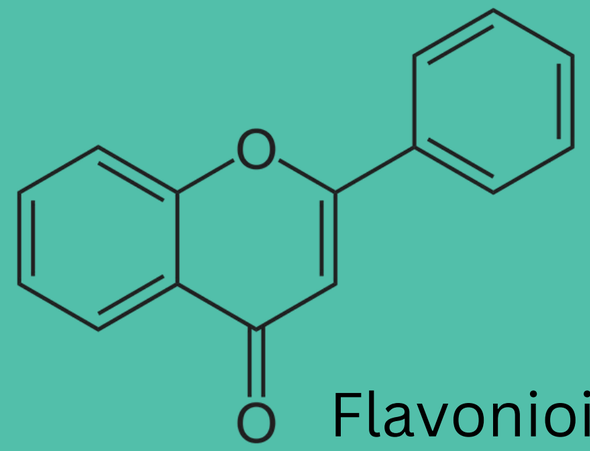
Health Benefits of Polyphenols

- Lower blood sugar
- Increase insulin sensitivity
- Decrease cancer risk
- Reduce inflammation
- Improve heart health and digestion
- Boost brain function



- **Flavonoids** -

- These are metabolites produced by the plant as a defense against predators.
- They help combat free radicals in the body, which are associated with aging and diseases like cancer and heart disease.
- Contribute to the flavor and aroma of tea .



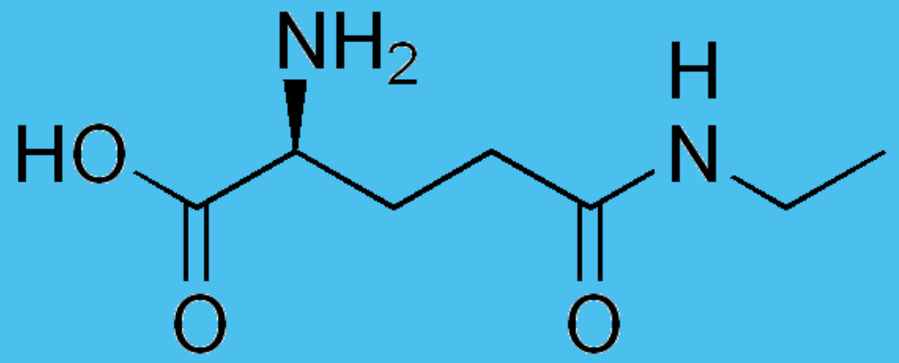
Flavonioid

- **Amino acids** (theanine) -

- Especially found in varieties like green tea and matcha.

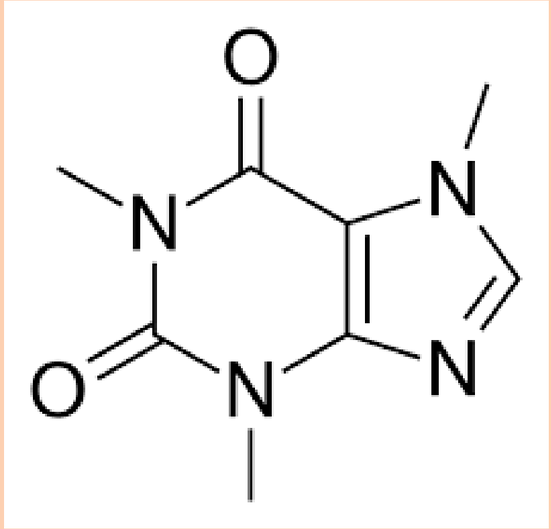
- Influence brain function by promoting the generation of alpha brain waves and are associated with a state of relaxed alertness, often experienced during meditation or deep relaxation

Theanine



- **Caffeine** -

- delivers a characteristic bitter taste and a mild stimulant effect.
- Interestingly, tea is often said to contain more caffeine than coffee, but this is by weight.
- Tea is often diluted more than coffee, affecting the final caffeine content



Caffeine

COFFEE

- Over 2 billion cups of coffee are consumed daily.

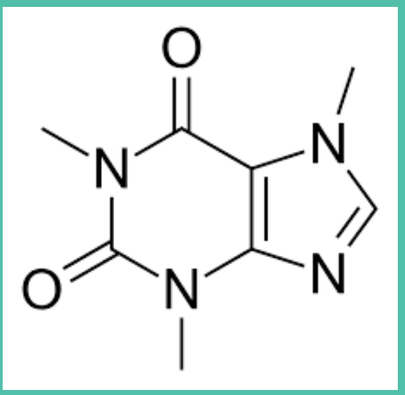
- Unlike tea, coffee products originate from a seed rather than a leaf.

- Coffee is a beverage brewed from roasted coffee beans. Darkly colored, bitter, and slightly acidic.

Key Compounds in Coffee

- **Caffeine** -

- A methyl-xanthine responsible for the characteristic bitter taste and famous stimulant effect.
- It works by blocking the action of adenosines, natural tiredness triggers in the brain.



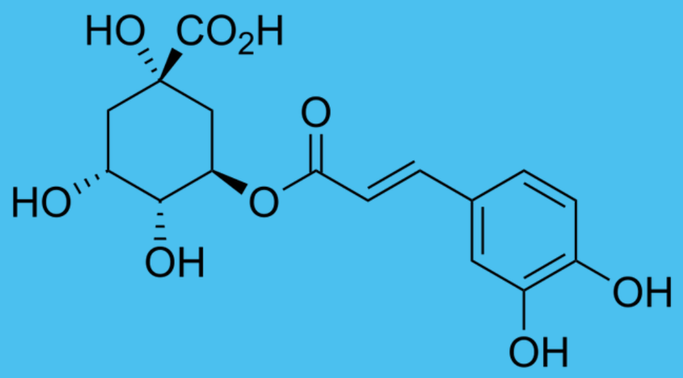
Caffeine

- **Trigonelline -**

- This is responsible for giving coffee its distinct aroma and flavor.

- **Chlorogenic Acid (CGA)-**

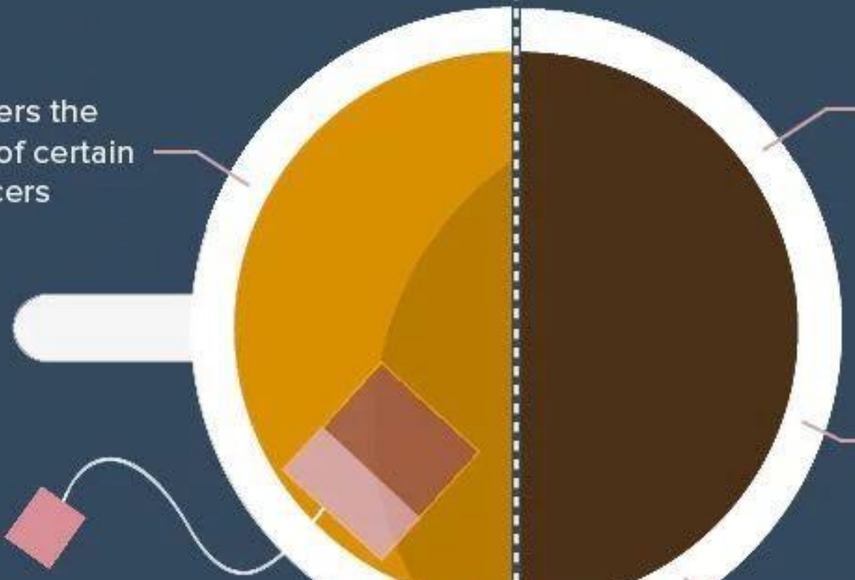
- It is a type of antioxidant that has been associated with various health benefits and slightly acidic taste of coffee



Chlorogenic Acid

Trigonellin e

Tea vs Coffee



Lowers the risk of certain cancers

Contains nutrients like potassium, manganese, magnesium, and niacin

Lowers the risk of type 2 diabetes

Protects the liver

Decreases inflammation

Improves insulin sensitivity

Promotes mouth health

May decrease the risk of heart disease

May protect against neurodegenerative diseases like Alzheimer's and Parkinson's

May protect against certain cancers

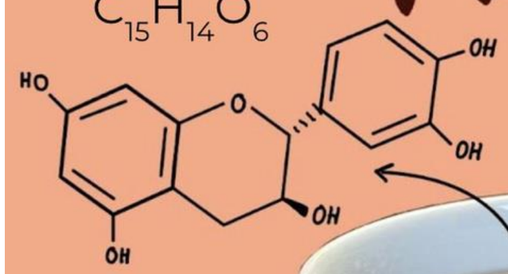
Reduces risk of Alzheimer's

Reduces risk of Parkinson's

Helps with depression

TEA vs COFFEE

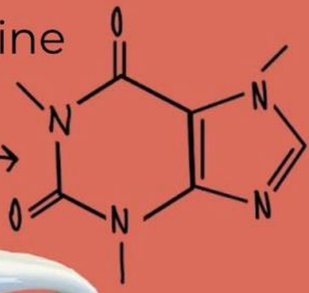
$C_{15}H_{14}O_6$



Catechin

→ I'm superior! I have 4 hydroxyl groups.
→ To top that, I have TWO rings that display aromaticity so I'm more stable than you are. And that's the tea!

Caffeine



$C_8H_{10}N_4O_2$

→ Well, I'm unique, I have an amide, amine, carbonyl, and an alkene group
→ I also have more pi electrons than you–I have 7 pairs. I cannot espresso how much I dislike you!

AROMA AND FLAVOR CHEMISTRY

Volatile Organic Compounds, Such as furans and pyrazines, are created during the roasting process and contribute to the coffee's aroma and flavor

Theaflavins and Thearubigins Formed during the oxidation of tea leaves, these compounds give black tea its characteristic color and briskness

COFFEE

TEA

Maillard reaction products are created when amino acids and sugars react during coffee roasting, adding richness and complexity to its flavor.

Terpenes: Contribute to the floral and citrus notes in tea

BREWING METHODS AND CONSUMER PREFERENCES

Tea

01

Varies by type (green, black, oolong, herbal).

02

Factors include water temperature, steeping time, and leaf quality

03

Preferences range from delicate floral notes to robust flavors.

Coffee

01

Methods like drip brewing, espresso, French press, and cold brew.

02

Grind size, water-to-coffee ratio, and brewing time matter.

03

Preferences span from bold and intense to mellow and creamy.

CONCLUSION

- Tea, rich in antioxidants like catechins and flavonoids, offers a calming and refreshing option with various flavors and varieties.
- On the other hand, coffee, with its bold taste and stimulating effects from caffeine and chlorogenic acids, provides a quick energy boost and potential health perks.