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A-level Food and Nutrition

SENIOR Five term 3

TOPIC 2/4: Food Additives

Competency: The learner justifies the importance of various additives, evaluates their safety and applies them to produce variety in organoleptic properties, nutritional value and shelf life of foods.

Food Additives in Food Production

Food additives are substances added to food during processing or preparation to **improve quality, safety, shelf life, and sensory appeal**. They play a vital role in modern food production, ensuring that foods remain nutritious, attractive, and safe for consumption.

Categories of Food Additives and Their Significance

1. Preservatives

Function: Prevent spoilage by inhibiting microbial growth.

Examples: Sodium benzoate, sorbic acid, nitrates.

Impact: Extends shelf life of bread, juices, meat, and dairy products.

2. Antioxidants

Function: Prevent oxidation of fats, oils, and vitamins.

Examples: Ascorbic acid (Vitamin C), tocopherols (Vitamin E), BHA/BHT.

Impact: Maintains freshness, prevents rancidity, preserves nutritional value.

3. Colorants

Function: Enhance or restore color lost during processing.

Examples: Carotenoids, chlorophyll, anthocyanins, tartrazine.

Impact: Improves visual appeal of beverages, candies, baked goods.

4. Flavor Enhancers

Function: Intensify or balance taste.

Examples: Monosodium glutamate (MSG), yeast extracts.

Impact: Improves palatability of soups, sauces, and snacks.

5. Sweeteners

Function: Provide sweetness with or without calories.

Examples: Sucrose, saccharin, aspartame, stevia.

Impact: Used in soft drinks, desserts, and diet foods to meet consumer preferences.

6. Emulsifiers, Stabilizers, and Thickeners

Function: Improve texture and consistency.

Examples: Lecithin, pectin, xanthan gum.

Impact: Keeps mayonnaise stable, thickens sauces, improves mouthfeel in ice cream.

7. Nutrient Additives (Fortification)

Function: Replace or enhance nutrients lost during processing.

Examples: Iron, iodine, vitamin D, folic acid.

Impact: Prevents deficiencies, improves public health (e.g., iodized salt, fortified cereals).

Summary Table

Additive Type	Example	Purpose	Quality Improvement
Preservatives	Sodium benzoate	Prevent spoilage	Longer shelf life
Antioxidants	Ascorbic acid	Prevent rancidity	Freshness, nutrient retention
Colorants	Carotenoids	Enhance color	Visual appeal
Flavor enhancers	MSG	Intensify taste	Better flavor
Sweeteners	Stevia	Add sweetness	Consumer preference
Emulsifiers/Thickeners	Pectin	Improve texture	Consistency, mouthfeel
Nutrient additives	Iron, iodine	Fortify foods	Public health benefits

Conclusion

Food additives are **essential tools in food production**. They help preserve freshness, improve taste and appearance, enhance nutrition, and ensure safety. While they must be used responsibly and within regulatory limits, their contribution to **food quality and consumer satisfaction** is undeniable.

Activity

- (i) prepare and compare two similar dishes; one cooked with different food additives while the other cooked without. (For example, bake cake with different flavours and spices versus a plain one or cake with preservatives versus one without);
- (ii) observe and document the differences in taste, texture, appearance, and shelf life of the products above over a set period of time;
- (iii) create and modify recipes by experimenting with different food additives to achieve various effects; and
- (iv) v) take note of the modified recipes and present in plenary.

Examples of Modified Recipes Using Food Additives

1. Fruit Salad with Ascorbic Acid (Vitamin C)

- **Base Recipe:** Fresh apples, bananas, pineapples, and mangoes.
- **Additive Used:** Ascorbic acid solution (lemon juice or pure vitamin C powder).
- **Effect:** Prevents enzymatic browning of apples and bananas, keeps fruit looking fresh.
- **Outcome:** Salad retains bright colors and nutrients for longer, ideal for buffets or storage.

2. Groundnut Sauce with Antioxidants

- **Base Recipe:** Groundnut paste, onions, tomatoes, salt, and water.
- **Additive Used:** Tocopherols (Vitamin E) or rosemary extract.
- **Effect:** Prevents lipid oxidation in groundnut paste, avoiding rancidity.
- **Outcome:** Sauce stays fresher longer, with improved flavor stability.

3. Bread with Emulsifiers

- **Base Recipe:** Wheat flour, yeast, sugar, salt, water.
- **Additive Used:** Lecithin (natural emulsifier from soy or egg yolk).
- **Effect:** Improves dough elasticity, enhances rise, and keeps bread softer for longer.
- **Outcome:** Bread has better texture, longer shelf life, and remains moist.

4. Juice Drink with Sweeteners

- **Base Recipe:** Passion fruit juice concentrate diluted with water.
- **Additive Used:** Stevia (natural non-caloric sweetener).
- **Effect:** Provides sweetness without added sugar calories.
- **Outcome:** Healthier beverage option, suitable for diabetic or calorie-conscious consumers.

5. Meat Sausages with Preservatives

- **Base Recipe:** Minced beef, spices, salt.
- **Additive Used:** Sodium nitrite (regulated amount).
- **Effect:** Prevents microbial growth, stabilizes red color, enhances flavor.
- **Outcome:** Sausages remain safe, visually appealing, and flavorful during storage.

Plenary Presentation Notes

Theme: Improving Food Quality with Additives

- **Ascorbic acid in fruit salad** → Maintains freshness and color.
- **Antioxidants in groundnut sauce** → Prevent rancidity, extend shelf life.
- **Emulsifiers in bread** → Improve texture and softness.
- **Sweeteners in juice** → Offer healthier alternatives.
- **Preservatives in meat** → Ensure safety and color stability.

Key Takeaway: Food additives, when used responsibly, **enhance quality, safety, and consumer satisfaction**. They are essential tools in modern food production and nutrition.

Evaluating Health Effects of Food Additives

1. Preservatives

- **Examples:** Sodium benzoate, nitrates, sorbic acid.
- **Positive Effects:**
 - Prevent microbial growth, reducing foodborne illness.
 - Extend shelf life, reducing waste.
- **Potential Risks:**
 - Nitrates/nitrites in processed meats may form nitrosamines, linked to cancer risk.
 - Sodium benzoate may trigger allergic reactions or worsen asthma in sensitive individuals.

2. Antioxidants

- **Examples:** Ascorbic acid (Vitamin C), tocopherols (Vitamin E), BHA/BHT.
- **Positive Effects:**
 - Prevent rancidity of fats and oils.
 - Preserve vitamins and improve nutritional quality.
- **Potential Risks:**
 - Synthetic antioxidants (BHA, BHT) have raised concerns about carcinogenicity in animal studies.
 - Natural antioxidants are generally safe and beneficial.

3. Colorants

- **Examples:** Tartrazine, sunset yellow, natural carotenoids.
- **Positive Effects:**
 - Enhance visual appeal, restore color lost in processing.

- **Potential Risks:**
 - Artificial dyes like tartrazine may cause hyperactivity in children or allergic reactions.
 - Some synthetic colorants are restricted due to possible carcinogenic effects.

4. Flavor Enhancers

- **Examples:** Monosodium glutamate (MSG), yeast extracts.
- **Positive Effects:**
 - Improve taste, reduce need for excess salt.
- **Potential Risks:**
 - MSG may cause headaches or nausea in sensitive individuals (“Chinese restaurant syndrome”), though evidence is mixed.
 - Generally recognized as safe (GRAS) when used within limits.

5. Sweeteners

- **Examples:** Aspartame, saccharin, stevia.
- **Positive Effects:**
 - Provide sweetness without calories, useful for diabetics and weight management.
- **Potential Risks:**
 - Aspartame may cause issues for people with phenylketonuria (PKU).
 - Some artificial sweeteners are linked to gut microbiome changes and possible metabolic effects.
 - Natural sweeteners like stevia are considered safer alternatives.

Summary Table

Additive Type	Benefits	Potential Risks
Preservatives	Prevent spoilage, extend shelf life	Cancer risk (nitrosamines), allergies
Antioxidants	Prevent rancidity, preserve nutrients	Synthetic forms may be carcinogenic
Colorants	Improve appearance	Allergies, hyperactivity, cancer concerns
Flavor enhancers	Better taste, less salt	MSG sensitivity (headaches, nausea)
Sweeteners	Sugar alternatives, weight control	PKU risk, gut microbiome effects

Key Considerations

- **Regulation matters:** WHO and national food safety authorities evaluate additives before approval.
- **Dose-dependent effects:** Most additives are safe at regulated levels, but excessive intake can be harmful.
- **Consumer preference:** There is growing demand for natural additives (e.g., plant extracts, vitamins) over synthetic ones.
- **Ultra-processed foods:** Often contain multiple additives, which may collectively increase risks of obesity, cardiovascular disease, and cancer.

Conclusion

Food additives are **essential for modern food production**, improving safety, nutrition, and appeal. However, their **potential health effects depend on type, dosage, and frequency of consumption**. Natural additives are generally safer, while synthetic ones require careful regulation. The healthiest approach is to **limit ultra-processed foods** and favor fresh or minimally processed options.

Thank You

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