

FOODIFLASH



E-MAGAZINE



DIET AND THE GUT MICROBIOME

A HEALTHIER ALTERNATIVE TO REGULAR BISCUIT NUTRITIOUS BISCUITS

ONE-DISH WONDERS: THE NUTRITIONAL AND TECHNOLOGICAL EVOLUTION OF A SIMPLE MEAL

ENERGIZING THE FUTURE: UNLOCKING THE TRUTH OF THE SAFETY OF ENERGY DRINKS

INNOVATIONS IN PLANT-BASED MEAT ANALOGUES: KEY INGREDIENTS, THEIR INTERACTION AND PRODUCTION TECHNIQUES

THE ROYAL SPICES OF SRI LANKA; EXPLORING THE BEST ANTIMICROBIAL HERBS LEADING THE WORLD OF SPICES

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ABOUT IFSTSL

Institute of Food Science and Technology Sri Lanka (IFSTSL) is the learned Institute in Sri Lanka to serve as an apex body representing professionals engaged in food science and technology and the processed and aligned industry in Sri Lanka. FoodieFlash is the E-magazine of IFSTSL published biannually.

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Webpage : <https://ifstsl.org/>

Email : editorifstsl@gmail.com

Address : Institute of Food Science and Technology Sri Lanka

No 21D, Vijaya Kumrathunga Mawatha (Polhengoda Gardens),
Colombo -05, Sri Lanka.



EDITOR'S NOTE:

Dear Readers,

Welcome to the second issue of FoodiFlash for 2024! We aim to empower your food choices with knowledge, innovation, and creativity. This issue carries exciting topics covering food nutrition, health, and culinary advancements.

The first article **“Diet and the Gut Microbiome,”** explores the relationship between our dietary choices and gut health. In addition, this article details how our diet influences individual microbiomes, with implications for everything from digestion to mental well-being.

Today most consumers search for healthier food. The article **“A Healthier Alternative to Regular Biscuit”** offers tips to indulge your sweet tooth without compromising health.

In our fast-paced world, energy drinks have become a popular choice, especially among youth. The content of the topic **“Energizing the Future: Unlocking the Truth of the Safety of Energy Drinks,”** provides a balanced view of their benefits and potential risks, helping you make informed decisions for your lifestyle.

The fourth topic is **“One-Dish Wonders: The Nutritional and Technological Evolution of a Simple Meal.”** Here, we explore different recipes that can fulfil nutrient-rich meals, all in one convenient dish.

We invite you to challenge your knowledge with our Puzzle on **“Nutri Brain Teaser.”** Join in the fun and sharpen your nutritional knowledge.

Plant-based diets continue to gain popularity, and our article **“Innovations in Plant-Based Meat Analogues: Key Ingredients, Their Interaction and Production Techniques”** explores the culinary innovations. Learn about the latest developments in plant-based alternatives and their journey to our plates.

Lastly, **“The Royal Spices of Sri Lanka,”** informs you about their health benefits and culinary versatility and celebrates Sri Lankan spice culture.

Finally, don't forget to check out the **“Answers for the Nutri Brain Teaser,”** where we unveil the solutions to our nutritional puzzles!

As always, we thank you for your continued support and readership. We hope you enjoy this issue as much as we enjoyed putting it together.

Happy reading!
Warm regards,
Dr Nimsha Weerakkody
Editor-in-Chief, FoodiFlash

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DIET AND THE GUT MICROBIOME



Prebiotics are non-digestible fibers and compounds that selectively nourish beneficial bacteria in the gut. Common prebiotics include inulin, fructooligosaccharides (FOS), and galactooligosaccharides (GOS), which are found in foods such as garlic, onions, bananas, asparagus, lentils, and whole grains.



Article by,
NIDESHA RANDENI
Department of Agricultural
and Plantation Engineering,
The Open University of Sri Lanka

Research intern,
Food Science and Technology
Programme,
United International College,
China

The gut microbiome, composed of trillions of microorganisms, is a complex ecosystem residing within the gastrointestinal tract. These microorganisms, mostly bacteria, play an essential role in digesting food, synthesizing vitamins, regulating immune responses, and even influencing mental health. As emerging research sheds light on the connection

between diet and gut microbiota composition, scientists are uncovering the profound impact that specific foods can have on our microbiome, thus opening doors to dietary interventions for disease prevention and improved health.

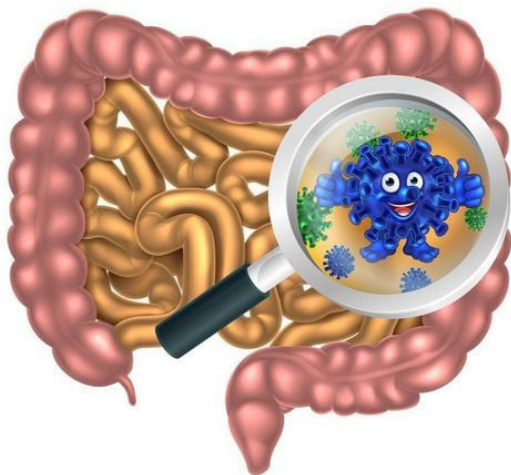


Figure 1: The gut microbiome

1. UNDERSTANDING THE GUT MICROBIOME: KEY FUNCTIONS AND COMPOSITION

The gut microbiome comprises a diverse range of bacteria, fungi, viruses, and archaea, with bacterial phyla Firmicutes and Bacteroidetes dominating the landscape. Other essential players include Actinobacteria and Proteobacteria, which, though less abundant, contribute to essential metabolic functions and immune regulation. The composition and diversity of these microbes are not random but are highly influenced by diet, lifestyle, and genetics. Studies have shown that a balanced and diverse gut microbiome correlates with a strong immune system, stable metabolic functions, and reduced inflammation, all critical factors in maintaining

overall health.

The microbiome engages in symbiotic relationships with its host, performing functions such as breaking down complex carbohydrates, producing short-chain fatty acids (SCFAs) like butyrate and acetate, and synthesizing vitamins (e.g., vitamin K, B12, and folate). These processes are integral to human physiology. A high level of microbial diversity is often linked with resilience against pathogens and adaptability to dietary changes, whereas a low diversity, often seen in processed food diets, is associated with conditions like obesity, type 2 diabetes, and inflammatory bowel disease.

2. THE IMPACT OF DIET ON MICROBIAL COMPOSITION

Diet is one of the most powerful influencers of the gut microbiome. Within days of changing dietary patterns, shifts in microbial composition can be observed. This responsiveness highlights the microbiome's adaptability and its sensitivity to dietary inputs.

A diet rich in dietary fiber, whole grains, polyphenols, and plant-based foods promotes beneficial microbes, whereas diets high in sugar, saturated fats, and ultra-processed foods support harmful microbial species, fostering inflammation. High-fat, low-fiber diets have been shown to increase bacteria

Table 1: Gut-friendly food for a healthier life

Food Category	Examples	Benefits to the gut
Fiber-rich Fruits	Mangoes, Durian, Jackfruit	Provide prebiotic fibers to feed good bacteria
Fiber-rich Veggies	Leafy greens, Mushrooms, Okra	Promote microbial diversity and regular bowel movements
Whole Grains	Oats, Brown rice, Millet, Sesame seed	Contain beta-glucans and resistant starches supporting microbes
Legumes and Beans	Lentils, Chickpeas, Green gram	High in fiber and protein, support gut lining
Fermented Foods	Curd, Kefir, Kimchi,	Introduce probiotics, enhance microbial balance
Polyphenol Foods	Green tea, dark chocolate, berries	Act as antioxidants, reduce inflammation

that produce endotoxins, triggering low-grade chronic inflammation and altering insulin sensitivity. In contrast, diets high in plant fiber support bacterial species that produce SCFAs, which help maintain the integrity of the gut lining, reduce inflammation, and provide energy for colonic cells.

PREBIOTICS: FUEL FOR BENEFICIAL BACTERIA

Prebiotics are non-digestible fibers and compounds that selectively nourish beneficial bacteria in the gut. Common prebiotics include inulin, fructooligosaccharides (FOS), and galactooligosaccharides (GOS), which are found in foods such as garlic, onions, bananas, asparagus, lentils, and whole grains.

Studies show that inulin promotes the growth of *Bifidobacterium* and *Lactobacillus* species in the colon, which are essential for producing butyrate, an SCFA with significant anti-inflammatory properties. Butyrate not only supports gut barrier integrity but also modulates the immune system, impacting inflammatory pathways linked to autoimmune and metabolic diseases. Clinical studies have indicated that diets high in prebiotics can support a reduction in the inflammatory markers associated with irritable bowel syndrome (IBS) and ulcerative colitis.

PROBIOTICS: REPLENISHING THE GUT WITH BENEFICIAL MICROBES

Probiotics are live bacteria that confer a health benefit on the host when administered in adequate amounts by improving gut microbiome diversity, competing with pathogens, and modulating immune responses. The most consumed probiotics come from the genera *Lactobacillus*, *Bifidobacterium*, and *Saccharomyces* present in food items like yogurt, curd, and other fermented products.

Studies have identified specific probiotics, like *Lactobacillus rhamnosus* GG, which diminish symptoms of IBS and improve gut barrier function. Probiotics achieve this by elaborating SCFAs and lactic acid, thus acidifying the gut and inhibiting the growth of pathogenic organisms. Beyond this, probiotics can communicate with the gut-associated lymphoid tissue GALT, temper immune functions, and reinforce the body's barrier to infection.

FIBER: THE MICROBIOME'S PRIMARY SOURCE OF FUEL

Dietary fiber, found in vegetables, fruits, grains, and legumes, plays a crucial role in



Figure 2: Foods improving gut health

gut health by serving as the primary substrate for gut bacteria. When gut bacteria ferment dietary fiber, they produce SCFAs, which serve as signaling molecules, influencing energy homeostasis, immune function, and even appetite regulation.

One significant SCFA, butyrate, has been shown to enhance the integrity of the gut lining by promoting tight junction proteins that prevent "leaky gut syndrome," a condition linked to various chronic inflammatory diseases. Butyrate also acts as a histone deacetylase (HDAC) inhibitor, influencing gene expression and reducing inflammation in colonic cells. By including a diverse array of fiber-rich foods such as oats, legumes, and leafy greens, individuals can promote a thriving and balanced gut microbiome.

3. THE GUT-BRAIN AXIS: CONNECTING DIET, MICROBIOME, AND MENTAL HEALTH

The gut-brain axis is a bi-directional communication system linking the gut and brain, allowing gut bacteria to influence mood, stress, and cognitive function. Gut microbes interact with the central nervous system (CNS) through metabolites, immune signaling molecules, and the vagus nerve. Certain gut bacteria produce neurotransmitters or their precursors, such as serotonin and gamma-aminobutyric acid (GABA), both of which play a role in mood regulation.

Studies have linked dysbiosis (an imbalance in gut bacteria) to conditions such as depression, anxiety, and cognitive decline. Probiotics, particularly strains like *Bifidobacterium* and

Lactobacillus, have shown promise in clinical trials, where they've been linked to improved mood and stress resilience in both animal and human studies. Emerging evidence suggests that probiotic interventions could one day support traditional treatments for mental health conditions by restoring a balanced gut microbiome.

4. BENEFITS OF A HEALTHY GUT MICROBIOME

A healthy gut microbiome has widespread benefits, impacting multiple aspects of health and wellness:

Enhanced Digestion and Nutrient Absorption: A balanced microbiome supports the breakdown of complex carbohydrates, proteins, and fats, enhancing nutrient absorption. SCFAs produced by gut bacteria are particularly important for colon health, providing energy to colonocytes and supporting gut motility.

Improved Immune Function: Around 70% of immune cells reside in the gut, highlighting the microbiome's role in immune health. Beneficial microbes modulate immune responses, helping to prevent overreactions that can lead to chronic inflammation and autoimmune diseases.

Reduced Inflammation: SCFAs like butyrate have strong anti-inflammatory properties, protecting the gut lining and reducing systemic inflammation. A high-fiber diet that supports butyrate-producing bacteria has been linked to lower incidences of inflammatory conditions, including IBS, IBD, and rheumatoid arthritis.

Mental Health Benefits: Through the gut-brain axis, the microbiome influences mental health, as some bacteria produce neurotransmitters and metabolites that regulate mood and stress. Research suggests that a balanced microbiome may lower the risk of depression and anxiety and improve overall cognitive function.

Metabolic Health: Gut bacteria regulate metabolic processes by breaking down food and producing bioactive compounds that influence fat storage, glucose metabolism, and insulin sensitivity. A balanced microbiome is

associated with a reduced risk of obesity, type 2 diabetes, and metabolic syndrome.

5. PRACTICAL DIETARY APPROACHES FOR A HEALTHY GUT MICROBIOME

Optimizing the diet for gut health involves incorporating a variety of fiber-rich and fermented foods while reducing processed sugars and fats. Here are some evidence-based strategies to maintain a diverse and balanced microbiome:

Increase Fiber Intake: Aim for at least 25-30 grams of fiber per day from whole grains, fruits, vegetables, and legumes. Each type of fiber (e.g., soluble, insoluble) has unique benefits and promotes diverse bacterial populations.

Include Prebiotic Foods: Incorporate prebiotic-rich foods like garlic, onions, bananas, and whole grains to stimulate beneficial bacterial growth.

Consume Probiotics Regularly: Fermented foods such as yogurt, curd, kimchi, and miso introduce live beneficial bacteria into the gut, enhancing microbiome diversity.

Minimize Processed Foods and Sugar: Diets high in sugar and refined fats reduce microbial diversity and encourage the growth of harmful bacteria, leading to inflammation and metabolic disturbances.

6. DIET AS A TOOL FOR MICROBIOME MODULATION

The role of diet in shaping the gut microbiome is clear, with growing scientific evidence pointing to the benefits of high-fiber, plant-based, and fermented foods. By feeding beneficial bacteria with prebiotics and replenishing the microbiome with probiotics, individuals can support gut health, immune function, and even mental well-being. Moving forward, personalized nutrition based on individual microbiome profiles may enable targeted dietary interventions for disease prevention and optimal health. As we continue to uncover the full scope of the gut microbiome's influence, it is clear that dietary choices hold immense potential for improving health outcomes across multiple domains.



A HEALTHIER ALTERNATIVE TO REGULAR BISCUIT

NUTRITIOUS BISCUITS



Nutritious biscuits are one of the potential food items in developing countries. All population groups typically consume biscuits. It is a flour-based baking product with low moisture content. It is also provided to us in the form of confectionery. It has become one of the processed food items with the greatest potential for expansion due to consumer demand. Generally, wheat flour has been used to prepare baked products such as biscuits, and cookies. This is due to the nature and usefulness of the proteins in wheat flour.



W.M.D.S.N. Wanigasooriya
Faculty of Agriculture,
University of Peradeniya, Sri
Lanka

The term "Nutritious Biscuits" refers to biscuits made with ingredients that offer health benefits and contribute positively to the consumer's diet. These biscuits typically focus on providing essential nutrients and minimizing unhealthy components.

The nutritious biscuits are specially designed

to provide a healthier alternative to regular biscuits by incorporating ingredients that offer greater nutritional benefits. These biscuits are often fortified or enriched to help meet the dietary needs of individuals, especially young children, elderly people, athletes, active individuals, and people with dietary restrictions who may need additional nutrients.

Nutritious biscuits are one of the potential food items in developing countries. All population groups typically consume biscuits. It is a flour-based baking product with low moisture content. It is also provided to us in the form of confectionery. It has become one of the processed food items with the greatest potential for expansion due to consumer demand. Generally, wheat flour has been used to prepare baked products such as biscuits, and cookies. This is due to the nature and usefulness of the proteins in wheat flour. However, due to the tropical climate, wheat is unsuitable for cultivation in Sri Lanka. Therefore, the tropical nations have relied on importing wheat flour to meet their needs for producing a variety of wheat flour-based food items. Sri Lanka imports around 1.2 to 1.5 million metric tons of wheat flour annually. Based on the Departments of Commerce Sri Lanka 2021 figures, the total expenditure on wheat flour imports for Sri Lanka would generally fall between approximately \$360 million to \$450 million. Moreover, some people are sensitive to the gluten in wheat. The importance of substituting wheat flour due to gluten intolerance and celiac disease. For individuals with celiac disease or gluten intolerance, consuming wheat flour can trigger severe gastrointestinal and systemic symptoms. Substituting with gluten-free flours is essential for avoiding these reactions and maintaining health.

The quality of the biscuit is determined by the kind of ingredients used and the processing specifications. Biscuits can be fortified to increase their nutritional value by using healthy ingredients that are high in protein, vitamins, and minerals.

FEATURES OF NUTRITIOUS BISCUITS:

- Whole Grains: Use of whole wheat, oats,

or other whole grains to provide fiber, vitamins, and minerals.

- Reduced Sugar: Lower sugar content to reduce empty calorie intake while still satisfying a sweet craving. Incorporation of sorghum flour, rice flour, coconut flour and chickpea flour like slightly sweet, mild flavored and fine textured flour that can satisfy sweet cravings while substituting for wheat flour.
- Healthy Fats: Inclusion of healthy fats from sources like nuts, seeds, or vegetable oils, rather than trans fats or saturated fats.
- Added Nutrients: Fortification with vitamins and minerals such as iron, calcium, or vitamin D to address specific nutritional gaps.
- Protein: Incorporation of protein-rich ingredients like nuts, seeds, or legumes to support growth and development.
- Fiber: Increased fiber content from whole grains or added fibers to aid digestion and promote satiety.

There are few benefits to combining wheat with other flour for making composite flour for baked goods. Composite flours are flours developed by blending several non-wheat flours in varied proportions, either with or without wheat flour. In developing nations, composite flour is preferred since it decreases the importation of wheat flour and promotes the use of locally cultivated grains as flour. Although the texture and properties of the bakery products made from composite flour were different from those made from wheat flour, they had an improved nutritional value and appearance. The bakery products made from composite flour were of good quality and shared some characteristics with bread made from wheat. Wheat is recognized as nutritionally poor, while being an excellent source of calories and other nutrients. Therefore, adding affordable staples like grains, pulses and other food items like tubers, yams, some fruits and vegetables to wheat flour helps increase the nutritious value of wheat products.

EXAMPLES OF NUTRITIOUS BISCUITS

WHOLE GRAIN BISCUITS



It is made primarily with whole wheat or oats, offering more fiber and nutrients.

Source:(<https://www.palatesdesire.com/wp-content/uploads/2021/12/whole-wheat-biscuits-recipe@palates-desire.jpg>)

NUT AND SEED BISCUITS:



Containing nuts like almonds or seeds such as chia, which add protein and healthy fats.

Source:(https://img.freepik.com/premium-photo/various-types-nuts-crackers-white-background_781284-7054.jpg?w=900)

FRUIT-INFUSED BISCUITS



Including dried fruits for added vitamins and natural sweetness.

Source:(https://avonbakers.com/wp-content/uploads/2020/03/20220403_211227-716x800.jpg)

VEGETABLE-ENRICHED BISCUITS



Incorporating vegetable powders or purees to increase nutrient density.

Source:(<https://www.shutterstock.com/image-photo/stacked-square-biscuits-sprinkling-dry-vegetables-2340945587>)

Table 1: Improved materials used to substitute wheat flour in biscuit production

PRODUCT ADDED	IMPROVEMENT ELEMENTS	SUBSTITUTIONLEVEL (%)
Buckwheat	Processing properties, sensory and textural characteristics, protein content and gluten-free biscuits	50 - 100
Sorghum	Dietary fiber and low-calorie; Fat, protein, ash, and calorific values as compared to wheat biscuits	25 - 45,50, and100
Maize	Gluten-free biscuits	100
Rice	Processing properties, sensory and textural characteristics, gluten-free biscuits	50–100
Pearl millet	Fat, protein, ash and calorific values as compared to wheat biscuits	100
Foxtail millet flour	Low phytates and tannins, increased polyphenols	9
Pea	Protein, fat, iron and crude fiber contents	5–100
Bean	Physical and nutritional characteristics	25,50,75, and100
Soybean	Protein, micronutrients, amino acids and vitamins profile and sensory evaluation	5,10,15 and 20
Flaxseed	ω -3(α -linolenic acid), dietary soluble and insoluble fibers and lignans	5,12,15,30, 50 and 75
Groundnut	Energy, protein, calcium and iron	
Mushrooms	Protein, fiber, ash, fat, potassium, phosphorus, magnesium, calcium, vitaminB3, vitamin C, texture, flavor and sensory acceptability	5,10,15 and 20
Grape (skin and seeds)	Proteins, ash, lipids, carbohydrates, vitamins, and phenolic compounds (tannins, phenolic acids, anthocyanins, and resveratrol)	15
Mango peel	Dietary fiber, polyphenols and carotenoids	5, 7.5, 10, 15,and 20
Moringa	Carotenoid, protein, and dietary fiber	5, 10, and 15
Banana (flour and peel)	Phenolic compound, starch digestibility, and glycemic index	5, 10, 15, 30,45, and 50
Pumpkin	Dietary fiber	10 and 15
Carrot pomace	Dietary fiber	10 and 15

Source: Goubgou et al., (2021), Senanayake et al., (2024), Jayawardana et al., (2022) and Pushpakumara et al., (2023)

BENEFITS OF NUTRITIOUS BISCUITS

Young children need to fulfill nutrition for proper growth and development. Stunting can result from inadequate growth and development during childhood. Stunting affects around one-third of children under age five in developing nations, and most of their deficiencies are in one or more micronutrients. Globally, 49 million (7.3%) young children were wasted in 2018, with roughly 17 million (2.4%) of those being seriously wasted (UNICEF, 2019). In the long run, energy and protein deficiencies were frequently linked to malnutrition issues that affect children. Malnutrition impacts physical development, morbidity, mortality, cognitive growth, reproduction, and physical work capability, which affects human performance, health, and survival. It is a contributing factor in several childhood disorders, and it is especially in developing nations. Therefore, nutritious biscuits are often used for young children for several important reasons:

- **BALANCED NUTRITION:** Young children have specific nutritional needs for growth and development. Nutritious biscuits can be fortified with essential vitamins, minerals, and other nutrients that might be lacking in their diet.
- **SUPPORT GROWTH AND DEVELOPMENT:** Nutrients such as calcium, iron, and vitamins are crucial for children's growth and development. Nutritious biscuits can help provide these nutrients in a tasty and appealing format.
- **CONVENIENCE:** Biscuits are a convenient snack option that can be easily packed for school or travel. Nutritious varieties provide a practical way to ensure that children get beneficial nutrients.
- **ENERGY NEEDS:** Children are active and require frequent energy boosts. Nutritious biscuits often contain complex carbohydrates, proteins, and healthy fats that help sustain energy levels throughout the day.
- **PROMOTE HEALTHY EATING HABITS:** Introducing nutritious biscuits helps instill healthy eating habits early on. By offering healthier snack options, parents can



guide children toward making better food choices.

- **ADDRESS DIETARY GAPS:** Nutritious biscuits can help fill in gaps in a child's diet, especially if they are picky eaters or have limited food preferences. They can be formulated to include whole grains, fiber, and other beneficial ingredients.

Nutritious biscuits can be particularly beneficial for elderly people due to their specific dietary and health needs.
- **INCREASED FIBER INTAKE:** Biscuits made with whole grains or added seeds and nuts can be high in dietary fiber. Fiber supports digestive health by promoting regular bowel movements and reducing the risk of constipation, which can be a common issue in older age.
- **IMPROVED BONE HEALTH:** Ingredients like nuts and seeds can provide essential minerals such as calcium, magnesium, and phosphorus. These minerals are crucial for maintaining bone density and preventing osteoporosis, which is a concern for many seniors.
- **IMPROVED HEART HEALTH:** Nutritious biscuits made with unsaturated fats from sources like nuts or healthy oils can help support cardiovascular health by promoting good cholesterol levels and reducing the risk of heart disease. Reduced sugar content helps manage blood pressure and decreases the risk of developing cardiovascular diseases.
- **HYDRATION:** While not a primary source of hydration, including moist or soft biscuits in the diet can contribute to overall fluid

intake, which is important for seniors who may not drink enough water.

- **BOOSTED IMMUNE SYSTEM:** Ingredients like nuts, seeds, and certain vegetables contribute to a stronger immune system by providing essential vitamins and minerals, such as vitamin E, zinc, and vitamin C.

Nutritious biscuits can be an excellent option for athletes and active individuals due to their specific energy and nutritional needs.

- **SUSTAINED ENERGY:** Nutritious biscuits made with whole grains (like oats or whole wheat) provide complex carbohydrates that offer a steady release of energy. This is crucial for athletes who require sustained energy levels for extended periods of activity.

- **RECOVERY AND MUSCLE REPAIR:** Many nutritious biscuits include ingredients like nuts, seeds, or protein-rich grains, which contribute to muscle repair and recovery after intense workouts or sports activities. Ingredients like nuts and seeds also provide essential amino acids needed for muscle growth and repair.

- **MENTAL FOCUS:** Ingredients like nuts and seeds provide omega-3 fatty acids and other nutrients that support cognitive function and mental focus, which are important for athletes who need to stay sharp and alert.

- **BALANCED NUTRITION:** They often contain a mix of vitamins, minerals, and antioxidants from whole grains, nuts, and seeds. These nutrients support overall health, boost immune function, and help in reducing oxidative stress caused by

intense physical activity.

LIMITATIONS ASSOCIATED WITH THE SUBSTITUTION OF WHEAT FLOUR

- **TEXTURE AND STRUCTURE:** Wheat flour has gluten, which provides elasticity and structure. Gluten-free flours may not bind as well.

- **FLAVOR DIFFERENCES:** Alternative flours often have unique flavors that may not be suitable for all recipes. For example, coconut flour has a distinct coconut flavor that may not work in savory dishes.

- **BAKING TECHNIQUES:** Alternative flours may require different baking techniques and times. Recipes often need experimentation to achieve the right results.

- **MOISTURE ABSORPTION RATES:** Different flours absorb moisture differently. Therefore, adjustments are necessary to achieve the desired consistency.

In summary, nutritious biscuits provide a well-rounded combination of energy, protein, healthy fats, and essential nutrients, making them a valuable addition to the diet of consumers. They offer a practical, portable, and balanced snack option that supports performance, recovery, overall health, growth and development.



Young children need to fulfill nutrition for proper growth and development. Stunting can result from inadequate growth and development during childhood. Stunting affects around one-third of children under age five in developing nations, and most of their deficiencies are in one or more micronutrients.



ENERGIZING THE FUTURE: UNLOCKING THE TRUTH OF THE SAFETY OF ENERGY DRINKS



King coconut water, a natural energy drink from Sri Lanka, is gaining popularity. It provides better hydration and replenishment than traditional sports drinks due to its high electrolyte content, especially potassium and magnesium. Its natural sugars offer a quick energy boost without the crash from artificial ingredients. Additionally, King coconut water contains antioxidants and essential nutrients that promote overall well-being.



PHD THATHSARNI
Department of Applied Nutrition
Wayamba University of Sri Lanka

Many people choose energy drinks because of their busy life styles and to fulfil quick energy requirements. These drinks promise providing a quick burst of energy and better focus. However, concerns about energy drinks and their health effects are raised by both consumers and medical practitioners.

Energy drinks are advertised to reduce fatigue, improve focus, and boost performance. However, it is important to understand the



Source: (<https://www.fda.gov/food/nutrition-facts-label/how-understand-and-use-nutrition-facts-label>)

ingredients in these drinks and how they might affect our health.

WHY ARE ENERGY DRINKS POPULAR?

Several factors contribute to the popularity of energy drinks and these include;

- i. Busy Lifestyles: People often need quick energy boosts;
- ii. Changing Consumer Preferences: Consumers are constantly looking for new products that promise better performance;
- ii. Need for Speed: In a fast-paced world, people crave instant energy to keep up with their tasks.

Young people see energy drinks as a natural choice, influenced by popular culture, celebrities, and targeted advertising. Athletes, students, and professionals also use them to enhance performance and stay awake.

INGREDIENTS AND HEALTH CONCERNS

The main concern with energy drinks is safety, which is closely linked to their ingredients. Each brand has its mix, but most include caffeine, sugar, taurine, vitamins, and herbal extracts. These ingredients enhance stimulating power.

CAFFEINE: This is the most important ingredient in energy drinks. It stimulates the central nervous system, improving alertness and focus. However, too much caffeine can cause sleeplessness, restlessness, fast heartbeats, and serious complications in sensitive individuals. Therefore, balancing the benefits and risks of caffeine is crucial.

SUGAR: Sugar provides a quick energy boost but can lead to a drop in blood sugar, causing fatigue and cravings for more sugar. Excessive sugar intake can contribute to obesity, cardiovascular diseases, and diabetes.

TAURINE: This is an amino acid that supports heart health and athletic performance. However, its safety is still questioned, especially when combined with other stimulants in energy drinks.

VITAMINS AND HERBAL EXTRACTS: These are added for their potential health benefits, but they don't necessarily reduce the risks posed by other ingredients. More research is needed to understand their effects...

THE ENERGY DRINK MARKET IN SRI LANKA

In Sri Lanka, the energy drink market was valued at 421.5 million dollars in 2020 and is expected to grow at a rate (compound annual growth rate [CAGR]) of 5.4% per year from 2021 to 2026. The market is divided



Source: (<https://www.coconutea.com/>)

into alcoholic and non-alcoholic segments, with non-alcoholic drinks being more popular. These drinks improve cognitive and physical performance, especially among adults.

King coconut water, a natural energy drink from Sri Lanka, is gaining popularity. It provides better hydration and replenishment than traditional sports drinks due to its high electrolyte content, especially potassium and magnesium. Its natural sugars offer a quick energy boost without the crash from artificial ingredients. Additionally, King coconut water contains antioxidants and essential nutrients that promote overall well-being.

HEALTH CONSCIOUSNESS AND NATURAL ALTERNATIVES

The growing awareness of health and wellness

products is driving the energy drink market in Sri Lanka. Consumers are looking for natural and botanical options. Manufacturers need to offer products with natural ingredients like green tea and guarana, which are gentle and beneficial to the body. These natural ingredients provide energy and health benefits, appealing to health-conscious consumers.

FUTURE TRENDS IN ENERGY DRINKS



Source: (<https://www.fda.gov/food/nutrition-facts-label/how-understand-and-use-nutrition-facts-label>)

The next generation of energy drinks will likely include more functional ingredients with specific health benefits. These could include adaptogenic herbs and

nootropic compounds like choline, peptides, proteins, and racetams. These formulations aim to boost energy while improving cognitive function, reducing stress, and promoting overall well-being. By using synergistic blends, manufacturers can create drinks that offer a more comprehensive approach to energy enhancement, meeting the changing needs and preferences of consumers.

POTENTIAL HEALTH RISKS

Research into the negative effects of energy drinks has increased. The European Cardiac Arrhythmia Society (ECAS) recently reported that excessive intake of energy drinks can cause serious heart problems, including arrhythmias, coronary vasospasm, ischemia, myocardial infarction, atrial fibrillation, and sudden cardiac death.

Energy drinks can also affect the central nervous system due to their caffeine and other stimulants. Studies suggest they might be linked to neurological conditions like manic psychosis, cerebral vasculopathy, and seizures. These ingredients can overstimulate the adrenergic system, causing metabolic acidosis, leukocytosis, hyperglycemia, and hypokalemia. Even small amounts of caffeine can have

psycho-stimulant effects.

Additionally, energy drinks may cause gastrointestinal and kidney disorders. Some researchers have reported cases of acute hepatitis, pancreatitis, and acute kidney injury (AKI).

REGULATORY CHALLENGES

Regulating energy drinks is challenging because different countries have different rules. In the United States, energy drinks are classified as dietary supplements, so they don't have to follow all the rules for regular drinks. This gives companies more freedom in labeling and marketing but raises concerns about ingredient testing and consumer understanding.

When it comes to Sri Lanka, energy drinks must have clear labels indicating their caffeine content and other ingredients. In addition to that, there are restrictions on marketing energy drinks to children and adolescents and sales of energy drinks may be restricted in certain settings, such as schools, to limit access for younger consumers.

Without specific laws targeting energy drinks and clear standards, companies can only follow the varying and inconsistent regulations.

PROTECTING PUBLIC HEALTH

To protect public health, some countries have introduced strict marketing rules and prohibited the sale of sugary energy drinks to children. Governments need to implement stricter regulations to address the health risks posed by energy drinks.

As consumers, we must stay informed and critically evaluate the ingredients and claims made by energy drink manufacturers. By advocating for greater transparency and accountability, we can shape the future of energy drinks in ways that prioritize our health and well-being. The future of energy drinks may include more natural and health-focused ingredients. Manufacturers will need to cater to consumers' desire for natural products, offering drinks that provide energy without the health risks associated with synthetic ingredients. This shift could lead to a new era of energy drinks that promote both energy and overall health.

ONE-DISH WONDERS: THE NUTRITIONAL AND TECHNOLOGICAL EVOLUTION OF A SIMPLE MEAL



One-dish meals allow for the easy incorporation of lean proteins, whole grains, and a variety of vegetables, helping to meet daily nutritional requirements. For example, a vegetable and chicken stir-fry over brown rice offers carbohydrate, lean protein, fat, fiber, vitamins, and minerals. The combination of these ingredients helps regulate blood sugar levels, maintain energy throughout the day, and support overall health. This holistic approach is particularly beneficial for individuals managing chronic conditions such as diabetes or heart disease, where balanced meals are crucial.



MIFRA SARAP

Department of Applied Nutrition
Wayamba University of Sri Lanka

In today's fast paced world, one dish meals have emerged as a favorite among busy individuals seeking convenience without compromising on nutrition. These meals, which combine all essential components like cereals, legumes, oil, fish/meat/egg, nuts/seed and vegetables in a single pot or pan, offer not only ease of preparation but also significant nutritional benefits. But what makes these one-dish special from a food science and technology perspective?



Figure: One-Dish Meal (ODM)
Source: <https://www.budgetbytes.com/22-fast-easy-one-pot-meals>

THE NUTRITIONAL POWER OF ONE-DISH MEALS

One-dish meals are highly valued for their ability to deliver a balanced diet in every serving. By combining different food groups such as cereals, legumes, lean proteins, oils, nuts/ seeds, and vegetables, these meals provide a wide range of nutrients, ensuring an optimal mix of vitamins, minerals, and macronutrients. This makes them ideal from a nutritional perspective, as they promote portion control and help maintain a balanced intake of macronutrients.

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and minerals. The combination of these ingredients helps regulate blood sugar levels, maintain energy throughout the day, and support overall health. This holistic approach is particularly beneficial for individuals managing chronic conditions such as diabetes or heart disease, where balanced meals are crucial.

Recently, well-designed 30 recipes of one-dish meals have been introduced by a research team led by Anoma Chandrasekara at Wayamba University of Sri Lanka. These meals were created specifically for the university students, taking into account their unique nutrient requirements. The recipes adhere to Sri Lanka's food-based dietary guidelines and are known for their high satiety values. Additionally, these meals align with the recommended energy distribution from macronutrients, make use of underutilized vegetables, and provide more than 50% of the daily vegetable requirements in one serving.



Figure: Thirty one-dish meals designed for university students by the research team of Prof. Anoma Chandrasekara










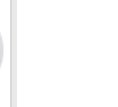


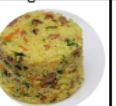

















 M1-Waya Pumpkinach Melange	 M2-Waya Pumpkinasia Patch	 M3- Waya Chickpea Delight	 M4- Waya Ashybean Sizzle	 M5- Waya Pumpkileeks Savory	 M6- Waya Ashleekin Medley	 M7- Waya Leeky Pea Carota	 M8- Waya Beetanash Mix	 M9- Waya Cowpeanach Combo	 M10- Waya Peanut Crunch
 M11- Waya Drumstick Bliss	 M12- Waya Long Lasiae	 M13- Waya Leeky Cowpeanash	 M14- Waya Sweetpotato Savor	 M15- Waya Veggie Burst	 M16- Waya Split Pea Delight	 M17- Waya Juneplums Medley	 M18- Waya Star Bean Mix	 M19- Waya Daikon Bliss	 M20- Waya Brinjal Bounty
 M21- Waya Brinjal Moringa Stir	 M22- Waya Okra Medley	 M23- Waya Goober Soy Delight	 M24- Waya Baby Jackfruit Delicacy	 M25- Waya Murungasia Rice	 M26- Waya Moringasia Blend	 M27- Waya Kohlrabi Stick	 M28- Waya Munggo Sweet Mix	 M29- Waya Vigna Jacky Mix	 M30- Waya Lasia Lotus Rice

Figure: Thirty one-dish meals designed for university students by the research team of Prof. Anoma Chandrasekara

THE SCIENCE BEHIND ONE-DISH MEALS

From a food science and technology perspective, one-dish meals present an exciting arena for innovation. Advances in cooking techniques and food processing have made it easier to enhance the nutritional profile of these meals while also improving their sensory attributes such as taste, aroma and texture.



Preparing meals as one-dish meals significantly reduces cooking time, is affordable because it uses less energy, and is convenient. Additionally, it helps retain water-soluble vitamins, such as vitamin C and B vitamins, which are often lost in prolonged cooking processes.

Furthermore, the incorporation of minimally processed ingredients such as pre-washed and cut vegetables, whole grains, and lean proteins ensures that these meals remain nutrient-dense while minimizing preparation time. Food technologists have also been experimenting with fortification adding essential nutrients like vitamins and minerals to common ingredients used in one-dish meals. This innovation ensures that even when ingredients might not naturally contain all the nutrients required, the meals still contribute to a balanced diet.

SUSTAINABILITY AND CONVENIENCE

One-dish meals also align with current trends in sustainable eating. Preparing meals in a single pot or pan reduces energy consumption and cuts down on food waste. It's easier to measure portions and use up leftovers when everything is mixed together, making one-dish meals a sustainable choice.

Additionally, the convenience factor cannot be understated. With busy lifestyles, many consumers are looking for ways to prepare healthy meals with minimal effort and time. One-dish meals often require fewer ingredients, less preparation, and minimal cleanup, making them perfect for anyone looking to eat healthily without spending hours in the kitchen.

THE FUTURE OF ONE-DISH MEALS

Looking ahead, the trend of one-dish meals is likely to continue growing as more people seek convenient, nutritious, and sustainable food options. Food companies are already responding by offering a wider range of meal kits, frozen meals, and pre-cooked ingredients specifically designed for one-dish preparations. These products are often fortified with additional nutrients, providing an easy way for consumers to meet their dietary needs.

As the demand for nutritious, convenient, and sustainable food options continues to grow, one-dish meals stand out as a versatile and practical choice. With advances in food science and technology, these meals have evolved to offer more than just simplicity they deliver on flavor, nutrition, and sustainability. Whether it's a hearty stew, a

vibrant stir-fry, or a comforting casserole, one-dish meals are here to stay, providing nourishment and satisfaction in every bite.

With the right ingredients and a dash of creativity, one-dish meals can easily become a staple in any household, embodying the perfect blend of science, nutrition, and culinary art.



NUTRI BRAIN TEASER

ACROSS

- Important macro mineral needed for bone development
- A rich source of dietary fibre
- An element needed for the production of thyroid hormone
- These species cause oxidative stress in biological systems
- Organ important for vision
- A common bone disease among women
- A type of cell in the immune system important for inflammatory process
- A hormone control blood glucose level
- Organ where fetus develop and grows
- Disease caused by iodine deficiency
- Important legume in the vegan diet
- Diet low in fruit and vegetable can cause cancer mainly in this part of body
- Last section of small intestine
- Proteins need for food digestion
- Essential B vitamin during pre & during pregnancy
- Compound needed for fat digestion and absorption
- Proenzyme need for protein digestion



DOWN

- Energy is measured in this unit
- Sugar found in milk
- Fermented soy product
- Part of a cereal grain rich with fibre
- High consumption of this mineral can lead to hypertension
- Liquid part of the blood
- Cellular membrane protrusion of small intestine
- A lymphoid organ
- Nutrient needs for growth and development of body
- Disease caused by deficiency of iron
- This environment is needed in the stomach for digestion of food
- Assay used to test mutagenic potential of chemical compounds



**PROF ANOMA
CHANDRASEKARA**

President/IFSTSL
Department of Applied Nutrition
Wayamba University of Sri Lanka

INNOVATIONS IN PLANT-BASED MEAT ANALOGUES: KEY INGREDIENTS, THEIR INTERACTION AND PRODUCTION TECHNIQUES



WHAT IS A MEAT ANALOGUE?

Due to increasing consumer concerns regarding health and related environmental challenges, vegetarian foods are becoming more common today. A compound that is structurally similar to another; but, it has a different composition is called an analog. In this context, a meat analogue is a food that is structurally similar to meat; but, differs in composition. Meat analogue, also known as a meat substitute, mock meat, faux meat, or imitation meat, replicates the aesthetic qualities of meat, such as texture, flavor, and appearance, or its chemical characteristics. There are mainly three common forms of meat analogues: coarse ground meat analogues, which include products like burgers, sausages, nuggets, and meatballs; emulsified meat analogues, found in deli 'meats,' frankfurters (hot dogs), and spreads; and loose fill meat analogues, used in dishes like taco fillings, chili mixes, and sloppy joe (a type of sandwich with ground meat in sauce).



Prepared by

Ms. Dilmi Ekanayake and Prof. Niranjalie Perera
Department of Food Science and Technology, Faculty of
Livestock, Fisheries and Nutrition, Wayamba University of
Sri Lanka

HEALTH BENEFITS OF MUSHROOM-BASED MEAT ANALOGUES

A growing number of studies confirm that eating a variety of plant-based foods supports to a reduced risk of lifestyle-related health problems. Mushrooms are among those plant-based foods that are known to supporting in preventing obesity and, heart disease, and reducing overall mortality. Mushrooms are rich in selenium and, helps boost liver enzyme activity which further benefits in detoxifies cancer-causing compounds. Since mushrooms are high in potassium and low in sodium, the regular consumption can aid lower the risk of high blood pressure and cardiovascular disease. Those with type 2 diabetes can benefit to have improved blood sugar, lipid (fat), and insulin levels with adding mushroom into their diet.

VEGAN SAUSAGES AS A MEAT ANALOGUE



Figure 1 - Mushroom based vegan sausages

Vegan sausages are plant-based meat alternatives that simulate the taste and texture of real meat. Ingredients like lentils, beans, nuts, and mushrooms are combined with various seasonings, herbs, and spices to create the appealing taste commonly associated with traditional sausages. Other components, such as vegetable oils, tapioca or potato starches, and binding agents (i.e., methylcellulose) are used to achieve the desired texture and juiciness. Some vegan sausages may also include vegetables like onions or peppers for added flavor. This mixture is stable, meaning it holds its form well, binds water and traps fat, giving the finished product its distinctive texture. Alternative sources like dietary fibers, gums and vegetable mucilage (a thick, sticky substance from plants), are often needed to achieve the correct texture. Today, advanced molecular-sensory methods are used to create flavors and aromas that closely resemble those of traditional meat sausages.

MAIN COMPONENTS IN A MEAT ANALOGUE: INGREDIENTS AND THEIR INTERACTION

PROTEINS

Proteins significantly impact various aspects of food production, including hydration, solubility, flavor binding, gelation, texturization, and dough formation. They also affect interfacial characteristics such as emulsification and foaming. Different physical, chemical, and nutritional properties can be observed in the final product, affecting its texture, flavor, and overall quality, based on the protein source used.

SOY PROTEIN

Soy protein, derived from soybeans, is a key component in meat substitutes due to its high quality and cost-effectiveness. Soybeans contain 35% to 40% protein, 15% to 20% fats, 30% carbohydrates, and trace amounts of essential nutrients like iron, calcium, zinc, and



Figure 2 - Ground TVP

B vitamins. Textured vegetable proteins (TVP), made from soy, can fully replace meat in various dishes, offering a similar chewiness and flavor. Soy protein is available in forms such as soy protein concentrate (SPC), which contains at least 65% protein, and soy protein isolate (SPI), with a protein content of at least 90%. Research indicates that combining soy protein with wheat gluten can enhance the appearance, texture, flavor, and nutritional value of meat analogues. Additionally, high polyunsaturated fat content and low saturated fat levels of soy, which are associated with recognized health benefits of lowering cholesterol and the reducing the risk of heart disease, have enhanced the demand for soy-based products like tofu, soy milk, and soy burgers.

MYCOPROTEIN

Mycoprotein, derived from the filamentous

fungus *Fusarium venenatum*, is used in products like vegan sausages, burgers, nuggets, and steaks offered by the brand Quorn, which specializes in meat substitutes made from mycoprotein. It has a unique flavor and a fibrous texture that replicates meat, because of the structure of its mycelium (the fungal cells). Mycoprotein is high in dietary fiber, including glucan and chitin, which helps lower cholesterol and may reduce overall calorie intake. The protein content of mycoprotein is high-quality, with a digestibility-corrected amino acid score of 0.996, and it contains all nine essential amino acids. Additionally, mycoprotein has a favorable fatty acid profile, being low in saturated fats and cholesterol-free. It also provides several essential micronutrients, including zinc, manganese, phosphorus, choline, folate, riboflavin, and vitamin B12, making it a nutritious option for various dietary needs.

substances like modified starches, carrageenan (a thickening agent derived from seaweed), methylcellulose (a cellulose derivative used as a thickener and gelling agent), and soy protein isolate (a highly concentrated soy protein). These agents enhance the product texture by thickening and gelling, which helps stabilize the emulsion and reduces oil separation and moisture loss. Polysaccharides, which are complex sugars, are particularly effective due to their ability to bind water and influence the rheological properties of the product. Soy protein, wheat gluten and other proteins and polysaccharides contribute to the structural integrity and cohesion of meat substitutes.

FLAVOR ENHANCERS

To create a "meat-like" flavor in meat substitutes, specific taste ingredients, including seasonings and spices, are added. The fundamental technology involves isolating naturally occurring volatile compounds and combining them with other thermal processing techniques to capture the flavor profile of meat. These flavor components are added in precise concentrations to replace the taste of meat. Additionally, flavor and aroma precursors, which are substances that react with other chemicals to produce specific flavors, can be used in combination with iron complexes to trigger Maillard reactions. These chemical reactions are responsible for the development of savory, meaty flavors during cooking. The inclusion of fats or oils, such as coconut, canola, or sunflower oil, also impacts the texture and mouthfeel of the product, enhancing the overall flavor experience.

COLORING AGENTS

Meat substitutes often use coloring agents such as tomato or beetroot paste to imitate the red color of meat. For a more authentic appearance, some products use leghemoglobin, a protein found in legumes that is chemically similar to myoglobin, the protein responsible for red color of meat. For an example, The Impossible Burger brand uses leghemoglobin to replicate the color and appearance of meat. The choice of coloring agents varies based on the desired



Figure 3- White Button Mushrooms

FAT

Lipids, including fats and oils, are used in meat analogs to improve tenderness, juiciness, and overall palatability. In modern meat substitutes, various vegetable oils such as canola, coconut, sunflower, sesame, and corn oil are used to replicate the fat content found in meat. These oils help enhance the texture and mouthfeel of the product. A key feature of emulsion-type products is the stability of both fat and moisture within a highly hydrated gel protein matrix. This means that the proteins used in these products must have excellent emulsification potential, allowing them to effectively bind fats and water. Oleosomes are natural fat-storage structures in plants that can be used to stabilize fats in plant-based products.

BINDING AGENTS

Binding agents in meat analogues include



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color characteristics, with the goal of closely resembling traditional raw or cooked meat.

EXAMPLE PROCESS FOR CREATING A MUSHROOM-BASED VEGAN SAUSAGE

Mushrooms are widely available and a versatile ingredient in meat alternatives due to their nutritional benefits and rich flavor. Fresh mushrooms, beetroots, textured soy protein (TSP), bread crumbs, vegetable oil, wheat flour, and selected spices can be used as the main ingredients. To create a mushroom-based meat alternative, fresh mushrooms are first cleaned, soaked in a sodium chloride solution, blanched with citric acid and sodium metabisulfite to prevent browning, and then steamed. Once cooled, they're minced or chopped, with some left in larger pieces for

texture. Beetroots are washed, steamed, and blended until smooth, while textured soy protein (TSP) is ground and sieved into a fine powder. These ingredients are then mixed and stuffed into pre-soaked casings.



Figure 4- Beetroot Paste

The sausages are steamed, cooled in ice water, vacuum-packed, and frozen at -18°C. Adjusting the ratios of mushrooms, TSP, and bread crumbs allows for varied formulations in the final product.

This article presents the significance of meat in diets and the associated health risks, such as cancer and cardiovascular diseases, due to high saturated fat and processed meat

consumption. It introduces meat analogues, which replicate meat characteristics using plant-based ingredients. It covers the role of proteins, fats, binding agents, flavor enhancers, and coloring agents in improving the texture, flavor, and appearance of meat substitutes.

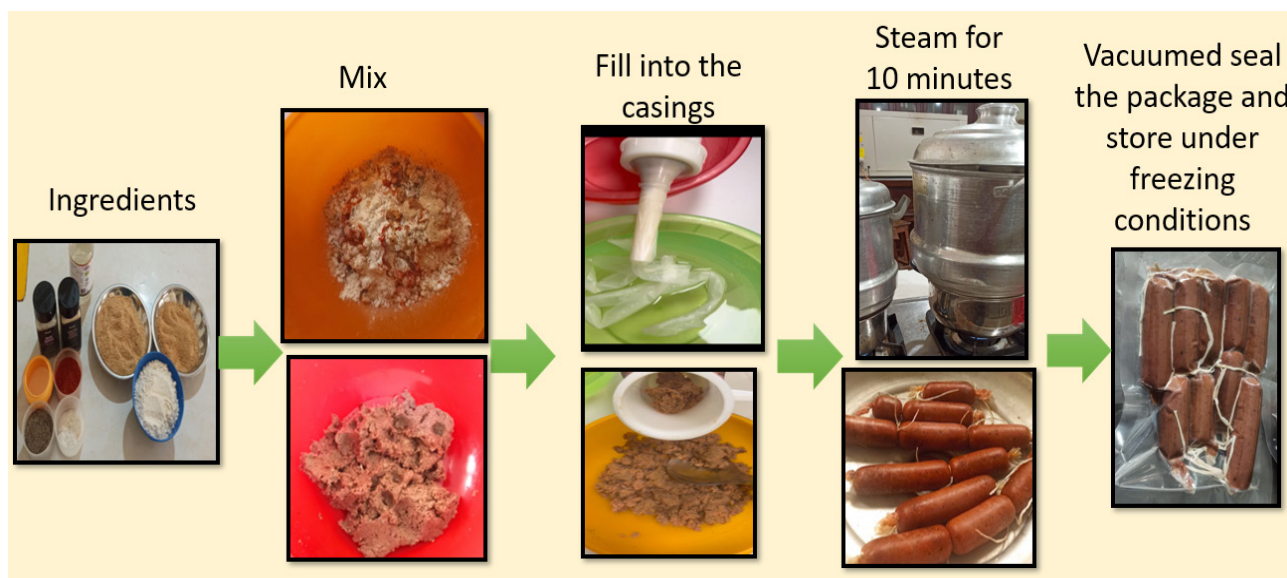


Figure 5- Processing flow of mushroom based vegan sausages



THE ROYAL SPICES OF SRI LANKA; EXPLORING THE BEST ANTIMICROBIAL HERBS LEADING THE WORLD OF SPICES

Sri Lanka, renowned as the "Queen of the World of Spices," is home to some of the most potent antimicrobial herbs valued for their medicinal and culinary uses. Since ancient times, herbs and spices have played a vital role in natural medicine, offering healing properties and disease prevention through powerful plant compounds. These herbs continue to be valuable in modern times, especially in protecting against viral infections and other critical illnesses such as cancer and heart disease. Commonly available herbs like garlic, ginger, cinnamon, turmeric, and goraka fruit possess significant antimicrobial properties, making them easily accessible remedies in Sri Lanka. Among these, garlic (*Allium sativum*) stands out for its rich content of allicin, an active compound with broad-spectrum antimicrobial activity. People use ginger (*Zingiber officinale*) for its gingerols and shogaols, which demonstrate



L.T. KUMARASINGHA
Postgraduate student, Faculty of
Agriculture,
Rajarata University of Sri Lanka
lihini97k@gmail.com

strong antibacterial and antifungal properties. Cinnamon (*Cinnamomum verum*), native to Sri Lanka, is rich in cinnamaldehyde, known for inhibiting bacterial growth, particularly in food preservation. Turmeric (*Curcuma longa*), with its bioactive compound curcumin, has potent antimicrobial and anti-inflammatory effects and is used widely in traditional medicine. Goraka (*Garcinia*), though primarily known for its antioxidant properties, also contains xanthenes, compounds with significant antimicrobial and antifungal activities. Together, these herbs not only define Sri Lankan spice culture, but also play a critical role in natural antimicrobial therapies, contributing to both health and culinary traditions and the brief information of them are mentioned below as follows:

GARLIC (*ALLIUM SATIVUM*)



Garlic is a widely used culinary ingredient and medicinal herb, with a long history dating back to ancient civilizations. The key bioactive component in garlic is allicin, a sulfur-containing compound derived from the amino acid cysteine. When garlic cloves are crushed, alliin is converted into allicin, which is further broken down into ajoene, a compound believed to inhibit blood vessel blockages caused by clots and atherosclerosis. Allicin is responsible for garlic's characteristic strong odor and potent pharmacological effects. Garlic also contains important nutrients such as germanium, magnesium, selenium, vitamins A and C, volatile oils (with approximately 0.5% sulfur-containing compounds), and zinc. Not only that garlic, particularly in its fresh and crushed form, exhibits a broad range of antimicrobial properties, including antiviral, antibacterial, antifungal, and antiphrostatic effects.

Additionally, garlic possesses antioxidant, anti-atherosclerotic, and anticancer activities, making it effective against a wide variety of pathogens, from common to rare infections. The bioactive components of garlic continue to be explored for their therapeutic potential in modern medicine.

GINGER (*ZINGIBER OFFICINALE*)



Ginger is a medicinal plant from the family Zingiberaceae, is renowned for its edible rhizome, which has been utilized globally for centuries to treat a variety of health conditions. Its therapeutic properties include the prevention of toxin accumulation, making individuals less susceptible to viral, fungal, and bacterial infections. Ginger exhibits direct antimicrobial activity, making it effective in treating bacterial infections. Moreover, it is inexpensive, easily accessible, and generally well-tolerated, contributing to its widespread use in managing ailments such as arthritis, cramps, rheumatism, sore throats, muscular aches, constipation, vomiting, hypertension, indigestion, dementia, fever, and infectious diseases. Notably, ginger also possesses antiviral properties, largely attributed to its high concentration of bioactive compounds like gingerols and zingerone, which inhibit viral replication and block viruses from entering host cells.

CINNAMON (*CINNAMOMUM ZEYLANICUM*)

Cinnamon is popularly known as herb which is used as a spice in worldwide not only for cooking but also in traditional and modern medicines. The most important



constituents of cinnamon bark and leaves are cinnamaldehyde and eugenol, which are present in the essential oil, thus contributing to the fragrance and to the various biological activities observed in cinnamon. Properties of cinnamon extract, essential oils and their compounds are the antibacterial activity against Gram-positive and Gram-negative bacteria responsible for human infectious diseases and degradation of food or cosmetic. Also, chemical constituents of cinnamon make it rich in many health beneficial properties like anti-oxidative, antimicrobial, insulin sensitivity, anti-ulcer, anti-diabetic, anti-inflammatory and also exhibits antioxidant, immunostimulant and antiviral activity and it can be used daily.

TURMERIC (CURCUMA LONGA)



Turmeric is a member of the ginger family Zingiberaceae, an ancient coloring spice and a food preservative, known for its various medicinal properties. Turmeric is one of the most nutritionally rich herbs which contains some protein, vitamin C, vitamin B6 calcium, iron, dietary fiber, sodium, and about 29 calories in a 1 tablespoon serving of turmeric powder. It also provides a rich supply

of potassium, magnesium, and manganese. In Ayurveda, turmeric has been used for various purposes and through different routes of administration. It is used topically on the skin for wounds, blistering disease, such as pemphigus and herpes zoster, parasitic skin infections and for acne. Also, it can be used via oral administration for common cold, liver diseases, urinary tract disease, and as a blood purifier.

GORAKA (GARZENIA):

Goraka, or *Garcinia cambogia* commonly known as the "Queen of Fruits," is a tropical fruit from the Clusiaceae family, highly valued for its taste and numerous health benefits.



Beyond its flavor-enhancing properties, Goraka boasts a myriad of health benefits that rich in hydroxycitric acid (HCA), and help to aid digestion, promote weight loss, and regulate blood sugar levels, reduces cholesterol. Its natural acidity also acts as a preservative, making it a popular ingredient in pickles and preserves. In addition to its culinary applications, Goraka holds a prominent place in traditional medicine and folklore. In Sri Lankan Ayurveda, it is a great source for its cooling properties and used to alleviate digestive disorders, reduce inflammation, and treat skin ailments. Furthermore, this fruit is a good source of antioxidants that blocks the multiplication and spreading of the cancer cells and best for digestion related issues such as constipation and bowel problems due to the presence of fiber and water in the fruit that enhances digestion as well.

Accordingly, the antimicrobial herbs of Sri Lanka are more than just spices; they are a vital part of the island's rich history and culture. Garlic, ginger, cinnamon, turmeric, and goraka offer a natural means of enhancing health, preventing infections, and promoting overall well-being. As the world looks to nature for solutions to modern health challenges, these Sri Lankan herbs remain at the forefront of natural medicine, celebrated for their powerful therapeutic properties and deep-rooted significance in both ancient and modern healing traditions.

ANSWERS FOR THE NUTRI BRAIN TEASER

ACROSS

1. Calcium
4. Fruit
5. Iodine
6. ROS
8. Eyes
9. Osteoporosis
11. Mast cell
12. Insulin
13. Uterus
15. Goitre
17. Soy
20. Colon
22. Ileum
23. Enzymes
24. Folic
25. Bile
26. Pepsinogen

DOWN

1. Calories
2. Lactose
3. Miso
6. Rice bran
7. Sodium
10. Plasma
11. Microvillus
14. Thymus
16. Protein
18. Anemia
19. Acid
21. Ames

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3. Sending hard copies to the IFSTSL office [Institute of Food Science & Technology Sri Lanka, No.21D, Vijaya Kumaratunga Mw (Polhengoda Gardens), Colombo-05, Sri Lanka] via registered post

Membership fee payments can be made by a cheque drawn in favour of "Institute of Food Science & Technology Sri Lanka", and cross A/P only or depositing money online into the following bank account and sending the paying slip through **WhatsApp to 077 114 9397**.

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For any clarification, please contact:

Mrs. Sandhya Fernando
Phone: +94 117 548 770 Fax: +94 117 548 771
Email: info@ifstsl.org

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CONTACT

0771449397 / ifstainfo@gmail.com
No.21D, Vijaya Kumaratunga Mw,
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