EURASIAN EXPERIMENT JOURNAL OF SCIENTIFIC AND APPLIED RESEARCH
(EEJSAR) ISSN: 2992-4146
©EEJSAR Publications Volume 7 Issue 3 2025

Comparative Toxicological Evaluation of Natural and Artificial Sweeteners: Focus on Liver and Kidney Damage

Kamanzi Ntakirutimana G.

School of Natural and Applied Sciences Kampala International University Uganda

ABSTRACT

The global rise in obesity, diabetes, and other metabolic disorders has accelerated the adoption of natural and artificial sweeteners as alternatives to traditional sugars. Promoted for their low or zero-caloric value, these sweeteners are now ubiquitous in processed foods, beverages, and pharmaceutical products. While generally recognized as safe (GRAS) by regulatory authorities, growing scientific evidence raises concerns about their long-term safety, particularly in relation to liver and kidney function. This review presents a comprehensive comparative toxicological evaluation of widely consumed natural sweeteners such as steviol glycosides and monk fruit extract and synthetic sweeteners including aspartame, sucralose, saccharin, and acesulfame potassium. It examines their metabolic fate, mechanisms of toxicity, dose-dependent effects, and histopathological outcomes in preclinical and clinical studies. Special attention is given to the roles of oxidative stress, inflammation, mitochondrial dysfunction, and alterations in gut microbiota, which collectively contribute to hepatotoxic and nephrotoxic manifestations. Furthermore, the review highlights discrepancies between current regulatory guidelines and emerging toxicological data, calling for updated risk assessments that consider chronic exposure, cumulative intake, and vulnerable populations. By synthesizing current evidence, this review aims to guide health-conscious consumption, inform clinical recommendations, and support regulatory frameworks for safer use of sweeteners in food and medicine.

Keywords: Sweeteners, Hepatotoxicity, Nephrotoxicity, Artificial sweeteners, Natural sweeteners, Gut microbiota

INTRODUCTION

The increasing global burden of metabolic disorders such as obesity, type 2 diabetes mellitus, and cardiovascular disease has prompted widespread efforts to reduce dietary sugar intake [1]. As a result, both natural and artificial sweeteners have gained significant popularity as sugar substitutes. Natural sweeteners, such as steviol glycosides derived from the Stevia rebaudiana plant and mogrosides from monk fruit (Siraitia grosvenorii), are often perceived as healthier alternatives due to their plant-based origin [2]. Artificial sweeteners, including aspartame, sucralose, saccharin, and acesulfame potassium, are synthetically produced compounds designed to mimic the taste of sugar without the associated caloric value [3]. These sweeteners are commonly added to beverages, baked goods, dairy products, and even pharmaceutical formulations. Although they provide sweetness without significantly impacting blood glucose levels, concerns have been raised about their long-term safety [4]. Regulatory agencies such as the U.S. Food and Drug Administration (FDA), European Food Safety Authority (EFSA), and the Joint FAO/WHO Expert Committee on Food Additives (JECFA) have classified most of these compounds as generally recognized as safe (GRAS) when consumed within established acceptable daily intake (ADI) levels [5,6]. However, recent studies suggest that even within these limits, chronic exposure may exert adverse effects, particularly on the liver and kidneys [7]. The liver and kidneys play crucial roles in the metabolism, detoxification, and elimination of xenobiotics, including sweeteners and their metabolites [8]. Toxicological studies have reported histopathological, biochemical, and functional alterations in these organs following prolonged sweetener exposure [9]. These effects are often mediated through oxidative stress, inflammation, mitochondrial dysfunction, and disruption of gut microbiota [10]. Given the increasing consumption of these compounds across all age groups, a deeper understanding of their toxicological profiles is essential. This review provides a comprehensive comparison of the hepatotoxic and nephrotoxic effects of both natural and artificial sweeteners, aiming to inform safer dietary choices, guide clinical practices, and support regulatory policy development.

Classification of Sweeteners

Sweeteners can be broadly categorized into two main groups: natural and artificial sweeteners [11]. This classification is primarily based on their origin and method of production. Natural sweeteners are derived from plant sources and typically undergo minimal processing before being incorporated into food and beverage products [12]. Common examples include steviol glycosides, extracted from the leaves of the Stevia rebaudiana plant, and mogrosides, which are the active sweet components found in monk fruit, also known as Siraitia grosvenorii [12]. Another notable natural sweetener is thaumatin, a sweet-tasting protein obtained from the katemfe fruit [13]. These sweeteners are often favored in health-conscious markets for their plant-based origins and low impact on blood glucose levels [12]. In contrast, artificial sweeteners are synthetically produced chemical compounds designed to replicate the sweetness of sugar without contributing significant calories [3]. Widely used examples include aspartame, a dipeptide composed of phenylalanine and aspartic acid; sucralose, a chlorinated derivative of sucrose [6]; saccharin, one of the earliest synthetic sweeteners; and acesulfame potassium, also known as Ace-K, which is frequently used in combination with other sweeteners to enhance flavor profiles [14]. Cyclamate, though banned in some countries due to safety concerns, continues to be used in others [15]. The primary distinction between natural and artificial sweeteners lies in their chemical structure and metabolic fate. While natural sweeteners are generally perceived as safer, both categories have been associated with potential health concerns. This review explores their comparative toxicological profiles with a specific focus on liver and kidney health outcomes.

Metabolism and Biological Fate

The metabolism and biological fate of sweeteners vary significantly depending on their chemical structure and origin. These differences influence not only their sweetness profile and caloric contribution but also their potential to induce toxicological effects in key organs such as the liver and kidneys [16]. Understanding how sweeteners are processed in the body is essential to assess their safety, especially under conditions of chronic exposure. Natural sweeteners, including steviol glycosides and mogrosides, generally follow metabolic pathways that involve the gut microbiota [17]. Steviol glycosides, the active compounds in Stevia, are not absorbed in their intact form. Instead, they reach the colon where they are hydrolyzed by intestinal microbiota into steviol [18]. This metabolite is then absorbed into the bloodstream, transported to the liver, conjugated with glucuronic acid, and subsequently excreted via the urine [18,19]. This pathway suggests a relatively low systemic burden from the parent compound, although the effects of its metabolite steviol have drawn increasing interest in toxicological studies. Mogrosides, derived from monk fruit, undergo hydrolysis in the gastrointestinal tract to yield mogrol and glucose [20]. These compounds show minimal systemic absorption, and the bulk of the sweetener is eliminated without entering systemic circulation in significant amounts [20]. Consequently, their toxicity potential is believed to be lower than that of synthetic compounds, although long-term safety data remain limited. Artificial sweeteners, in contrast, often have more direct systemic exposure and elimination routes. Aspartame, a widely used artificial sweetener, is rapidly hydrolyzed in the gastrointestinal tract to produce phenylalanine, aspartic acid, and methanol [21]. While these are naturally occurring metabolites, elevated levels—particularly of methanol—can be problematic in susceptible individuals or under high intake conditions [22]. Sucralose is only partially absorbed in the gastrointestinal tract, with the majority excreted unchanged in feces [23]. A smaller proportion is absorbed and ultimately eliminated via the urine [23]. However, some evidence suggests that sucralose can accumulate in the liver and kidneys, contributing to potential cytotoxicity [24]. Saccharin and acesulfame potassium are both absorbed efficiently and excreted largely unchanged through the kidneys [25]. Their persistent presence in renal excretion raises concerns about cumulative exposure, particularly in individuals with compromised renal function or high sweetener intake [25]. Overall, the metabolic fate of sweeteners plays a pivotal role in shaping their toxicological profile and warrants thorough investigation in both experimental and clinical contexts.

Nephrotoxicity of Sweeteners

The potential nephrotoxic effects of sweeteners have been a growing concern, with evidence emerging from both preclinical studies and human observations.

Evidence from Preclinical Studies

Animal studies have demonstrated that certain artificial sweeteners may contribute to kidney damage. Saccharin has been linked to bladder carcinogenesis in rodents, with recent findings also reporting tubular necrosis and glomerular damage at high concentrations [26]. Acesulfame K has been associated with renal oxidative stress and impaired glomerular filtration in animal models, indicating potential nephrotoxicity [27]. Similarly, chronic exposure to sucralose has been shown to alter renal function, promote inflammation, and accumulate in renal tissue [28]. In contrast, natural sweeteners such as stevia and monk fruit appear to exert nephroprotective effects, likely due to their antioxidant properties, when consumed in low to moderate doses [29].

Human Observations

Epidemiological studies suggest a potential association between high artificial sweetener intake and reduced renal function, particularly in older adults [30]. Additionally, diabetic patients who consume large amounts of artificial sweeteners tend to exhibit higher levels of urinary protein excretion, a marker of kidney dysfunction [28]. While more research is needed, these findings raise concerns about the long-term impact of artificial sweeteners on kidney health, highlighting the importance of moderation and further investigation into their effects.

Role of Oxidative Stress and Inflammation

Oxidative stress and inflammation play a crucial role in toxicological effects on the liver and kidneys [31]. One major mechanism involves the excessive generation of reactive oxygen species (ROS), which can lead to cellular damage [32]. Additionally, oxidative stress contributes to the upregulation of pro-inflammatory cytokines, such as TNF-α and IL-6, further exacerbating tissue injury [33]. Chronic inflammation and oxidative damage can impair mitochondrial function, leading to energy depletion and an increased rate of cellular apoptosis [34]. This cascade of events compromises organ function and may contribute to the progression of diseases affecting the liver and kidneys. Artificial sweeteners have been shown to exhibit higher pro-oxidative and pro-inflammatory potential compared to natural sweeteners [35]. Their prolonged consumption may heighten oxidative stress and inflammation, increasing the risk of metabolic and organ-related disorders [28]. Understanding these mechanisms is essential in evaluating the long-term safety of artificial sweeteners and their potential impact on overall health.

Impact on Gut Microbiota and Metabolite Production; Dose, Duration, and Combined Exposure

The gut microbiota plays a vital role in maintaining host metabolic, immune, and detoxification functions [36]. Increasing evidence suggests that the consumption of sweeteners, particularly artificial ones, can significantly alter gut microbial composition and function [37]. Artificial sweeteners such as sucralose, saccharin, and acesulfame potassium have been shown to disrupt microbial diversity and promote the overgrowth of pro-inflammatory bacterial taxa, notably members of the phylum Proteobacteria [38]. These microbial imbalances, often referred to as dysbiosis, can increase gut permeability, stimulate systemic inflammation, and contribute to the indirect hepatotoxic and nephrotoxic effects observed in both preclinical and clinical studies [39]. In contrast, natural sweeteners like Stevia appear to have a neutral or even beneficial impact on the gut microbiome. Some studies indicate that Stevia may support the growth of beneficial bacteria such as Bifidobacterium species, which are associated with anti-inflammatory effects and improved gut barrier integrity [40]. However, long-term human studies remain limited, and further research is necessary to validate these findings. Beyond composition, the toxicological outcomes of sweeteners are closely influenced by the dose, duration of exposure, and combination with other substances [41]. While most regulatory agencies set acceptable daily intake limits, chronic exposure—even within these limits—may lead to bioaccumulation and subclinical organ stress. This is particularly relevant in individuals consuming multiple types of sweeteners concurrently, a common practice in processed food consumption [42]. Moreover, co-exposure to other hepatotoxic or nephrotoxic agents, such as alcohol, nonsteroidal anti-inflammatory drugs (NSAIDs), or environmental toxins, may exacerbate organ injury and accelerate disease progression [43]. A comprehensive understanding of these interactions is essential for developing informed dietary guidelines and mitigating long-term health risks.

Regulatory Perspectives

The regulation of sweeteners is overseen by national and international agencies that aim to ensure consumer safety through evidence-based guidelines. Prominent among these are the United States Food and Drug Administration (FDA), the European Food Safety Authority (EFSA), and the Joint FAO/WHO Expert Committee on Food Additives (JECFA). These bodies conduct toxicological evaluations using data from long-term animal studies, in vitro assessments, and available clinical research to determine the safety profiles of sweeteners. A central outcome of these evaluations is the establishment of an Acceptable Daily Intake (ADI), which represents the maximum amount of a substance that can be consumed daily over a lifetime without posing significant health risks [44]. For example, EFSA has set the ADI for aspartame at 40 milligrams per kilogram of body weight per day, while the FDA has established a 15 milligrams per kilogram per day limit for sucralose [45,46]. JECFA has approved steviol glycosides, the active components in Stevia, at an ADI of 4 milligrams per kilogram per day [47]. Acesulfame potassium, another commonly used synthetic sweetener, shares an ADI of 15 milligrams per kilogram per day with sucralose [48]. These values are derived with considerable safety margins and are designed to protect consumers across various age groups and health statuses. Despite these regulatory safeguards, there is growing scientific concern that chronic consumption of sweeteners, even within these established limits, may lead to adverse health effects. Studies have begun to highlight subtle but potentially significant hepatic and renal outcomes, particularly among individuals with pre-existing conditions or higher-than-average sweetener intake [49]. Moreover, current ADI determinations typically focus on individual sweeteners in isolation and do not consider the cumulative or synergistic effects that may arise from consuming multiple sweeteners simultaneously—a common scenario in

modern diets rich in processed foods [50]. Additionally, real-world consumption patterns often deviate from the controlled conditions under which ADIs are calculated [51]. Individuals with diabetes, obesity, or those adhering to calorie-restricted diets frequently consume sweeteners in large quantities across multiple products. This has prompted public health advocates and researchers to call for a more dynamic and updated regulatory approach that takes into account contemporary dietary behaviors, vulnerable population groups, and emerging scientific data. The role of gut microbiota, metabolic by-products, and chronic low-dose exposure is still underexplored in regulatory assessments. These factors can influence systemic inflammation, organ stress, and the long-term safety of both artificial and natural sweeteners. As such, there is a growing need for regulatory frameworks to incorporate findings from microbiome science, systems toxicology, and longitudinal human studies. While existing regulations have been instrumental in guiding the safe use of sweeteners, the evolving scientific landscape demands a more integrative and precautionary approach. Periodic re-evaluation of ADIs, enhanced post-market surveillance, and stricter assessment of cumulative exposure are essential steps toward ensuring consumer safety and maintaining public trust [52].

CONCLUSION

Natural and artificial sweeteners show divergent toxicological profiles, with artificial sweeteners exhibiting greater potential for hepatic and renal damage, particularly under chronic and high-dose exposure. Natural sweeteners, while safer, may still cause adverse effects at excessive levels. A balanced consumption, informed by ongoing research and individual health contexts, remains essential. Policymakers should consider updating intake guidelines and encouraging research into safer alternatives.

REFERENCES

1. Lara-Castor L, O'Hearn M, Cudhea F, Miller V, Shi P, Zhang J, et al. Burdens of type 2 diabetes and cardiovascular disease attributable to sugar-sweetened beverages in 184 countries. Nature Medicine. 2025; doi:10.1038/s41591-024-03345-4
2. Ikechukwu, GC., Egba SI., Ibeh, RC., Helal EU, Ejiofor, EU and Okafor, PN (2017) Assessment of Sub-chronic Effect of Two Artificial Food Additives on Selected Biochemical Parameters in Wistar Rats. Journal of Pharmacology and Toxicology, 12: 180-190
3. Chattopadhyay S, Raychaudhuri U, Chakraborty R. Artificial sweeteners – a review. Journal of Food Science and Technology. 2011;51(4):611–21. doi:10.1007/s13197-011-0571-1
4. Angelin M, Kumar J, Vajravelu LK, Satheesan A, Chaithanya V, Murugesan R. Artificial sweeteners and their implications in diabetes: a review. Frontiers in Nutrition. 2024;11. doi:10.3389/fnut.2024.1411560
5. Lohner S, Toews I, De Gaudry DK, Sommer H, Meerpohl JJ. Non-nutritive sweeteners for diabetes mellitus. Cochrane Library. 2017; doi:10.1002/14651858.cd012885
6. Program HF. Aspartame and other sweeteners in food. U.S. Food And Drug Administration. 2025. Available from: https://www.fda.gov/food/food-additives-petitions/aspartame-and-other-sweeteners-food
7. Kossiva L, Kakleas K, Christodouli F, Soldatou A, Karanasios S, Karavanaki K. Chronic use of artificial sweeteners: pros and cons. Nutrients. 2024;16(18):3162. doi:10.3390/nu16183162
8. Rai M, Paudel N, Sakhrie M, Gemmati D, Khan IA, Tisato V, et al. Perspective on Quantitative Structure–Toxicity Relationship (QSTR) models to predict hepatic biotransformation of xenobiotics. Livers. 2023;3(3):448–62. doi:10.3390/livers3030032
9. Anbara H, Kian M, Darya G, Sheibani MT. Long-term intake of aspartame-induced cardiovascular toxicity is reflected in altered histochemical parameters, evokes oxidative stress, and trigger P53-dependent apoptosis in a mouse model. International Journal of Experimental Pathology. 2022;103(6):252–62. doi:10.1111/iep.12458
10. Abdolmaleky HM, Zhou JR. Gut microbiota dysbiosis, oxidative stress, inflammation, and epigenetic alterations in metabolic diseases. Antioxidants. 2024;13(8):985. doi:10.3390/antiox13080985
11. Das A, Chakraborty R. An introduction to sweeteners. In: Reference series in phytochemistry. 2018. p. 1–13. doi:10.1007/978-3-319-27027-2_1
12. Castro-Muñoz R, Correa-Delgado M, Córdova-Almeida R, Lara-Nava D, Chávez-Muñoz M, Velásquez-Chávez VF, et al. Natural sweeteners: Sources, extraction and current uses in foods and food industries. Food Chemistry. 2021;370:130991. doi:10.1016/j.foodchem.2021.130991
13. Masuda T. Sweet-Tasting protein Thaumatin: Physical and chemical properties. In: Reference series in phytochemistry. 2018. p. 493–523. doi:10.1007/978-3-319-27027-2_10
14. Jorge K. SOFT DRINKS | Chemical Composition. In: Elsevier eBooks. 2003. p. 5346–52. doi:10.1016/b0-12-227055-x/01101-9
15. Lawrence JF. CYCLAMATES. In: Elsevier eBooks. 2003. p. 1712–4. doi:10.1016/b0-12-227055-x/00318-7
16. Magnuson BA, Carakostas MC, Moore NH, Poulos SP, Renwick AG. Biological fate of low-calorie sweeteners. Nutrition Reviews. 2016;74(11):670–89. doi:10.1093/nutrit/nuw032

17. Ruiz-Ojeda FJ, Plaza-Díaz J, Sáez-Lara MJ, Gil A. Effects of sweeteners on the gut microbiota: A review of experimental studies and clinical trials. Advances in Nutrition. 2018;10:S31–48. doi:10.1093/advances/nmy037
18. Purkayastha S, Markosyan A, Prakash I, Bhusari S, Pugh G, Lynch B, et al. Steviol glycosides in purified stevia leaf extract sharing the same metabolic fate. Regulatory Toxicology and Pharmacology. 2016;77:125–33. doi:10.1016/j.yrtph.2016.02.015
19. Gu W, Rebsdorf A, Anker C, Gregersen S, Hermansen K, Geuns JMC, et al. Steviol glucuronide, a metabolite of steviol glycosides, potently stimulates insulin secretion from isolated mouse islets: Studies in vitro. Endocrinology Diabetes & Metabolism. 2019;2(4). doi:10.1002/edm2.93
20. Egba, SI., Ogbodo, JO., Ogbodo PO and Obike CA (2017) Toxicological Evaluation of Two Named Herbal Remedies Sold Across Orumba South Local Government of Anambra State, South-Eastern Nigeria. Asian Journal of Research in Biochemistry, 1(1):1-6
21. Choudhary AK, Lee YY. The debate over neurotransmitter interaction in aspartame usage. Journal of Clinical Neuroscience. 2018;56:7–15. doi:10.1016/j.jocn.2018.06.043
22. Ashurst JV, Schaffer DH, Nappe TM. Methanol toxicity. StatPearls - NCBI Bookshelf. 2025. Available from: https://www.ncbi.nlm.nih.gov/books/NBK482121/
23. Schiffman SS, Rother KI. Sucralose, a synthetic organochlorine sweetener: Overview of biological issues. Journal of Toxicology and Environmental Health Part B. 2013;16(7):399–451. doi:10.1080/10937404.2013.842523
24. Wu HT, Lin CH, Pai HL, Chen YC, Cheng KP, Kuo HY, et al. Sucralose, a non-nutritive artificial sweetener exacerbates high fat Diet-Induced hepatic steatosis through taste receptor type 1 Member 3. Frontiers in Nutrition. 2022;9. doi:10.3389/fnut.2022.823723
25. Pang MD, Goossens GH, Blaak EE. The impact of artificial sweeteners on body weight control and glucose homeostasis. Frontiers in Nutrition. 2021;7. doi:10.3389/fnut.2020.598340
26. Azeez OH, Alkass SY, Persike DS. Long-Term saccharin consumption and increased risk of obesity, diabetes, hepatic dysfunction, and renal impairment in rats. Medicina. 2019;55(10):681. doi:10.3390/medicina55100681
27. Saarti M, Khalaf MM, Althanoon ZA. Non-Nutritive sweeteners modulated creatinine and urea levels in white albino rats. Pharmacognosy Journal. 2024;16(2):422–5. doi:10.5530/pj.2024.16.66
28. Schwarz A, Hernandez L, Arefin S, Sartirana E, Witasp A, Wernerson A, et al. Sweet, bloody consumption – what we eat and how it affects vascular ageing, the BBB and kidney health in CKD. Gut Microbes. 2024;16(1). doi:10.1080/19490976.2024.2341449
29. Wazir M, Verma H, Singh J, Singh P, Passey S. The Battle of Natural Sweeteners: A comprehensive guide to monk fruit and stevia. Current Research in Nutrition and Food Science Journal. 2025;13(1):24–45. doi:10.12944/crnfsj.13.1.2
30. Ran Z, Zheng Y, Yu L, Zhang Y, Zhang Z, Li H, et al. Linking artificial sweetener intake with kidney function: insights from NHANES 2003–2006 and findings from Mendelian randomization research. Frontiers in Nutrition. 2024;11. doi:10.3389/fnut.2024.1387676
31. Chaudhary P, Janmeda P, Docea AO, Yeskaliyeva B, Razis AFA, Modu B, et al. Oxidative stress, free radicals and antioxidants: potential crosstalk in the pathophysiology of human diseases. Frontiers in Chemistry. 2023;11. doi:10.3389/fchem.2023.1158198
32. Hong Y, Boiti A, Vallone D, Foulkes NS. Reactive Oxygen Species Signaling and Oxidative Stress: Transcriptional Regulation and Evolution. Antioxidants. 2024;13(3):312. doi:10.3390/antiox13030312
33. Mittal M, Siddiqui MR, Tran K, Reddy SP, Malik AB. Reactive oxygen species in inflammation and tissue injury. Antioxidants and Redox Signaling. 2013;20(7):1126–67. doi:10.1089/ars.2012.5149
34. Kowalczyk P, Sulejczak D, Kleczkowska P, Bukowska-Ośko I, Kucia M, Popiel M, et al. Mitochondrial oxidative Stress—A causative factor and therapeutic target in many diseases. International Journal of Molecular Sciences. 2021;22(24):13384. doi:10.3390/ijms222413384
35. Basson AR, Rodriguez-Palacios A, Cominelli F. Artificial Sweeteners: History and new concepts on inflammation. Frontiers in Nutrition. 2021;8. doi:10.3389/fnut.2021.746247
36. Cao C, Yue S, Lu A, Liang C. Host-Gut microbiota metabolic interactions and their role in precision diagnosis and treatment of gastrointestinal cancers. Pharmacological Research. 2024;207:107321. doi:10.1016/j.phrs.2024.107321
37. Hosseini A, Barlow GM, Leite G, Rashid M, Parodi G, Wang J, et al. Consuming artificial sweeteners may alter the structure and function of duodenal microbial communities. iScience. 2023;26(12):108530. doi:10.1016/j.isci.2023.108530
38. Feng J, Peng J, Hsiao YC, Liu CW, Yang Y, Zhao H, et al. Non/Low-Caloric artificial sweeteners and gut microbiome: From perturbed species to mechanisms. Metabolites. 2024;14(10):544. doi:10.3390/metabo14100544

39. Chen P. Enteric dysbiosis, gut barrier and liver disease. HepatoBiliary Surgery and Nutrition. 2018;7(1):38–40. doi:10.21037/hbsn.2017.12.06
40. Kasti A, Nikolaki M, Synodinou K, Katsas K, Petsis K, Lambrinou S, et al. The effects of stevia consumption on gut bacteria: friend or foe? Microorganisms. 2022;10(4):744. doi:10.3390/microorganisms10040744
41. Magnuson BA, Roberts A, Nestmann ER. Critical review of the current literature on the safety of sucralose. Food and Chemical Toxicology. 2017;106:324–55. doi:10.1016/j.fct.2017.05.047
42. Knezovic Z, Zidar BJ, Pribisalic A, Luetic S, Jurcic K, Knezovic N, et al. Artificial sweeteners in food Products: concentration analysis, label practices, and cumulative intake assessment in Croatia. Nutrients. 2025;17(7):1110. doi:10.3390/nu17071110
43. Sriuttha P, Sirichanchuen B, Permsuwan U. Hepatotoxicity of Nonsteroidal Anti-Inflammatory Drugs: A Systematic Review of randomized Controlled trials. International Journal of Hepatology. 2018;2018:1–13. doi:10.1155/2018/5253623
44. Gad SE. Dose–Response relationship. In: Elsevier eBooks. 2005. p. 95–8. doi:10.1016/b0-12-369400-0/00357-4
45. European Food Safety Authority. Aspartame. European Food Safety Authority. 2023. Available from: https://www.efsa.europa.eu/en/topics/topic/aspartame
46. Program HF. Aspartame and other sweeteners in food. U.S. Food And Drug Administration. 2025. Available from: https://www.fda.gov/food/food-additives-petitions/aspartame-and-other-sweeteners-food
47. Ashwell M. Stevia, Nature's Zero-Calorie sustainable sweetener. Nutrition Today. 2015;50(3):129–34. doi:10.1097/nt.0000000000000094
48. Lobach AR, Roberts A, Rowland IR. Assessing the in vivo data on low/no-calorie sweeteners and the gut microbiota. Food and Chemical Toxicology. 2018;124:385–99. doi:10.1016/j.fct.2018.12.005
49. Huneault HE, Tovar AR, Sanchez-Torres C, Welsh JA, Vos MB. The impact and burden of dietary sugars on the liver. Hepatology Communications. 2023;7(11). doi:10.1097/hc9.0000000000000297
50. Sievenpiper JL, Purkayastha S, Grotz VL, Mora M, Zhou J, Hennings K, et al. Dietary guidance, sensory, health and safety considerations when choosing Low and No-Calorie sweeteners. Nutrients. 2025;17(5):793. doi:10.3390/nu17050793
51. Syed S, Acquaye A, Khalfan MM, Obuobisa-Darko T, Yamoah FA. Decoding Sustainable Consumption Behavior: A systematic review of theories and models and provision of a guidance framework. Resources Conservation & Recycling Advances. 2024;23:200232. doi:10.1016/j.rcradv.2024.200232
52. Bhagyasri A, Kumar RN, Balakrishna N, Rao VS. Exposure Assessment of Artificial Sweeteners among Type 2 Diabetic, Overweight and Obese Individuals. The Indian Journal of Nutrition and Dietetics. 2016;53(3):268. doi:10.21048/ijnd.2016.53.3.5297

CITE AS: Kamanzi Ntakirutimana G. (2025). Comparative Toxicological Evaluation of Natural and Artificial Sweeteners: Focus on Liver and Kidney Damage. EURASIAN EXPERIMENT JOURNAL OF SCIENTIFIC AND APPLIED RESEARCH, 7(3):150-155