

Review Article

Konjac glucomannan: Properties, modifications and applications in pharmacy

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Abstract

Konjac glucomannan (KGM) is a natural polysaccharide extracted from the tuber of *Amorphophallus konjac*, known for its biocompatibility, biodegradability, and safety, making it suitable for use in both the food and pharmaceutical industries. Nevertheless, its high viscosity and limited solubility present major obstacles for its use in pharmaceutical formulations. To overcome these challenges, various chemical and physical modification techniques such as hydrolysis, oxidation, and carboxymethylation have been employed to adjust their molecular weight, viscosity, and solubility characteristics to align with pharmaceutical formulation requirements. These modifications enable KGM to function as a drug delivery vehicle capable of controlled and targeted release, with potential applications in intracellular therapies, colon-targeted delivery systems, and oral nanocarriers for insulin and other bioactive agents. Its effectiveness as an excipient and drug carrier matrix is further supported by its ability to interact selectively with target cells, including macrophages, via mannose receptors and its inherent antioxidant and antidiabetic activities. The combination of its modifiability, pharmaceutical functionality, and therapeutic potential positions KGM as a strong candidate among natural polymers for the development of advanced biomaterial-based drug delivery systems.

Keywords: Konjac glucomannan, Modifications, Drug delivery systems, Pharmaceutical applications

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INTRODUCTION

Konjac glucomannan (KGM) is a natural macromolecular polysaccharide extracted from the tuber of *Amorphophallus konjac*, a perennial herbaceous monocotyledonous plant belonging to the Araceae family [1]. *Amorphophallus konjac*, locally known as *porang*, is a species native to Indonesia. It is widely recognized for its edible tubers, which serve as the primary source of konjac glucomannan. KGM, also found in yeast cell walls, has been reported to possess

strong adsorptive properties toward mycotoxins, highlighting its potential as a functional biomaterial for detoxification [2]. KGM is a polysaccharide composed of D-mannose and D-glucose monomers linked by β -1,4 glycosidic bonds as illustrated in Figure 1 [3]. The molecular structure of KGM also consists of β -glucose and β -mannose units, with a small number of acetyl groups, forming a randomly coiled linear chain. The single-chain conformation of KGM in aqueous solution is influenced by dihedral angle energies and its

intramolecular hydrogen bonding. KGM is characterized by a high molecular weight and viscosity, good solubility and swelling ability, non-ionic nature, and excellent gel-forming capability in water [1]. However, its high viscosity and substantial water absorption capacity limit its utilization in certain applications. Therefore, structural modifications are necessary to overcome these inherent properties and expand its potential use.

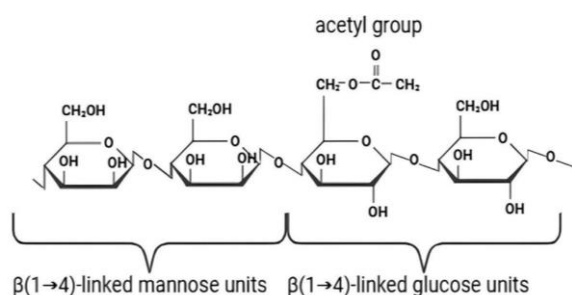


Figure 1: Molecular structure of Konjac Glucomannan (KGM)

KGM exhibits excellent biocompatibility and biodegradability, and it is derived from an abundant biomass source, making it widely applicable across various fields. In addition to being used as a dietary fiber, KGM has a long-standing history in traditional Chinese medicine and is also utilized in Southeast Asian regions [4]. In the health sector, KGM is used as a functional health supplement for individuals with diabetes and obesity in China. In the pharmaceutical field, KGM is utilized as a drug delivery matrix due to its ability to serve as a carrier or substrate for the encapsulation and delivery of biologically active compounds. Its biodegradable nature and gel-forming capability support its role in such applications [3]. KGM is also known for its low toxicity and minimal side effects, attributed to its natural polymer origin [5]. According to the *Food and Drug Administration* (FDA), KGM is classified as Generally Recognized as Safe (GRAS) in the United States, Canada, and the European Union for its use as a food additive [3]. Moreover, KGM has been explored as a carrier for anti-tuberculosis drugs such as isoniazid and rifabutin, owing to its mannose units, which can enhance interactions between microparticles and macrophages via mannose receptors expressed on their cell surfaces [6]. In line with this approach, quercetin-loaded microparticles have also been reported to exhibit significant antibacterial activity against *Mycobacterium tuberculosis*, supporting their growing use as a potential pulmonary delivery system for tuberculosis therapy [7].

Toxicity assessments have been determined to show that KGM-based microspheres alone are non-cytotoxic, with macrophage-like THP-1 cell viability maintained at $\geq 70\%$ across all tested concentrations. In pulmonary epithelial A549 cells, this viability threshold was sustained up to a concentration of $125\text{ }\mu\text{g/mL}$. Furthermore, Lactate Dehydrogenase (LDH) release remained below 10% , indicating no membrane damage. Inhalation studies in rats, involving both single and repeated doses, showed no detectable alterations in leukogram profiles, IgE levels, organ indices, or pulmonary histopathology, suggesting that these particles are safe for inhalational applications [6]. As a renewable natural polymer with excellent biocompatibility, biodegradability, and notable biological activity, KGM holds considerable promise for pharmaceutical applications [8]. In view of KGM's broad potential, this review article aims to provide a comprehensive overview of its key characteristics, various modification strategies, and pharmaceutical applications, serving as a foundation to support future research and development.

METHODS

This review was conducted by searching literature in PubMed, Scopus, ScienceDirect, and Google Scholar using the keywords “konjac glucomannan”, “modification”, “hydrolysis”, “oxidation”, “carboxymethylation”, “sulfation” and “pharmaceutical applications”. Only articles published between 2000 and 2025 that are relevant to KGM properties, modification methods, and pharmaceutical applications were included in this review.

Physicochemical characteristics of KGM

The structure of KGM includes acetyl groups located at the C-6 position of the side chain, which enhance its solubility by inhibiting intramolecular hydrogen bonding between individual KGM polymer chains, but simultaneously inhibit gel formation, as their removal through deacetylation promotes molecular aggregation and gelation. The water solubility of KGM is attributed to the presence of acetyl substituents, accounting for approximately 5% to 10% of the mannose residues along the main chain. Molecular dynamics simulations have demonstrated that these acetyl groups play a crucial role in maintaining the semi-flexible, irregular helical conformation of KGM chains in aqueous solutions at room temperature, with the helical configuration depending on the degree of polymerization [1].

In addition, the morphology of KGM depends on the extraction method used. Ethanol-extracted KGM typically exhibits round to oval shapes, whereas commercial KGM tends to be flat, possibly due to mechanical grinding processes. The smoother surface of commercial KGM suggests the presence of surface impurities. A 1 % KGM solution exhibits a viscosity of 14,696.86 mPa·s, indicating its strong thickening capability. X-Ray Diffraction (XRD) patterns reveal that ethanol-extracted KGM possesses a more crystalline phase compared to its commercial counterpart [3]. KGM is also characterized by its excellent thickening ability, film-forming capacity, gelation properties, biocompatibility, and biodegradability. It is generally colorless and odorless. However, native KGM exhibits extremely high viscosity and poor dispersibility in water due to its high molecular weight, which typically ranges from 1.0×10^5 to 2.0×10^6 Da, thereby restricting its applicability [9]. For instance, in its hydrosol form, KGM can be difficult to swallow, even at relatively low concentrations, which limits its use as a supplement or functional food [10]. To overcome these limitations, several degradation approaches have been investigated to reduce the viscosity of KGM, including enzymatic hydrolysis (biodegradation) [9], acid and ultrasonic hydrolysis [6], and thermal hydrolysis [10], each of which offers distinct advantages and limitations.

Chemical and physical modifications of KGM for pharmaceutical applications

Hydrolysis

The degradation of KGM can effectively reduce its viscosity, one of which is through hydrolysis. Acid hydrolysis is a method that randomly breaks 1, 4- or 1,6-glycosidic linkages, resulting in the degradation of natural polymers through acidolysis. Commonly used reagents include hydrochloric acid, sulfuric acid, and nitric acid, with hydrochloric acid reported to be the most effective [11]. Acid hydrolysis combined with sonication has been shown to accelerate the hydrolytic reaction and reduce viscosity more effectively than acid hydrolysis alone due to cavitation forces generated during sonication [6]. Meanwhile, thermal hydrolysis involves exposing KGM to high-temperature steam (121°C), during which the viscosity of a 1 % (w/w) KGM solution markedly decreases. The viscosity, initially at 55 Pa·s, was reduced to 11 Pa·s after 20 minutes and further to 5 Pa·s after 60 minutes of treatment. The duration of thermal hydrolysis also plays a role in determining the optimal

depolymerization conditions. A significant viscosity reduction of up to 71 % was observed at 60 minutes, but the rate of reduction slowed thereafter [10]. Enzymatic hydrolysis involves the use of specific enzymes such as β -mannase and β -glucanase, which cleave β -1,4-glycosidic bonds, resulting in a molecular weight reduction of 98.77 % and a viscosity decrease of 16.22 % [9]. Variations in pH (4.5 and 5.0) showed no significant effect on the number of cleaved KGM chains [9]. However, within the pH range of 5.0 to 6.0, viscosity decreased with increasing pH, whereas between pH 6.0 and 7.0, viscosity increased. Increasing enzyme concentration also contributed to the reduction in KGM viscosity. Reaction time studies indicated that viscosity declined over 2 to 3 hours of hydrolysis. Comparison of various hydrolytic methods is presented in Table 1.

Oxidation

Oxidation refers to a chemical modification of KGM through the introduction of aldehyde or carboxyl groups along the polymer backbone, or by cleaving the polymer chains. Common oxidizing agents applied to KGM include sodium periodate, hydrogen peroxide, and sodium hypochlorite. Among these, hydrogen peroxide is a relatively mild oxidant capable of converting hydroxyl groups into carboxyl groups or inducing chain scission. However, it is less effective in significantly reducing the high viscosity inherent to native KGM. A combined modification approach, involving acid hydrolysis followed by oxidation, has been reported to reduce crystallinity and viscosity significantly - from 37,200 Pa·s in native KGM to 322.5 Pa·s after acid hydrolysis and further down to 4.3 Pa·s after the oxidation step. Nevertheless, this dual treatment compromises the swelling capacity of KGM due to the reduction of hydroxyl groups and an increase in particle size, attributed to destruction, erosion, and permeation effects induced by hydrochloric acid and hydrogen peroxide [11].

Carboxymethylation

KGM has been widely utilized for hydrogel applications owing to its exceptional gel-forming ability, water absorption, and retention capacity. However, such properties can be disadvantageous in aqueous-based systems due to excessive thickening, which may hinder the formulation of hydrogels composed of multiple phases or components. To address this limitation, carboxymethylation has been investigated as a strategy to modify KGM.

Table 1: Comparison of KGM hydrolytic methods based on mechanism, effects on molecular weight and viscosity, and their advantages and limitations

Hydrolytic method	Mechanism	Molecular weight reduction	Viscosity reduction	Controlled variables	Advantages	Limitations	References
Acid hydrolysis	Polymer chain cleavage using acid (HCl) and cavitation (sonication)	17.3 %	96 %	Sonication duration, pH	Maintains structural integrity, simple process	Requires KGM dissolution and waste handling	[12]
	Glycosidic bond cleavage and hydroxyl group oxidation to carboxyl groups using H ₂ O ₂	N.a	99.99 %	Oxidation temperature, reaction time, pH, oxidant, and catalyst	Drastically reduces KGM viscosity	Increases particle size, low freeze-thaw stability (unsuitable for frozen products)	[11]
Thermal hydrolysis	Polymer chain breakdown by high-temperature heating	71 %	91.4 %	Temperature, time	Preserves structure, no need to dissolve KGM	High energy consumption	[10]
Enzymatic hydrolysis	Polymer chain cleavage by specific enzymes (β -glucanase)	98.77 %	16.22 %	Enzyme concentration, reaction time, temperature, pH	Specific cleavage by enzymes	Complex process, reduces KGM solubility, alters structure	[9]

This modification involves the introduction of carboxymethyl groups ($-\text{CH}_2\text{COOH}$) into the KGM polymer chains, thereby disrupting interchain hydrogen bonding and resulting in a less viscous solution. The resulting derivative is referred to as carboxymethyl konjac glucomannan (CKGM) [4]. While acid-hydrolyzed KGM retains its primary molecular structure, as indicated by the FT-IR spectrum being largely similar to that of native KGM, the process merely shortens the polymer chains without altering the functional groups. In contrast, carboxymethylation induces structural changes that are evident in the FT-IR spectrum of CKGM, particularly by the disappearance of acetyl peaks [8], a phenomenon also observed in enzymatically hydrolyzed KGM [9]. These changes are primarily attributed to deacetylation under alkaline conditions during carboxymethylation and the addition of carboxymethyl groups, as confirmed by the emergence of characteristic carboxylate stretching bands. Furthermore, a weakening of the hydroxyl group signals is also observed [4].

Sulfation

Sulfation is another significant chemical modification method that can enhance the biological functionality of KGM. Through reaction with chlorosulfonic acid and N, N-dicyclohexyl carbodiimide under anhydrous conditions, sulfate groups are introduced mainly at the C-2, C-3, and C-6 positions of the KGM backbone without significant polymer degradation. The sulfated derivative shows stronger anticoagulant activity than native KGM, indicating that sulfation can alter both physicochemical and biological

properties, thereby improving its suitability for pharmaceutical and biomedical applications [13].

Application of KGM in drug delivery

KGM-based approaches for macrophage-targeted drug delivery

As a novel excipient, KGM offers diverse potential applications, including as a tablet disintegrant, filler, binder, film-forming agent, and encapsulating material for controlled drug release [14]. KGM-based drug delivery systems have been applied in microparticles loaded with anti-tuberculosis drugs (isoniazid and rifabutin), leveraging the interaction between mannose residues of KGM and mannose receptors expressed on the surface of alveolar macrophages to induce phagocytosis (Figure 2 a). This process facilitates the uptake of microparticles by macrophages - cells where *Mycobacterium tuberculosis* resides. The internalization capability has been demonstrated by labeling KGM with fluorescein, which revealed a strong affinity between KGM microparticles and macrophages, with approximately 90 – 100 % of differentiated THP-1 cells phagocytosing the fluorescein-labeled KGM microparticles (Figure 2 b), independent of the administered dose. These findings confirm that KGM microparticles exhibit excellent interaction profiles with macrophages. Therefore, KGM holds promise as an effective drug delivery platform for delivering therapeutic agents into macrophages - an approach that is particularly relevant for the treatment of intracellular diseases such as tuberculosis [6].

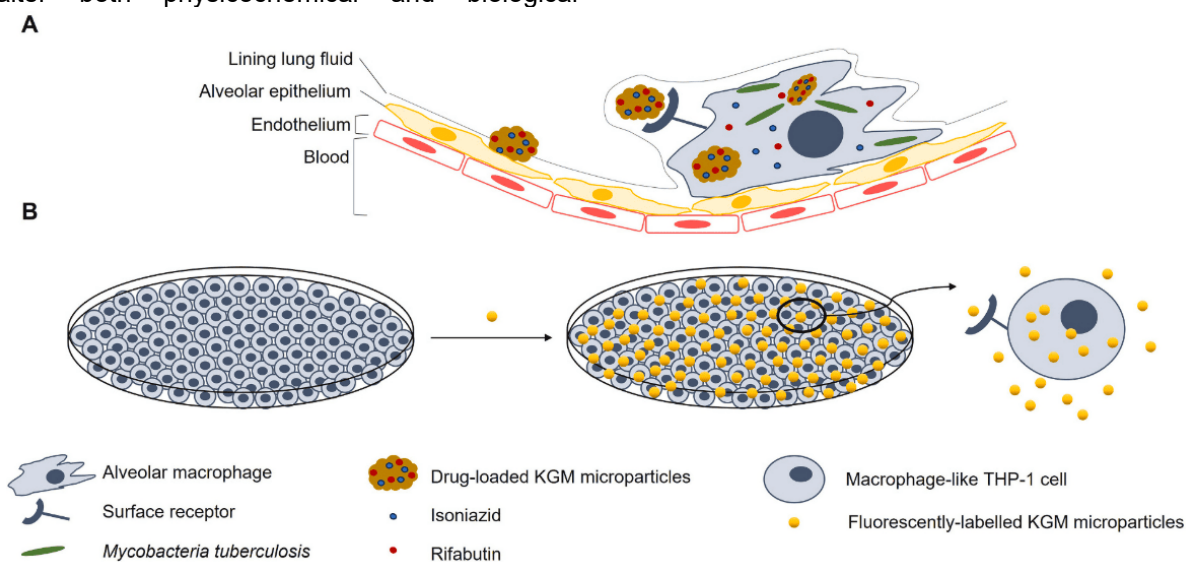


Figure 2: Conceptual scheme: (a) Phagocytosis of drug-loaded KGM microspheres by macrophages following deposition in the alveolar region; (b) Uptake of fluorescein-labeled KGM microspheres by differentiated THP-1 macrophage-like cells [6]

Application of KGM in oral drug delivery systems for diabetes therapy

KGM exhibits intrinsic hypoglycemic activity, making it a promising nanocarrier for diabetes therapy through its dual functionality—as both a therapeutic agent and a drug delivery vehicle. One such application involves the formulation of KGM-based nanoparticles combined with Concanavalin A, which is a glucose-binding plant lectin, for an oral insulin delivery system that responds to blood glucose levels. Concanavalin A demonstrates a high affinity for glucose; thus, under hyperglycemic conditions, glucose binding triggers the release of insulin from the nanoparticles. In simulated gastric fluid (SGF) at pH 1.2, approximately 40 % of insulin is released within 8 hours, whereas in simulated intestinal fluid (SIF) at pH 6.8, around 60 % is released within 6 hours. The hypoglycemic effect of KGM-insulin-concanavalin A nanoparticles does not occur as rapidly as that of subcutaneous insulin injections but is sustained and gradual for over 6 hours. This controlled release profile presents a promising approach for oral insulin delivery that is more physiological and convenient for patients [5].

Application of KGM derivatives in controlled drug delivery systems

The CKGM, a derivative obtained through carboxymethylation of KGM, exhibits enhanced water solubility, swelling rate, and stability compared to its native form. CKGM has been widely employed in hydrogel preparation due to its improved aqueous solubility and stability. Several CKGM-based hydrogels have been successfully developed using auxiliary materials such as chitosan, gelatin, or other natural or synthetic polymers [4]. Due to its anionic nature, CKGM can spontaneously form polyelectrolyte complexes (PECs) in aqueous solutions with cationic polymers such as chitosan (CS) without the need for covalent crosslinkers. These complexes are of particular interest in drug encapsulation and delivery due to their biodegradability, non-toxicity, and environmental responsiveness, making them ideal candidates for advanced drug delivery systems [8].

A study on the release of ovalbumin (OVA) from CKGM/2-hydroxypropyltrimethyl ammonium chloride chitosan (HACC) composite nanospheres demonstrated that higher CKGM concentrations lead to decreased OVA release. This is attributed to the increased anionic charge density associated with higher CKGM levels, which results in tighter internal networks and

improved OVA encapsulation, thereby slowing its diffusion. Thus, composite nanospheres containing higher CKGM concentrations tend to retard OVA release from the system [8].

Hydrogel formed from CKGM combined with CS and gelatin serves as a structural framework. The presence of abundant hydrophilic and reactive functional groups, along with the ability to modulate charge density, allows polysaccharides to form dynamic crosslinking networks, enabling the hydrogel to respond to various stimuli [4].

Meanwhile, a study conducted by Korkiatithaweechai *et al* [15] involved the oxidation of KGM using sodium periodate to produce oxidized KGM. This process cleaves the carbon-carbon bonds in KGM's cis-diol groups, yielding highly reactive aldehyde groups capable of forming covalent bonds with amine groups in chitosan, thus generating a stable crosslinked network. This oxidized KGM–chitosan matrix was applied to encapsulate sodium diclofenac. The system exhibited resistance to gastric pH due to reduced free amine groups, leading to minimal swelling and slower drug release. Moreover, at intestinal pH (7.4), the extensive crosslinked network impeded drug diffusion, resulting in a slower and more controlled release profile [15]. Table 2 summarizes selected applications of KGM in drug formulation, including dosage forms, active pharmaceutical ingredients, therapeutic targets, and the mechanistic role of KGM in each system.

Biological activity of KGM

KGM as an antioxidant agent

KGM has been reported to exhibit various pharmacological activities, including lowering cholesterol levels, managing diabetes, alleviating constipation, reducing cardiovascular risk factors, promoting weight loss, and preventing colorectal cancer [3,14]. In addition, KGM possesses potential anti-inflammatory properties, which may act synergistically with etoricoxib in pain management and suppression of inflammatory mediators. One proposed mechanism involves the regulation of the nuclear factor kappa B (NF- κ B) signaling pathway and the reduction of inflammatory cell populations, contributing to decreased oxidative stress and inflammatory responses. Another contributing mechanism includes the downregulation of tumor necrosis factor- α (TNF- α), a key mediator in inflammation and immune processes [14].

Table 2: Applications of konjac glucomannan (KGM) in various drug formulation systems and its mechanisms of action based on therapeutic targets

Formulation type	Active ingredient	Target / Indication	KGM mechanism	References
Raft-forming gastroretentive system – based on KGM, pectin, and alginate	Etoricoxib & Famotidine	Gastric ulcers caused by long-term NSAID use	KGM increases system viscosity, reduces floating lag time, and strengthens the gel network, thereby supporting controlled drug release for up to 8 hours.	[14]
Spray-dried respirable microparticles from acid-hydrolyzed KGM	Isoniazid & Rifabutin	Pulmonary tuberculosis treatment: particles are inhaled into the alveoli and designed to be phagocytosed by alveolar macrophages	1. KGM's mannose units are recognized by mannose receptors on macrophages, triggering phagocytosis. 2. Once internalized, the particles release the drug directly inside the macrophages, enhancing local drug concentration and antibacterial potency.	[6]
Alginate–thermally hydrolyzed KGM–Chitosan microgel	Quercetin	Colon-targeted delivery for Inflammatory Bowel Disease (IBD)	Thermally hydrolyzed KGM enhances gel structure, reduces burst release, and maintains stability throughout gastrointestinal transit.	[10]
CKGM/2-hydroxypropyltrimethyl ammonium chloride chitosan (HACC) nanospheres (polyelectrolyte complex)	Ovalbumin	Vaccine delivery	KGM is modified via carboxymethylation into negatively charged CKGM, which forms an electrostatic complex with positively charged HACC, resulting in a controlled-release system with high ovalbumen encapsulation efficiency (up to 71.8 %) and sustained release over 72 hours.	[8]
Oxidized KGM–Chitosan crosslinked polymer film	Diclofenac sodium	Controlled intestinal drug release	Oxidized KGM forms aldehyde groups that crosslink with chitosan's amine groups via Schiff base reactions, producing a pH-sensitive polymer matrix for controlled intestinal drug delivery.	[15]
Glucose-responsive KGM–Concanavalin A gel nanoparticles	Insulin	Oral insulin delivery for type I diabetes mellitus	KGM exhibits hypoglycemic effects and is combined with glucose-responsive Concanavalin A, which binds to glucose at high concentrations and triggers insulin	[5]

Interestingly, the hydrolysis process of KGM, which converts the polysaccharide into oligosaccharides, enhances its antioxidant activity. The improved solubility and reactivity of low-molecular-weight fractions may contribute to better interaction with reactive oxygen species, thereby supporting their potential role in protecting cells against oxidative stress [9]. Such antioxidant effects, combined with anti-inflammatory mechanisms, highlight the therapeutic relevance of hydrolyzed KGM in the management of oxidative stress-related conditions.

KGM as an antidiabetic agent

Type 2 diabetes mellitus is a chronic metabolic disorder associated with insulin resistance, hyperglycemia, and dyslipidemia, conditions that are largely influenced by obesity, lipid abnormalities, and gut microbiota dysbiosis. Alterations in the gut microbiota have been shown to affect lipid metabolism and insulin sensitivity. KGM is a high-viscosity dietary fiber that reduces lipid absorption in the intestines by absorbing water and forming a gel, thereby slowing the absorption of glucose and lipids. KGM can also regulate the gut microbiota by increasing the population of beneficial bacteria such as *Bifidobacterium* and *Akkermansia muciniphila*, which can contribute to metabolic improvements. Fermentation of KGM by gut microbiota can induce the release of short-chain fatty acids (SCFAs), such as butyrate and propionate, which are beneficial for glucose metabolism and help regulate the secretion of Glucagon-Like Peptide-1 (GLP-1), a hormone that plays a crucial role in stimulating insulin secretion. In addition, KGM also stimulates the expression of PPAR- γ , which is involved in glucose and lipid metabolism [16].

KGM can be hydrolyzed into an oligosaccharide form known as konjac mannan oligosaccharides (KMOS). This hydrolyzed form has been shown to exert significant biological activities, particularly in glucose regulation. In high-fat diet (HFD)-fed mice, it was reported that KMOS supplementation reduced blood glucose levels in both oral glucose tolerance tests (OGTT) and insulin tolerance tests (ITT), while also lowering fasting insulin, fasting glucose, and the Homeostatic Model Assessment of Insulin Resistance (HOMA-IR) index, as illustrated in Figure 3. These beneficial effects were comparable to those observed in the metformin-treated group, which served as the positive control [17]. The underlying mechanism of KMOS is closely related to the activation of insulin signaling and the AMPK pathway. In an insulin-

resistant HepG2 cell model, the study demonstrated that KMOS significantly improved glucose uptake. KMOS enhanced the phosphorylation of IRS-1, AKT, AS160, and AMPK, thereby promoting GLUT2 translocation to the membrane and increasing cellular glucose utilization [17].

KGM as potential agent in lactose intolerance management

Lactose intolerance is a condition caused by insufficient lactase activity, leading to poor lactose digestion and gastrointestinal discomfort. Both hydrolyzed KGM and KGM can enhance the production of short-chain fatty acids (SCFAs) in the colon, particularly acetic acid, propionic acid, and butyric acid. These metabolites, which result from lactose fermentation, play a crucial role in alleviating symptoms of lactose intolerance. Both KGM and hydrolyzed KGM promote the growth of beneficial gut bacteria such as *Lactobacillus* and the *Lachnospiraceae*, which are known to improve lactose fermentation and reduce intestinal inflammation. KGM notably increases *Lactobacillus* abundance by about 18.23 %, while hydrolyzed KGM (HKGM) predominantly raises levels of *Lachnospiraceae* NK4A136_group [18].

In mice, KGM and hydrolyzed KGM enhanced immune function by increasing spleen and thymus indices, improved metabolic health by lowering cholesterol and triglycerides in serum and liver, while hydrolyzed KGM notably raised serum free fatty acids, as illustrated in Figure 4. They also improved intestinal health by increasing villus height, reducing crypt depth, and thickening the intestinal wall, which supports better nutrient absorption [18].

Current research and future direction

Recent research on KGM has focused on modifications such as hydrolysis, oxidation, and carboxymethylation to overcome its high viscosity and enhance its solubility. Hydrolyzed KGM has demonstrated improved antioxidant activity and the ability to interact specifically with mannose receptors on macrophages, thus supporting its application in targeted drug delivery systems. KGM derivatives, such as CKGM, have been developed into hydrogels and nanospheres, often in combination with other polymers, for controlled drug release. The applications of KGM in colon-targeted delivery, glucose-responsive systems, and inflammatory therapies are presented in Table 2.

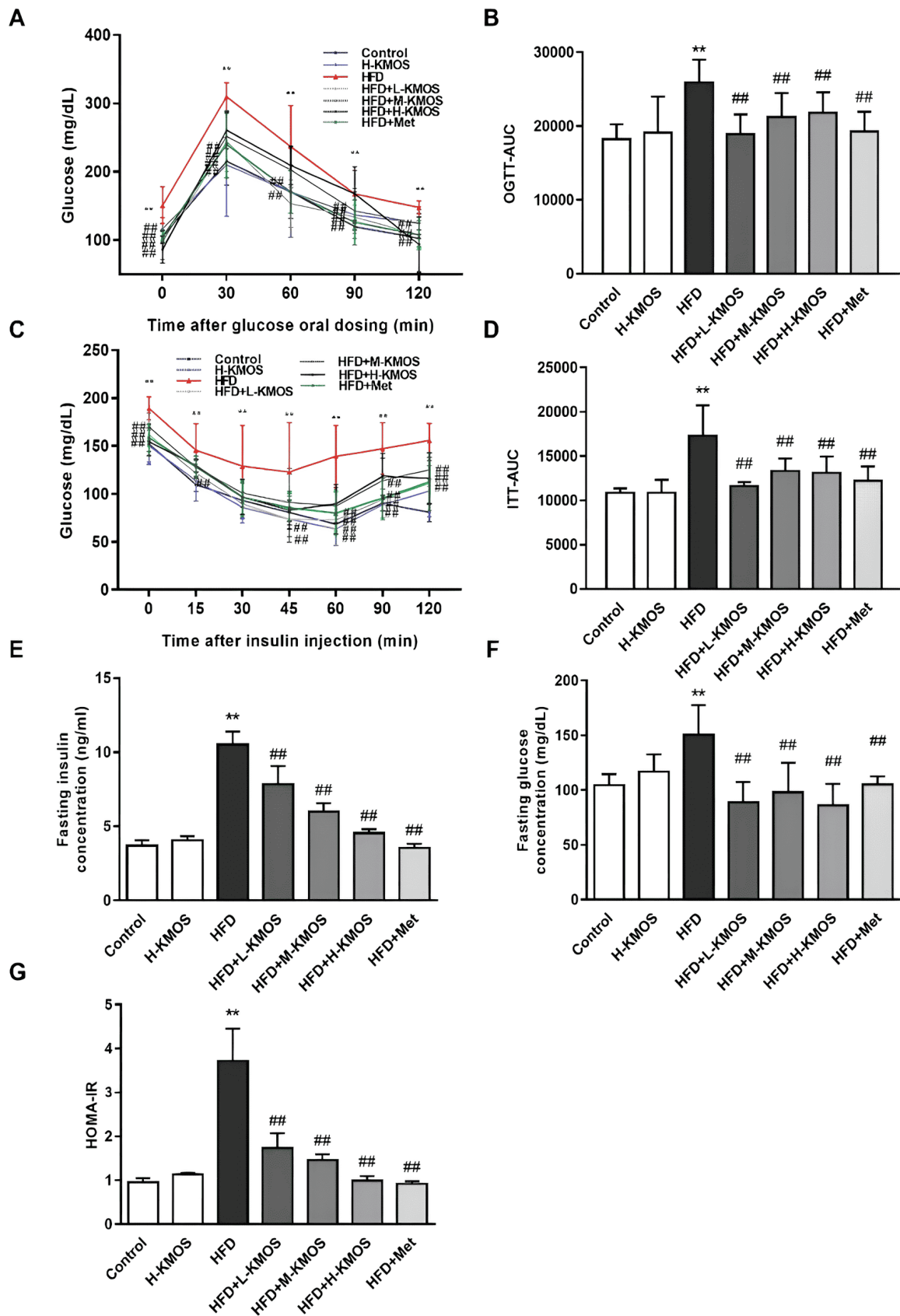


Figure 3: Effect of KMOS on glucose and insulin tolerance in high-fat diet (HFD)-fed mice. (a-b) Oral glucose tolerance and AUC analysis; (c-d) insulin tolerance and AUC analysis; (e) fasting insulin; (f) fasting glucose; (g) HOMA-IR index [17]

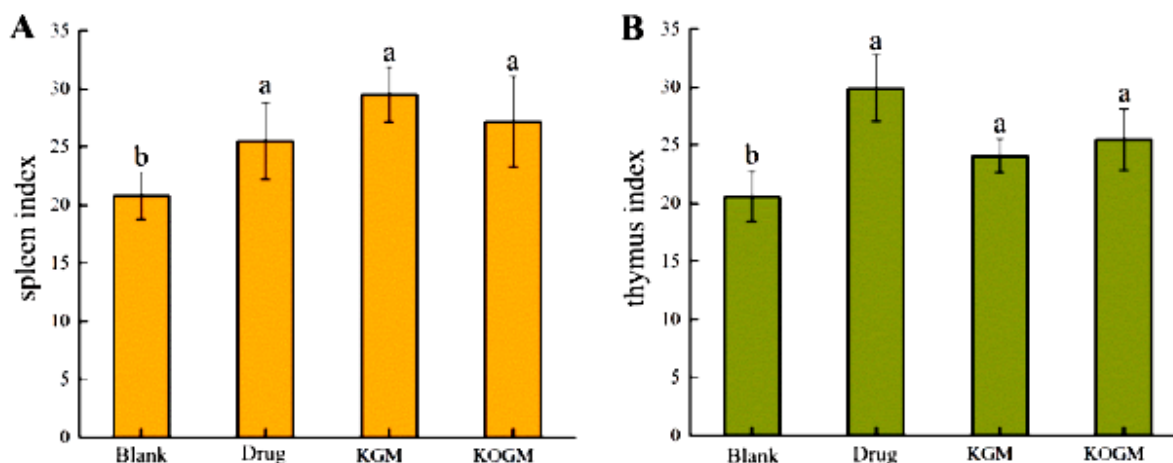


Figure 4: Effects of KGM and Hydrolyzed KGM (HKGM) on the (a) spleen index and (b) thymus index in mice [18]

In the future, the utilization of modified KGM and its derivatives in drug delivery systems is expected to support the development of receptor-specific targeted delivery platforms for the treatment of metabolic disorders, inflammatory conditions, and chronic infections.

CONCLUSION

Konjac glucomannan is a natural polymer that holds great promise for various pharmaceutical applications due to its biodegradability, biocompatibility, and gel-forming ability. KGM possesses unique physicochemical characteristics, particularly its high viscosity, which poses challenges in its utilization. Therefore, several chemical and physical modification approaches, such as hydrolysis, oxidation, carboxymethylation, and sulfation, have been developed to overcome these limitations. These modifications facilitate the application of KGM in more efficient and targeted drug delivery systems. Moreover, the biological activities of KGM and hydrolyzed KGM, such as antioxidant, antidiabetic effects and potential agent in lactose intolerance management, further strengthen its therapeutic value. With its broad applications and developmental potential, KGM and hydrolyzed KGM stand out as promising candidates in future pharmaceutical formulation research. Further studies are needed to optimize its characteristics.

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Ethical approval

None provided.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of Interest

No conflict of interest is associated with this work.

Contribution of Authors

I (We) declare that this work was done by the author(s) named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. Diastry Fauziyah Hardlin conceived and designed the study, collected and analyzed the data, and drafted the manuscript. Dewi Isadiartuti and Dewi Melani Hariyadi supervised the study, provided critical feedback, designed the study, analyzed the data, and reviewed the manuscript. All authors read and approved the final version of the manuscript for publication.

Use of Artificial Intelligence/Large Language Models

No AI-assisted technology was used in the research, writing, or editing of this manuscript.

Use of Research Reporting Tool

This article is a narrative review; therefore, no formal reporting guideline was applied.

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