**Innovation of konjac glucomannan polymer for inhalation microspheres delivery system**

**Dewi Melani Hariyadi**¹,²,³,⁴, Yuyun Nailufa⁵,⁶, Diastry Fauziyah Hardlin7, Dewi Isadiartuti¹,², Noorma Rosita¹,²,⁴

Department of Pharmaceutical Sciences, Faculty of Pharmacy, Universitas Airlangga1, Campus C Mulyorejo, Surabaya 60115, Indonesia

Pharmaceutics and Delivery for Drugs, Cosmetic and Nanomedicine (Pharm-DCN) Research Group2, Faculty of Pharmacy, Universitas Airlangga, Campus C Mulyorejo, Surabaya, 60115, Indonesia

Inter-University Center of Excellence (IUCoE) of Health Autonomy-Drug Discovery3, Universitas Airlangga, Surabaya, 60115, Indonesia

Centre of Excellent (PUIPT) Skin and Cosmetic Technology4, Universitas Airlangga, Surabaya, 60115, Indonesia

Doctoral Programme of Pharmaceutical Sciences5, Faculty of Pharmacy, Universitas Airlangga, Surabaya 60115, Indonesia

Study Program of Pharmacy, Faculty of Pharmacy, Hang Tuah University6, Surabaya 60111 Indonesia

Master Programme of Pharmaceutical Sciences7, Faculty of Pharmacy, Universitas Airlangga, Surabaya 60115, Indonesia

**Background and aims.** Konjac glucomannan (KGM), a non-ionic polysaccharide, is a safe, biodegradable, biocompatible, and bioadhesive polymer. Glycosidic bonds on D-glucose and D-mannose interact with mannan receptors on lung macrophages. However, KGM needs to be depolymerized to reduce its viscosity so it can be processed by spray drying and produce small sizes. The hydrolysed KGM affected the characteristics of polymer to form microspheres.

**Methods.** Depolymerization of KGM was carried out using acid hydrolysis combined with sonication. KGM was dispersed in ethanol to form a suspension and stirred for 30 minutes at 1000 rpm. Then, 37% HCL was added and sonicated for 60 minutes at 45 kHz. The mixture is washed with 70% ethanol at pH 6.5-7.0. Solution was then stored overnight. The mixture was vacuum oven dried for 48 hours at 50°C. Hydrolysed KGM was characterized by FTIR, DSC, yield, pH, viscosity and molecular weight using Gel Permeation Chromatography (GPC). Hydrolyzed KGM is then used for the production of inhalation microspheres using spray drying technique.

**Results.** Acid hydrolysis produced the hydrolysed KGM with high yield of 78.91±5.94%. The viscosity of hydrolyzed KGM decreased from 24780±60.00 mPas to 60.83±1.55 mPas, and the pH range was 6.59 to 6.77. The molecular weight of KGM and hydrolysed were 4750 kDa and 1970 kDa respectively.

**Conclusion/Discussion.** Depolymerization of KGM has been successfully carried out using acid hydrolysis combined with sonication produced high yield of hydrolyzed KGM. The lower molecular weight was decreased and a decreased viscosity was observed indicated potential use for polymer of microspheres and can be further developed to encapsulate drug by spray drying.

**Acknowledgment**

The authors would like to thank Directorate General of Higher Education, Research and Technology for the Fundamental Research Grant (PFR) scheme 2025 (Contract Number 2313/B/UN3.LPPM/PT.01.03/2025), Universitas Airlangga and the Faculty of Pharmacy for the facilities.

**References:**

(1) Guerreiro, F. et al. (2023). International Journal of Biological Macromolecules, 248: 125838

(2) Hariyadi, D.M. et al. (2019). International Journal of Pharma Research and Health Sciences, 7(4): 3020–3027