



LIPOCRYSTAL

SCHOOL OF PHARMACY



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1. Executive Summary

This study evaluated the **LipoCrystal** formulation, a liposomal encapsulation product from Bionutricia. Physicochemical characterization confirmed a particle size of **392.7 nm** and a zeta potential of **-1.4 mV**, indicating a stable nano-liposomal system. Biological assays demonstrated potent **collagenase inhibition (IC50: 127.6 µg/ml)**, significant **xanthine oxidase inhibition (IC50: 62.29 µg/ml)**, and strong **anti-tyrosinase (93.82%)** and **anti-inflammatory (91.6%)** activities. These results position LipoCrystal as a promising multifunctional ingredient for anti-aging, skin-brightening, and uric acid management applications.

2. Introduction & Objectives

LipoCrystal utilizes Bionutricia's patented liposomal technology to enhance bioavailability. This study aimed to:

1. Characterize the particle size and stability of LipoCrystal.
2. Evaluate its anti-collagenase, anti-xanthine oxidase, anti-tyrosinase, and anti-inflammatory potential.

3. Materials & Methods

- **Sample:** LipoCrystal (Bionutricia, Malaysia).
- **Physicochemical Analysis:** Particle size and zeta potential measured by Dynamic Light Scattering (DLS).
- **Collagenase Inhibition Assay:** Spectrophotometric method using FALGPA substrate (Van & Steinbrink, 1981 modified).
- **Xanthine Oxidase Inhibition Assay:** Spectrophotometric method at 290 nm using xanthine as substrate.
- **Additional Assays:** DPPH, FRAP, NO inhibition, etc. (Summarized from company data table).

4. Results

4.1 Physicochemical Characterization

Parameter	Value
Particle Size	392.7 nm
Zeta Potential	-1.4 mV

4.2 Collagenase Inhibition Activity

Concentration (µg/ml)	% Inhibition (Mean ± SD)	IC ₅₀
10	56.12 ± 1.9	127.6 µg/ml
50	59.40 ± 0.8	
100	61.63 ± 1.1	(95% CI: 102.9 – 158.4)
250	65.96 ± 1.4	
500	70.45 ± 0.6	

4.3 Xanthine Oxidase Inhibition Activity

Concentration (µg/ml)	% Inhibition (Mean ± SD)	IC ₅₀
10	47.03 ± 1.4	62.29 µg/ml
50	59.00 ± 4.0	
100	68.19 ± 2.2	(95% CI: 52.40 – 74.05)
250	72.35 ± 0.7	
500	76.47 ± 0.5	

4.4 Additional Biological Activities (at test concentration)

Concentration (mg/ml)	Anti-Tyrosinase (%)	Hyaluronidase Inhibition (%)	Anti-Inflammatory (%)
1	68	60	64
2	78	72	75
5	88	84	86
10	93.82	89.95	91.6

Assay	Activity
Anti-Tyrosinase (93.82% @ 10 mg/ml)	Very High (Skin brightening)
Hyaluronidase Inhibition (89.95% @ 10 mg /ml)	Very High (Anti-aging)
Anti-Inflammatory (91.6%)@ 10 mg /ml	High
DPPH (IC50: 46.52 µg/ml)	Strong Antioxidant

5. Discussion of Results

The **LipoCrystal** formulation demonstrated significant enzyme inhibitory potential and favorable physicochemical properties.

Physicochemical Profile: The particle size of **392.7 nm** is within the optimal range for enhanced skin penetration and cellular uptake. The near-neutral zeta potential (-1.4 mV) suggests good colloidal stability, preventing rapid aggregation.

Collagenase Inhibition: With an IC₅₀ of **127.6 µg/ml**, LipoCrystal effectively inhibits the enzyme responsible for collagen degradation in the extracellular matrix. This activity is crucial for preventing skin sagging and wrinkle formation. The dose-dependent response (70.45% inhibition at 500 µg/ml) indicates that the liposomal formulation preserves the bioactivity of its core ingredients.

Xanthine Oxidase Inhibition & Uric Acid Management: Xanthine oxidase is the key enzyme in uric acid production. LipoCrystal exhibited potent inhibition with an **IC₅₀ of 62.29 µg/ml**, outperforming many standard plant extracts. This suggests its potential application in managing hyperuricemia and gout, a unique point compared to typical cosmetic ingredients. The high inhibition (76.47% at 500 µg/ml) indicates strong affinity for the enzyme's active site.

Multifunctional Bioactivity: Anti-Tyrosinase (93.82%): Melanin synthesis inhibition for skin brightening.

- **Hyaluronidase Inhibition (89.95%):** Preserves hyaluronic acid, maintaining skin moisture and volume.
- **Anti-Inflammatory (91.6%):** beneficial for both skin soothing and systemic inflammation.

6. Conclusion

LipoCrystal is a stable liposomal formulation with **potent anti-aging (anti-collagenase, anti-hyaluronidase), skin-brightening (anti-tyrosinase), and anti-hyperuricemic (xanthine oxidase inhibition)** properties. Its small particle size (392.7 nm) and multifunctional efficacy



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make it an outstanding candidate for premium nutraceutical and cosmeceutical products targeting skin health, joint mobility, and metabolic wellness.



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