

CHARACTERISTICS OF PROTEINASE ACTIVITY AND THE STATUS OF THE PROTEINASE-INHIBITOR SYSTEM IN THE RESPIRATORY ZONE OF THE LUNGS OF RATS WITH EXPERIMENTAL DIABETES MELLITUS COMPLICATED BY INTESTINAL DYSBIOSIS



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Background

Among the many inter-organ connections, the gut–lung axis remains less well understood; in particular, the role of the gut microbiota in the development of 'diabetic lungs' remains unclear and requires further investigation.

Aim

To investigate the effect of dysbiosis on indicators of protease activity and the state of the protease–inhibitor system in the respiratory zone of the lungs of rats with experimental diabetes mellitus.

Gut–Lung Axis



Intestinal dysbiosis

Systemic inflammation
↑ Protease inhibitors
↓ Proteolysis



Type 2 diabetes mellitus



"Diabetic lungs" (fibrosis, ↓ elasticity)

Materials and Methods



Experimental model: male white non-linear rats (2 months old)

Type 2 diabetes model: high-fat diet for 4 weeks + streptozotocin (Sigma, USA, 40 mg/kg, i.p.)

Dysbiosis model: lincomycin-induced

Study parameters (lungs, respiratory zone): total proteolytic activity, collagen lysis, α_2-macroglobulin, α_1-proteinase inhibitor.

Study Design

	Control (n, rats)	Diabetes mellitus (DM)
Without dysbiosis		
With dysbiosis		

Results

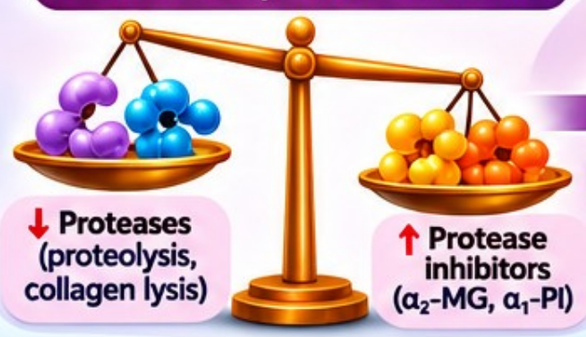
Total proteolytic activity	Collagen lysis	α_2-Macroglobulin	α_1-Proteinase inhibitor
↓ In diabetes	↓ In diabetes	↑ In diabetes	↑ In diabetes
↔ Dysbiosis: no significant effect	Dysbiosis effect: not established	↑ ↑ With diabetes + dysbiosis	↑ ↑ With diabetes + dysbiosis

Qualitative trends based on the study summary; not quantitative measurements.

Key Findings

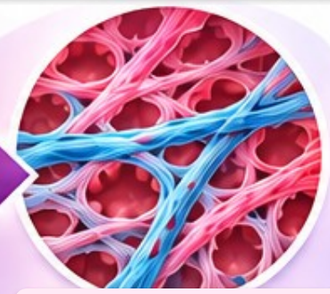
- Diabetes mellitus reduced total proteolytic activity and collagen lysis in the lungs.
- Diabetes increased the levels of α_2-macroglobulin and α_1-proteinase inhibitor.
- Dysbiosis did not significantly affect total proteolytic activity.
- In the presence of dysbiosis, the increase in α_2-macroglobulin and α_1-proteinase inhibitor was significantly higher than in diabetes alone.

Protease–Antiprotease Imbalance



↓ Proteases (proteolysis, collagen lysis)

↑ Protease inhibitors (α_2-MG, α_1-PI)



Potential lung remodelling

Conclusion

Experimental dysbiosis intensifies the imbalance in the protease–antiprotease system of the respiratory zone of the lungs due to an increase in the protease-inhibiting component.