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Biological Effects of Donkey Milk in Animal Models: A Mini-Review

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Abstract: *Donkey milk contains nutrients and bioactive compounds that may affect inflammation, antioxidant defenses, and metabolism. This mini-review critically evaluates the biological effects of donkey milk in six selected animal studies published between 2024 and 2026. Findings included reduced gastric injury, lower renal inflammation and fibrosis-related markers, reduced hepatic lipid accumulation, and improved swimming endurance. Immune responses varied between experimental settings. Raw and reconstituted spray-dried milk produced comparable responses for one measured immune endpoint. These findings support further investigation of donkey milk as a functional food, but its therapeutic benefits in humans remain unproven.*

• Introduction

Donkey milk contains nutrients and bioactive compounds that may influence inflammation, antioxidant defenses, and metabolism. Recent animal studies suggest potential protective and immunomodulatory effects, but heterogeneity and limited evidence preclude definitive conclusions. Standardized animal models and rigorous human trials are needed to clarify its therapeutic potential.

• Material and method

- **Review design:** Narrative mini-review of six selected animal studies involving rats, mice, and rabbits.
- **Included interventions:** Conventional liquid donkey milk and reconstituted whole-milk powder.
- **Excluded groups:** Selenium-enriched milk and isolated polysaccharide groups within the selected studies.
- **Data extracted:** Animal model, milk preparation, dose, intervention duration, biological outcomes, and study limitations.
- **Evidence synthesis:** Qualitative comparison accounting for differences in experimental design and outcomes.
- **Assessments not performed:** Meta-analysis and formal risk-of-bias assessment.

• Results and discussions

1 Gastric protection



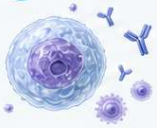
Milk given before ethanol exposure reduced gastric damage in rats.
Lower malondialdehyde and higher glutathione were consistent with reduced oxidative injury.
This was a prevention model.

2 Renal responses



Supplementation was associated with reduced inflammatory and fibrosis-related signals in rats with experimentally induced kidney injury.

3 Immune modulation



Healthy mice showed altered gut microbiota and circulating metabolites, with increased hepatic IL-6 and TNF-alpha.
Increased cytokines alone do not establish improved immunity.

4 Lipid metabolism



Conventional milk reduced hepatic lipid-droplet accumulation and adipocyte enlargement in rats fed a high-fat diet.
Selenium-enriched findings were considered separately.

5 Exercise performance



Whole milk prolonged exhaustive swimming in mice and altered energy-related, inflammatory, and oxidative measurements.
Responsee differed by dose and endpoint.

6 Milk processing



Raw and reconstituted spray-dried milk produced equivalent cumulative serum lysozyme responses in vaccinated rabbits.
Equivalence was not established for total immunoglobulins.

• Conclusions

Whole donkey milk may influence tissue protection, metabolism, exercise performance, and immune responses in animals. The evidence supports its further study as a functional food, while remaining insufficient to establish human therapeutic benefits. Future research should prioritize standardized milk preparations, nutritionally matched controls, independent replication, and controlled human studies.