

# Using Milk Exosomes to Enhance Oral Drug Delivery

## Problem

Poor oral bioavailability of therapeutics

## Technology Overview

Using milk-derived exosomes to orally deliver therapeutics that would otherwise be damaged by ingestion

## IP Status

- ▶ National stage US patent application pending
- ▶ Available for exclusive or non-exclusive licensing

## Value Proposition

- ▶ Customizable nanoparticles that enhance bioavailability
- ▶ Adaptable to various types of therapeutics
- ▶ Proven *in-vivo* efficacy

## Market Attractions

- ▶ The global market for nanoparticles in drug delivery was \$83B in 2020
- ▶ The exosome therapeutic market is expected to reach \$2.28B by 2030, growing at a CAGR of 18.8%

## Contact

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**Problem:** Many pharmaceuticals must be administered intravenously due to their poor oral bioavailability. In addition to issues associated with sterility and inconvenience, the cost of repeated infusion over a six-week course of therapy costs the healthcare system tens of billions of dollars per year and forces some patients to leave the comfort of their home and be exposed to other sick patients during treatment. Considering that many of these patients are elderly and immune-suppressed, the risk of contracting hospital-acquired infections increases dramatically, which greatly compromises patient outcomes, significantly enhances the chances of mortality, and further increases costs.

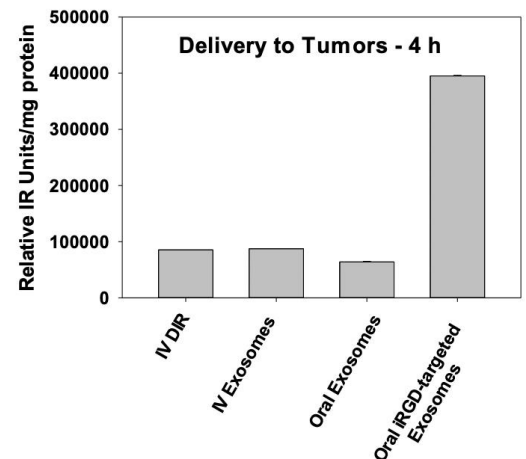
**Solution:** A CU research group led by Dr. Anchordoquy has developed a drug delivery system to enhance therapeutic uptake in the gastrointestinal tract using a naturally occurring mechanism based on milk exosomes. Specifically, the inventors have demonstrated that milk exosomes are absorbed from the gut as intact particles and can be modified with ligands to bolster bioavailability and promote retention in target tissues. The work to date has focused on small molecule therapeutics, but could potentially be expanded to include peptides or nucleic acids.

In addition to delivery, the technology includes isolation and loading approaches that have been validated in a mouse model wherein oral bioavailabilities greater than 10% have been achieved.

**Advantages and Value Propositions:** Exosomes are being investigated in part due to their capacity to protect nucleic acid therapeutics, namely antisense RNA and mRNA drugs, during oral delivery. Thus, the invention disclosed here has the potential to penetrate a rapidly expanding space with a high potential for market growth. Similarly, mRNA and monoclonal antibody therapeutics may benefit from delivery via exosomes rather than intravenous or intratissue delivery, global markets that were valued at \$1.2 billion and \$107 billion in 2020 respectively.

## Additional Documents and Sources:

"The Potential of Exosomes From Cow Milk for Oral Delivery" Betker JL, Angle BM, Graner MW, Anchordoquy TJ. J Pharm Sci. 2019 Apr;108(4):1496-1505. doi: 10.1016/j.xphs.2018.11.022. Epub 2018 Nov 20. PMID: 30468828; PMCID: PMC6788294.



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