

TARGETED IONOPHORE-BASED METAL SUPPLEMENTATION

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PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,504,394	11/22/2022	2019-048

BRIEF DESCRIPTION

Metal deficiency is implicated in a variety of genetic, neurological, cardiovascular, and metabolic diseases. Current approaches for addressing metal deficiency rely on generic metal ion supplementation, which can potentially lead to detrimental off-target metal accumulation in unwanted tissues and subsequently trigger oxidative stress and damage cascades. The inventors have developed a new modular platform for delivering metal ions in a tissue-specific manner and demonstrate liver-targeted copper supplementation as a proof of concept of this strategy.

Specifically, the inventors designed and synthesized a N-acetylgalactosamine-functionalized ionophore, Gal-Cu(gtsm), to serve as a copper-carrying "Trojan Horse" that targets liver-localized asialoglycoprotein receptors (ASGPRs) and releases copper only after being taken up by cells, where the reducing intracellular environment triggers copper release from the ionophore. The inventors utilized a combination of bioluminescence imaging and inductively-coupled plasma mass spectrometry assays to establish ASGPR-dependent copper accumulation with this reagent in both liver cell culture and mouse models with minimal toxicity. The modular nature of this synthetic approach presages that this platform can be expanded to deliver a broader range of metals to specific cells, tissues, and organs in a more directed manner to treat metal deficiency in disease. This patent broadly covers directed metal delivery to select organs, tissues, and organelles.

SUGGESTED USES

Selectively deliver metal nutrients to organs, either as dietary supplements or for treating diseases and disorders such as fatty liver disease and cancer.

ADVANTAGES

This modular platform can be expanded to deliver a broad range of metals to specific cells, tissues, and organs in a directed manner to treat metal deficiency in disease.

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ Puromycin Activity-Based Sensing Probes For Molecular Imaging And Histochemistry
- ▶ Homoallylamines As Formaldehyde-Responsive Triggers With Imaging Applications
- ▶ Diagnostic Colorimetric Assay
- ▶ Fluorescent Probe for Selective Imaging of Carbon Monoxide in Living Cells Using Palladium-Mediated Carbonylation

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OTHER INFORMATION

KEYWORDS

fatty liver disease, metal deficiency, oxidative stress, cancer, metal ions

CATEGORIZED AS

- » **Agriculture & Animal Science**
- » Animal Science
- » **Biotechnology**
- » Health
- » **Materials & Chemicals**
- » Biological
- » **Medical**
- » Delivery Systems
- » **Research Tools**
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