Modified iron transport protein clears excess iron from the body

While iron is an essential nutrient, accumulation of excess iron in the body can lead to diseases such as liver cirrhosis, heart disease, and diabetes. Current treatments of iron overload primarily rely on small molecule therapeutics that chelate excess iron before being secreted in the urine or feces. However, these iron chelators carry the risk of toxic side effects and can lead to bacterial infections. This technology delivers a non-toxic strategy for iron chelation that relies on a modified iron transport protein K3Cys. By slightly changing the iron transport protein neutrophil gelatinase associated lipocalin (NGAL), this technology retains the iron-binding properties of NGAL but provides for the efficient secretion in urine. As such, this technology enables the effective and safe removal of excess iron from the body.

Improved non-toxic, antibacterial strategy for iron chelation and secretion

Iron overload is the unhealthy accumulation of iron in the body and may derive from hereditary factors or develop in patients that receive regular blood transfusions. While small molecules exist that remove the excess iron by chelation, these therapies can cause serious side effects or lead to increased risk of bacterial infections. This technology takes advantage of the iron-binding properties of NGAL to deliver a non-toxic therapeutic that effectively binds excess iron. Using an in vivo screen for iron-clearing potential and further site-specific protein modification, this technology details a K3Cys mutant NGAL protein. KyCys3 retains the iron-binding properties of its parent protein, but bypasses renal absorption and is secreted in urine. Additionally, K3Cys carries antibacterial activity for the treatment of bacterial infections, including urinary tract infections. Therefore, this technology offers an effective therapeutic option for excess iron removal in patients that improves upon currently available iron chelation strategies.

K3Cys has already been demonstrated in vivo to remove excess iron in mouse models of both acquired and hereditary iron overload.
Lead Inventor:
Jonathan Barasch, M.D., Ph.D.

Applications:
• Treatment of iron overload, both hereditary and acquired
• Treatment of acute iron poisoning
• Antibacterial properties may be used to treat bacterial infections such as urinary tract infections

Advantages:
• Non-toxic strategy for removing excess iron
• Readily excreted in urine
• Prevents bacterial growth
• Stable under acidic conditions

Patent Information:
Patent Issued (US 9,534,027)
Patent Pending (US 20150329607)
Tech Ventures Reference: IR 2652, 2735, CU12170, CU13307

Related Publications:

Inventors
Jonathan M. Barasch