Peptides for Ischemia/Reperfusion Treatment

Organization
Kansas State University

Industry:
Healthcare

Researchers:
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Status of Intellectual Property:
Issued US Patent 8,895,502

Next Steps:

- Licensing to a pharmaceutical company
- Scale-up from pre-clinical trials
- Full scale clinical trials
- FDA approval

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Wanted

Experienced leader to commercialize therapeutic peptides that combat excessive inflammation and tissue damage due to ischemia/reperfusion (IR).

Customer Problem

Ischemia/reperfusion (IR) is a process that amplifies tissue damage caused by a lack of blood flow because of clinical conditions from myocardial infractions to traumas and hemorrhages. The resulting return of blood flow (reperfusion) brings with it antibodies that induce an excessive inflammatory response due to recognition of the damage-associated proteins.

β2-glycoprotein I (β2-GPI) is the only known serum protein, of the multiple antigens recognized by these antibodies, that has been identified in this process. β2-GPI provides a target for antibodies to bind to, contributing to the excessive inflammatory response causing tissue damage. If the surface receptor of β2-GPI was inhibited, then the excessive immune response by antibodies binding to it should be reduced. β2-GPI is also involved in blood vessel formation in tumors, indicating that inhibition of the protein may decrease tumor formation.

Potential Market Uses

The novel peptides that have been developed are therapeutic and combat this excessive immune response and reduce tissue damage by inhibiting β2-GPI. β2-GPI is inhibited by the peptides competing for the β2-GPI cell surface receptor, preventing antibodies from recognizing them.

This mode of inhibition is completely safe and does not compromise the patient's immune system, while effectively blocking complement activation and reducing inflammation and tissue damage. The peptides can utilize smaller serine residues resulting in cheaper manufacturing costs – the peptide also holds a longer half-life and retains its therapeutic activity after administration.

Medical professionals treating intestinal and myocardial IR, cancer, hemorrhage, and pre-eclampsia could utilize this therapy. The therapy would need to be developed further by a pharmaceutical company for scaling-up and clinical trials/approval in order to distribute to medical professionals that can take advantage of the reduced risk vs. existing treatments due to the superior properties of these peptides.

Market Size

$2.8 Billion – The estimated pharmaceutical market for IR treatments.

1.3 Million – The number of thrombotic events (heart attacts, etc.) that cause IR injury in the United States each year; and these are just some of the largest risk factors for IR injury, not including trauma or restriction of blood flow during surgery.

Innovation

The novel peptides inhibit antibodies from binding to β2-glycoprotein I (β2-GPI) through competing for the binding site of the cell-surface binding site. This inhibition decreases ischemia/reperfusion injury by preventing antibody action.

Stage of Development

The technology holds the patent US 8895502 BW 'β2-glycoprotein I peptide inhibitors' and has been published in two peer-reviewed publications.

The technology is still preclinical, with the following developments –

- Synthesized peptides
    - Do not aggregate
    - Have a therapeutically effective half-life
- Cell Data
    - Small enough to cross cell membrane
    - Safe and effective
- Animal Data
    - Prevention of hemorrhage
    - Reduction in tumor size
    - Decrease in new blood vessel formation
    - Prevention of pre-eclampsia

Competitive Advantages

- **Safer**
    - Other applications of complement inhibitors for IR injury prevention also render the patient more susceptible to bacterial infection
    - Our peptides can prevent inflammation without inhibiting bactericidal activity
- **Not limited to the short-term**
    - Another advantage of not increasing infection risk is that the treatment can be used indefinitely without worry of bacterial infection – whereas others must be limited to short-term treatments to minimize risk
- **No residual damage**
    - Competing technologies can recognize normal intracellular components and indicate that cellular injury has begun before it actually has, possibly initiating damage rather than preventing it
    - Our peptide actively prevents a serum protein that may initiate damage
- **Longer half-life**
    - Utilizing reverse sequences and D amino acids, our peptide retains biological activity and is also more resistant to degradation
- **Therapeutic administration retains activity**
    - Peptides administered during reperfusion retain activity