Office of Technology Transfer

Auburn University

Peptides for Specific Targeting and Gene Delivery to Muscle

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Reference: Muscle targeting

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Overview

Auburn University is seeking a licensee or development partner for peptides that selectively bind to muscle. Muscle makes up the largest tissue volume of the body, yet its size makes muscle specific therapy difficult. This becomes particularly relevant when approaches to gene therapy for inherited muscular diseases are evaluated. The delivery of DNA has a low success rate regardless of the vector. In addition, multiple intramuscular or intracardial injections is inefficient and impractical. Thus, a mechanism to target constructs or pharmaceuticals to muscle following intravenous injection is critical.

Advantages

- Targets muscle tissues specifically, allowing for highly specific drug or gene delivery
- The various peptides can be selected for specificity to skeletal, smooth or cardiac muscle
- Some peptides have shown cross-species reactivity, suggesting species independence
- Selection process of peptides drastically reduces the possibility of cross-reactivity with other tissues in the body, enhancing targeting
- This process has also produced peptides specific to central nervous system and glioma

Status

- US patent number 6,329,501
- Another provisional has been filed addressing peptides specific for cardiac targeting
- Coupled with an adeno-associated virus vector, specific *in vivo* delivery of genes to muscle cells has been demonstrated in mice in an independent study (link)

Description

Cardiac disease (or cardiopathy) is the leading cause of death in the United States. Duchenne muscular dystrophy (DMD), characterized by skeletal muscle tissue deterioration and wasting, is probably the most common inherited progressive lethal disorder of mankind.

Past attempts at therapy for DMD have involved direct intramuscular injection. However, these techniques suffer from the fact that widespread intramuscular transduction is impractical. Furthermore, muscles such as the heart and diaphragm are not readily accessible to direct injection. This limits effective delivery of drugs and genes for treatment of cardiac disease as well as for complete treatment of DMD. Clearly, specific targeting of therapeutics is required.

Using bacteriophage-based libraries, random peptide sequences can be injected into an animal and allowed to circulate and bind. Tissues of interest are harvested for bound phage, which are grown up and then reinjected. After several cycles, phage can be isolated that are specific to the tissue of interest and that did not bind significantly to other tissues in the body. The binding sequences from these phage can then be determined and then translated to peptides or other targeting vehicles, such as viral vectors.

We have used this methodology to identify various peptide sequences with enhanced *in vivo* selectivity to skeletal and cardiac muscle and with binding sites accessible from the blood stream. One such peptide has been added to an adeno-associated virus vector to demonstrate specific *in vivo* delivery of genes to skeletal and cardiac muscle tissue in mice.

Licensing Opportunities

- This technology is available for exclusive or non-exclusive licensing
- Joint development opportunities include funded research or a joint venture