

The Revolution Starts Here

Chikujee
Therapeutics

NUCLEIC ACID THERAPEUTICS

Product Information

BINDI - NA

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Although the nucleic acid delivery market is still in its infancy there are currently 1,300 clinical trials underway worldwide. The majority of these are in early clinical development (c. 67%) with just over 2% on Phase II trials. This indicates that relatively few nucleic acid candidates are likely to reach the market in the short term but the potential of the sector is significant.

By 2015, nucleic acid products in development from ten key companies could generate additional sales of around US\$1.1 billion. These products utilize a range of delivery platforms including viral to non-viral delivery systems and cover gene therapies, gene agents and DNA vaccines for a variety of targets including cancer, cardiovascular disease and infectious diseases.

Drivers and dampeners of growth

The future of nucleic acid based therapies and gene therapies hangs in the balance whilst regulators and researchers weigh up the unmet clinical need for curative/preventative therapies versus the safety issues (immunogenicity, pathogenicity) associated with the delivery of some of these agents.

Whilst the majority of gene therapy trials under evaluation incorporate the use of viral vectors there has been a shift in opinion in favor of non-viral delivery. However, significant opportunities exist for future commercial development within the pharmaceutical industry. These include:

- Development of new polymers and biopolymers that may be utilized in the safe and efficient delivery of genetic material to host cells
- The development of viral and non-viral vectors that can be regulated and incorporate high DNA payloads
- Targeted delivery of nucleic acid drugs to increase the specificity of treatment
- Cost-effective production and application of safe and efficient vectors for the delivery of nucleic acid-based therapies
- Identification and delivery of polygenic genes for the treatment of multi-gene based diseases e.g. cancer
- Improvements in DNA vaccine delivery and immune stimulation

There are six types of nucleic acid-based therapeutics that have been proposed. Some have made it to market, others are still in development, and some have been put on the back burner due to technical difficulties. The six technologies examined in this study are:

- Antisense
- Ribonucleic acid inhibition (RNAi)
- Gene therapy
- Nucleoside analogs
- Ribozymes, and
- Aptamers

Three of the primary requirements for the development of effective multi-targeting therapeutic modalities for the treatment of cancer are the tumor-targeted delivery of the therapeutic molecules of interest to the tumor site(s) in the body (both primary and metastatic), passage of the molecular therapeutic through the cell membrane, and targeting specifically a growth or apoptotic pathway. However, lack of efficient targeted delivery, low transfection efficiency, instability to nucleases, poor tissue penetration, and nonspecific immune stimulation have hindered the translation of nucleic acid based therapeutics into clinical applications. The development of a systemically administered, tumor-specific drug delivery vehicle based on NanoBindi-NA with high therapeutic efficiency could overcome these limitations and thus realize the potential of nucleic acid based therapeutics including siRNAs to become effective anticancer clinical modalities.

Unique company & technology evaluation

Chikujee Therapeutics' Nanobindi-NA product engine offers a potential new delivery platforms with a distinct competitive advantage and have identified their key attributes, based on a number of criteria including:

- Proprietary delivery technology
- Applications of the delivery technology within the biopharmaceutical industry
- Management/technical expertise of the delivery specialist
- Competitive edge within the delivery technology sector
- Products in development/approved utilizing the delivery technology

Multi-point evaluation and scoring assessment

NanoBindi-NA based drug delivery product engine offers competitive advantage based on a number of parameters, including:

• The technology

NanoBindi-NA delivery platform uses a Multi-stage core-shell architecture as the targeted delivery vehicle (TSDV) for therapeutic nucleic acids. The unique BOSH based polymeric shell protects the nucleic acid from degradation within the body. The targeting ligand (receptor based) ensures active targeting of the TSDV to the desired cell. Once inside the cancer cell, the nucleic acid based therapeutic drug is released, where it is most efficacious.

• The application of the technology within a number of therapy areas

The multi-stage shell structure allows choice in terms of route of delivery (oral, parenteral, transdermal, implantable), delivery of Antisense, Ribonucleic acid inhibition (RNAi) , Gene therapy , Nucleoside analogs , Ribozymes, and Aptamers based drugs.

• The current status of the technology in clinical development

Chikujee is in the preliminary stages of development for conducting pre-clinical studies on number of drug candidates for testing.

• Competition within the technology arena

The management team is confident that, based on our technology platform compared to

alternative drug delivery systems to technologies under evaluation, we have measurable competitive advantage over competitors

• **The drug delivery specialist's expertise**

We intend to strategically align with number of nucleic acid based therapeutics companies in development, strategic alliances, financial position, marketing presence to gain market leadership.

• **The product portfolio**

Drug delivery systems under evaluation, products in development, Commercialisation/developmental partnerships include candidates from following categories

- Antisense
- Ribonucleic acid inhibition (RNAi)
- Gene therapy
- Nucleoside analogs
- Ribozymes, and
- Aptamers

Chikujee's initial focus is developing therapeutics for targeted delivery to central nervous system and liver.

