National Cancer Center (NCC) Japan, NCC Seed Acceleration Program（NCC SAP）

Social Implementation Project for Next-Generation Cancer mRNA Vaccines

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Vision

- We aim to develop an innovative cancer vaccine that brings new hope for patients and, in the future, may even enable cancer prevention.
- Our strategy focuses on mRNA vaccines targeting the **"Dark Transcriptome"**, which is specifically expressed in cancer cells, as a public neoantigen.
- This project goes beyond improving cancer treatment outcomes: it aspires to create the world's first preventive cancer vaccine, shaping a future where people no longer develop cancer.
- We will develop mRNA cancer vaccines targeting neoantigens shared across multiple cancer types.

Marketability

- We envision a target patient population of approximately 170,000 new cases per year in Japan, including non-small cell lung cancer, triple-negative breast cancer, renal cancer, bladder cancer, and malignant melanoma, all with high unmet medical needs.
- Currently, mRNA cancer vaccines under development are largely divided into personalized vaccines and classical shared cancer antigens. However, the former lack broad applicability, while the latter show limited immunogenicity and insufficient clinical efficacy.
- In contrast, the neoantigens identified through our development are cancer-shared and exhibit strong immunogenicity, thereby enabling the creation of mRNA cancer vaccines that are cost-effective and applicable to a broad patient population.

Innovation

- Identified ~420,000 Dark Transcripts using our novel analysis.
- ~90,000 cancer-specific, with ~3,000 predicted immunogenic epitopes.
- Immunogenicity of several Dark Transcriptome–derived epitopes already validated.
- Targeting public neoantigens → potential for the first preventive cancer vaccine.

Partnering

【 Expected partners 】
We are keen to explore collaboration with the following partners.
Pharmaceuticals・CMO/CDMO/CRO/SMO・Venture capitals

【 Expectation 】
Startup support, non-clinical studies, Phase I clinical trial design and execution, and supply of combination drugs

Research Outline

Key Words: #RNA, #Cancer Prevention, #Immune Response, #Dark Transcriptome

- Research Plan
  We have developed a unique analytical pipeline, DT finder, and identified more than 3,000 cancer-specific therapeutic targets derived from Dark Transcripts (DTs). In this project, we aim to develop an mRNA cancer vaccine ("DT vaccine") targeting these DT-derived neoantigens. By focusing on antigens shared across multiple cancer types, we seek to realize a highly versatile off-the-shelf therapeutic vaccine, with the long-term vision of extending this approach to preventive cancer vaccines.

- Business Plan
  The DT vaccine is unique in that, unlike conventional personalized mRNA vaccines, it targets shared neoantigens effective across multiple cancer types. Based on pan-cancer analyses, we will develop a panel-type vaccine that can provide therapeutic options for a wide range of patients. While initially developed as a therapeutic agent, the DT vaccine also holds the potential to expand into the cancer prevention field in the future, creating significant social and economic impact.