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Purpose of Research

A sustained release drug delivery system that continuously releases any incorporated therapeutically active substance is a useful way to obtain long-term efficacy. In terms of application to living bodies, substances should be highly biocompatible, biodegradable and injectable. In this research, we selected DNA as a material fulfilling all these requirements. In addition, since DNA stimulates innate immunity depending on its base sequence, we foresee being able to develop systems with different properties such as immunostimulatory and immunologically inert systems.

Summary of Research

Use of the property of DNA to form duplex structures between complementary DNA strands makes it possible to design multipodal DNA nanostructures that can form hydrogels by self-organization. The new technique involves preparing hydrogels consisting only of DNA, salts and water by self-organization, and makes it possible to develop delivery systems that contain drugs and proteins such as antigens for sustained release.

Release of OVA from DNA hydrogels FITC-labeled OVA/DNA hydrogel

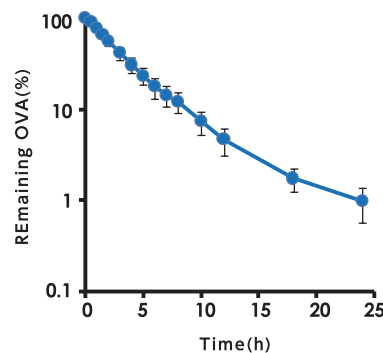
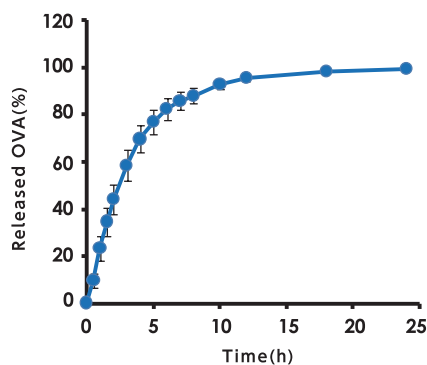
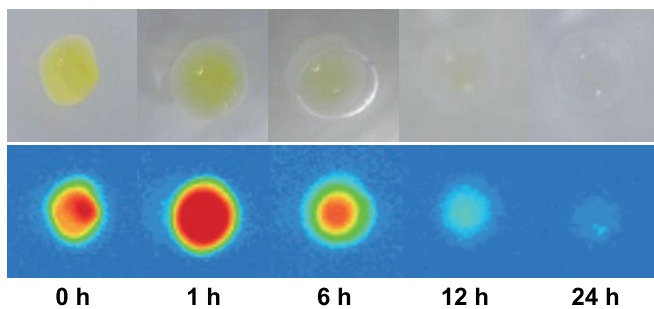


Figure: Release of OVA from DNA hydrogels (FITC-labeled OVA/DNA hydrogel)

Comparison with Conventional or Competitive Technologies

- DNA hydrogels: Biocompatible and biodegradable
- Possible to control physiological activities by controlling base sequences and steric structures
- Possible to design DNA hydrogels with immunoadjuvant activities

Expected Applications

- Sustained release drug delivery system
- Immunoadjuvant
- Cellular administration adjuvant

Challenges in Implementation

- Need for safety evaluations of individual nucleic acids
- Studies to optimize unit structures for each purpose of use, incorporated material and administration method/route
- Evaluation of efficacy in clinical studies

What We Expect from Companies

- Introduction to vaccines targeted for cancers and infections
- Assisting drug development/formulation research
- Joint clinical development of drugs by applying this technique

POINT

- Gelatinization does not require heating or chemical reactions
- Administration by injection is possible with easy sol-gel transition by pressurization
- The substances are biodegradable

- Intellectual Property: WO2012/144560 "Self-gelatinizable nucleic acids"
- Prototype: Present