

FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

Project Title: The temporal and spatial manipulation of "basket type organic/inorganic-hybrid structure" as a future theranostic nanomedicine

Name: Yoshihisa NAMIKI

Institution: The Jikei University School of Medicine

1. Background of research

As our country is aiming to become a very healthy nation, improving the quality of medical care by developing methods for early diagnosis and patient-friendly treatments for infections such as influenza, which can cause widespread anxiety in the nation, and for highly-fatal diseases such as cancer, is one of our high-priority issues. Free manipulation of the movement of drugs with the remote controlled light/magnetism/ultrasound used in the cutting-edge medical technology is expected to be a next generation technology which can address this issue.

2. Research objectives

Remotely manipulating the moving speed and position of nanoparticles, which are mineral capsules that respond to various types of physical energy and that are filled with organic drugs, will lead to an innovative technology that allows "pinpoint and perfectly timed" diagnosis/treatment.

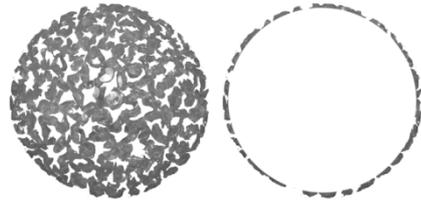
3. Research characteristics (incl. originality and creativity)

We aim for the realization of innovative nanomedicine in which we can remotely control accumulation/release/effects of drugs by using nano-size micro capsules that efficiently convert light/magnetic/ultrasonic energies. This is an unprecedented study in which we can use Japan's strength by applying Japan's world-leading nano technology to medicine.

4. Anticipated effects and future applications of research

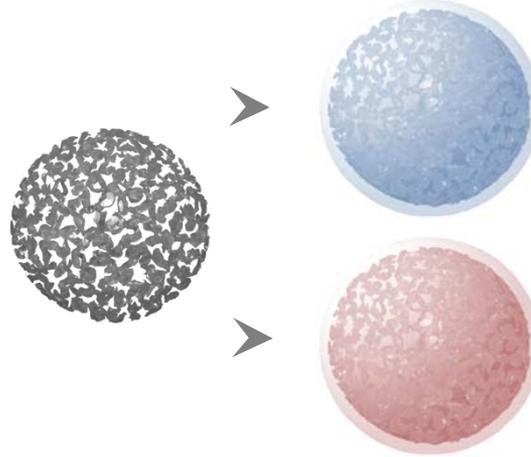
It will allow "highly sensitive speedy diagnosis" and "highly effective treatment which is gentle to the body" for "diseases which were hard to diagnose" and "incurable diseases." The realization of medical care which is gentle to the weak, such as elderly people, will contribute to the promotion of a long and healthy life, reduced healthcare costs and the development of the healthcare industry. Moreover, since with this technology the behavior of drugs can be controlled precisely, it can be applied to wide areas, such as pharmaceutical and biotechnology.

Basket type nanostructure



<3D> <Cross section>

Basket type organic/inorganic-hybrid structure



Diagnostic nanocomposite

Components

- Organic drugs
- Inorganic baskets

Therapeutic nanocomposite

Utilization of physical energy

- ① Light
- ② Magnetism
- ③ Ultrasound

The temporal and spatial manipulation of nanocomposite

Remotely controlled
accumulation/release of drugs

Pinpoint and perfectly timed
diagnosis and treatment

Innovative nanomedicine

- ① Highly sensitive & speedy diagnosis
(Influenza, cancer)
- ② Highly effective & patient friendly treatment
(Cancer ▪ myocardial infarction ▪ cerebral hemorrhage)