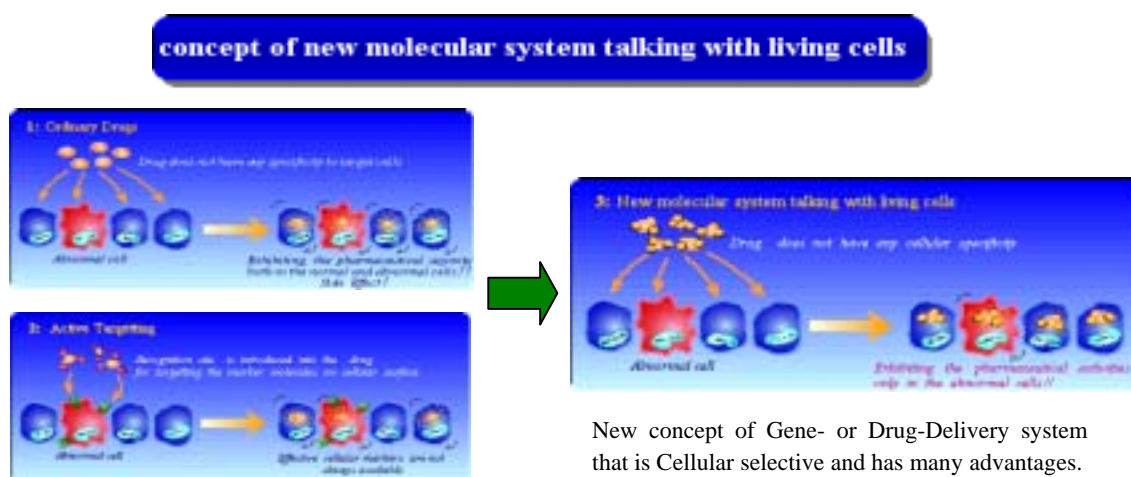


Technical Subject

Development of the Nano-materials Responding to Intra-cellular Signals for New Concept of Drug Delivery (D-RECS)

Corresponding Applicant: Yoshiki Katayama (Faculty of Engineering, Kyushu University)

C0 researcher: Hiroaki Shimokawa (Faculty of Medicine, Kyushu University),
Masaharu Murata (Faculty of Engineering, Kyushu University)



Goal & Contribution to well-being for all humanity :

Goal of the research is development of various new nano-materials responding to target intercellular signals and realization of new concept of gene- or drug-delivery system. This system will contribute to extend the application of gene therapy and various drugs that have strong pharmacological activities, because the real cell-specific dosage of drugs will become possible using the concept.

Method / Approach :

To realize the concept of intracellular signal-responsive drug delivery system, we are trying to develop the following new systems using nano-materials that we have recently developed and are developing.

- 1) Polymer micelle-type drug capsule responding to intracellular protein kinase signal
- 2) Hydro-gel responding to intracellular protein kinase signal
- 3) Gene delivery and regulation system responding to protein kinase signal or protease signal

Introduction / Position in the session :

Living cells possess an intracellular signal transduction system that includes many biological reactions, the purpose of which is to allow cells to respond to their outer environment and thus to maintain themselves. In these signals, protein kinase and protease signals are the most important. If such enzymatic activities are hyper- or hypo-activated, the cell fall into disordered states. Thus, these enzymatic activities are important criterion for the cellular condition. If any materials that release pharmacological activities responding to the extraordinary activating signal could be designed, it could constitute a novel, intelligent drug with sensing ability with regard to the cellular condition.

Many stimuli-responsive materials have been reported and applied to drug delivery system. However, those materials can respond to just physical stimuli such as temperature, pH. Recently, we have developed a polymer micelle responding to protein kinase A signal and New artificial gene-regulation systems responding to protein kinaseA or caspase-3 signals. We propose to term the concept 'D-RECS' which means drug-delivery system responding to cellular signal. Here we extend this strategy to other various protein kinases and proteases that regulates live and death signals in living cell to develop a novel practical drug delivery systems.