

# Development of novel bioanalytical methods and nanomaterials for cell biology

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## Background

- Nanomaterials have potentials for regulating cellular processes at molecular levels, and fine tuning of cell-material interface is one critical issue for the development.
- Development of novel bioanalytical methods to measure phenomenon derived from multiple cells and materials is important for evaluating materials.

## Aim

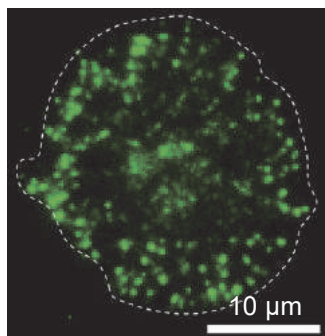
- Development of functional nanoparticles and polymers regulating cellular processes
- Development of assay systems to measure reactions at biointerface
- Development of methods to measure cell-material/cell interactions

## Advanced Research Topics

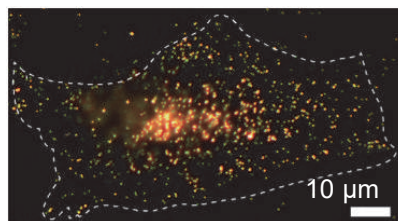
Proximal signaling of the immune receptor phosphorylation (figure, upper right) was biochemically reconstituted with the model cell membrane, consisting of purified recombinant proteins and substrate supported lipid bilayers. Phosphorylation reaction was measured in real time by fluorescence microscope.

We have developed a method to internalize nanoparticles with various materials and sizes in to the cytosol fraction of live cells that are normally protected from intrusion with layers of barriers (figure, right bottom). We also found ways of conjugating cellular membranes with modified soluble polymers.

We are also developing the method to measure interactions of cell-cell and cell-materials, in real time in bulk solution, and use the method to evaluate how nanomaterials can modulate cellular processes.



Phosphorylation of receptors (green fluorescence) in a single immune cell



Gold nanoparticles introduced into the cytosol fraction in a single human cell

## Publications

- Kaizuka, Ura, Lyu, Chao, Henzie, and Nakao.. Langmuir . (2016)
- Ushiyama, Ono, Kataoka, taguchi, and Kaizuka. Langmuir . (2015)
- Furlan, Minowa, Hanagata, Kataoka, and Kaizuka. J. Biol. Chem.. (2014)

## Summary

- Reconstitute and measure reactions at biointerface
- Nanomaterials for the cytosol and membranes of cells
- Measurement of cell-cell/material interactions in solution

## Research outcome

- Fine tuning for internalizing materials to the cytosol
- Development of the method to modulate the cellular interface by membrane bound polymers