Department of Nanobio Drug Discovery

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Research Projects:

1. Background and aims

Recent advances in the field of engineering, including nano, material, and analytical technology, contribute to produce huge amount of bio-information, which helps progress of genomic, genetic, epigenetic, and proteomic studies. Systems biology, a new approach on the basis of those accumulated bio-information, allows novel methods for both discovery of novel drugs and biomakers, and creation of innovative diagnostic tools and therapeutic methods."**Nanobio**" research, an integrated research between "nano" -material technology and "bio"-logy, will not only provide cutting-edge bio-information to the drug discovery science field, but also expand the range of research options in the medical and pharmacological field.

In our laboratory, we will use Nanobio technology not only for elucidation of changes in genome function under physiological and pathological conditions, but also for establishment of novel diagnostic and therapeutic tools of cancers.

2. Research directions

Using nanobio analytical devices, such as DNA microarray, we will collect novel genome-wide bio-information that cannot be obtained by conventional analytical devices. In combination of these new information and high quality clinical specimens, we seek to develop (1) new methods for diagnosis, (2) tailor-made therapy and (3) targeted therapy of cancers.

1: From mRNA expression profiling to "Tailor-made" therapy.

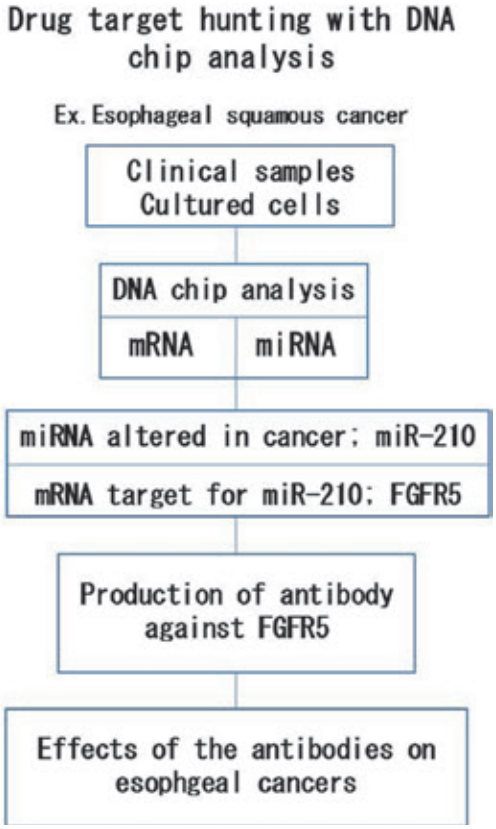
Most of current gene counseling are to diagnose diseases or to stratify patients by a single gene marker. In contrast, using a comprehensive gene expression data set, we are trying to establish mathematical models to predict a survival rate, sensitivity to chemo-radiation therapy, and distant metastasis for patients with various malignancies, especially esophageal cancer. To establish a reliable stratification strategy using these prediction models will enable us to perform "Tailor-made" therapy.

2: Functional analysis of microRNA (miRNA)

MicroRNAs are short RNA molecules that do not code proteins. With microarray technique we are investigating microRNA functions in normal cell differentiation and in malignant characteristics of tumor cells. As an outcome from this project, we indicated that low expression level of miR-210 is correlated to good prognosis of patients with esophageal cancers.

3: Development of antibody drugs

We found that FGF5 is a target for miR-210 and that high expression level of FGFR5 is correlated to good prognosis of patients with esophageal cancers. An antibody against FGFR5 inhibits cell proliferation of primary cultured cells derived from esophageal cancers. We are studying mechanism of the inhibition of cell proliferation, in order to develop new antibody drugs against esophageal cancers.



Recent publications

- S.Tsuchiya et al. MicroRNA-210 regulates cancer cell proliferation through targeting fibroblast growth factor receptor-like 1 (FGFRL1). J Biol Chem. 286,420-428,2011
- Y.Shimada et al. Expression analysis of fibroblast growth factor receptor-like 1 (FGFRL1) in esophageal squamous cell carcinoma. Esophagus 11 (1), 48-53, 2014