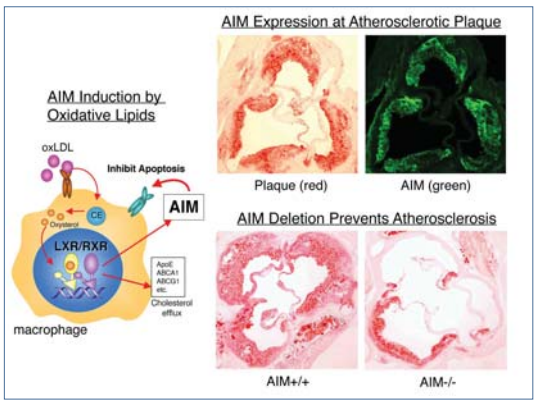
Center for Disease Biology and Integrative Medicine

Molecular Biomedicine for Pathogenesis

http://www.cdbim.m.u-tokyo.ac.jp/english/index.html

Focusing on functional analysis of newly isolated genes, particularly related to apoptosis, cell differentiation, or cell cycle, our laboratory is pursuing clarification of the pathogenesis of various diseases and the related physiological machineries in cellular and molecular aspects. Based on our technical advantage in gene manipulation via gene knockout and transgenesis, we give high priorities to *in vivo* analyses. Our overall goal is to apply our findings to development of novel and definitive therapies for types of diseases.

- Role of AIM (Apoptosis Inhibitor of Macrophage) in atherosclerosis development and other diseases
- Regulation of hematopoiesis and its relevance to leukemogenesis; via functional analysis of a newly identified Polycomb group molecule MBT-1
- Regulation of tumorgenesis by modulating apoptosis and cell cycle; via analysis of DEDD-deficient animals

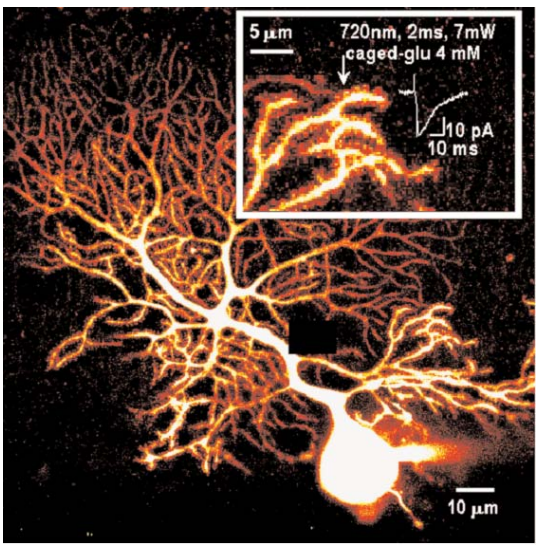


Structual Physiology

http://www.bm2.m.u-tokyo.ac.jp/index-e.html

We have been exploring two-photon excitation microscopy, which utilizes an infrared femtosecond-pulsed laser as a light source, to visualize and stimulate intact tissues at the cellular and molecular levels. We focus on the functions and disorders of the brain and secretory organs.

- The dynamics of synapses in the cerebral cortex, in relation to memory, cognitive processes and mental disorders
- Molecular mechanisms of exocytosis in synapses and the islet of Langerhans, and their optical control



Fine structure and function of a central neuron studied with two-photon excitation imaging and uncaging

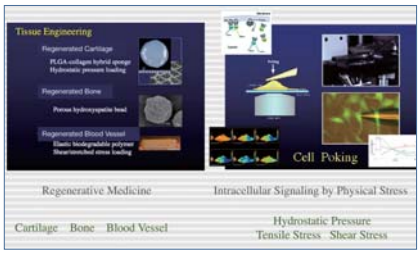
Regenerative Medical Engineering

http://www.cdbim.m.u-tokyo.ac.jp/

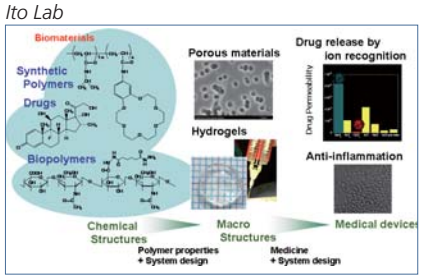
We aim to create a basic methodology for tissue engineering by integrating engineering sciences such as mechanical, material, and chemical system engineering into basic and clinical medicine. Especially for the regeneration of bones, cartilages, and blood vessels, we focus on cellular response to physical stimulations, which can be utilized instead of growth factors and cytokines. Besides, we focus on peritoneum as a place for in vivo tissue regeneration. Development of new biomaterials such as porous materials, hydrogels, molecular signal-responsive materials is also one of our major missions.

- Development of new polymeric and inorganic biomaterials for regenerative medicine
- *In vitro* regeneration of carriages, bones, and small blood vessels
- Mechanism of cellular response to physical stimulations
- Development of new polymeric biomaterials for peritoneal diseases
- Mathematical system design for tissue regeneration process
- Development of molecular signal-responsive materials for a medical use

Ushida Lab



Ito Lab

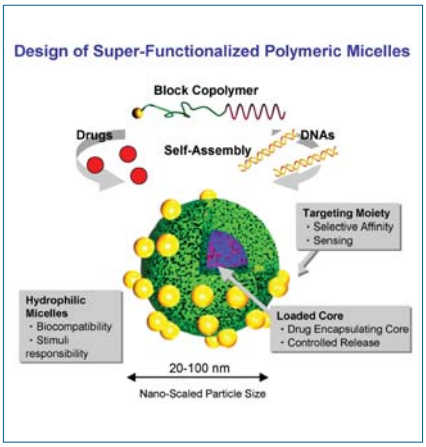


Clinical Biotechnology

http://www.bmw.t.u-tokyo.ac.jp/english/index.html http://park.itc.u-tokyo.ac.jp/NBEP/index-en.html http://square.umin.ac.jp/t-e/

Nanodevices produced by nanotechnology integrate materials and systems on a nanometer scale, and hold the key to realizing the futuristic medical system that can serve the needed function at the right time and the right place with minimal invasiveness. Furthermore, nanodevices are expected to become an important interface between basic biomedical science and clinical medicine by facilitating the translation of basic achievements into clinical applications. Our division wishes to produce revolutionary medical nanodevices based on nanotechnology and thereby to spread the idea of "Nanomedicine" intranationally and internationally.

- Development of nano-scaled carriers of drugs and genes based on polymeric micelles
  - Functional diagnostic imaging
  - Pinpoint cancer therapy
  - Gene therapy
- Development of functional polymeric micelles responsive to external stimuli
- Development of functional cell arrays based on nano-fabrication of polymers
- Development of intelligent scaffolds delivering drugs and genes and their application to regenerative medicine

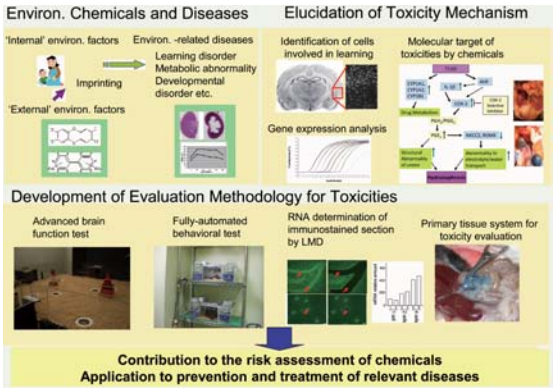


Environmental Health Sciences

http://env-health.m.u-tokyo.ac.jp/english/index.html

Children's health problems of today include such conditions as disorders in the reproductive and immune functions, learning deficits, mental problem and 'metabolic syndrome'. Our research is carried out on the recognition that the homeostasis is disrupted by various environmentally hazardous chemicals, to which expectant mothers and their newborn babies are exposed during their highly sensitive period of life, and that the contamination with these chemicals may lead to various disease conditions in children after birth. Our experimental investigations are focused on the following themes.

- Elucidation of mechanisms involved in the manifestation of toxicity at the molecular and cellular level due to exposure to environmental pollutants, such as dioxin/PCBs and heavy metals.
- Clarification of epigenetic mechanisms that alter susceptibility to environmental chemicals.
- Development of methodologies for evaluating the toxicity of chemicals to the learning and emotion of rodents and of in vitro toxicity techniques at the molecular and cellular levels.
- Development and application of techniques and methodology for evaluating risks of toxic substances in formulating safety standard for the environment and food.



Animal Resources / Research Resources and Support - Animal Research

Our laboratory focuses on understanding the molecular mechanisms which underlie the synaptic plasticity, activity dependent formation of neuronal circuitry, and learning and memory. We generate knockout mice and inducible knockout mice of signal transduction molecules including the glutamate receptors. We also manage the animal facilities, give researchers advice on their animal experiments, and give lectures on laboratory animal science so that animal experiments are carried out in consideration of animal welfare.

- Molecular analysis of brain function using genetically modified mice
- Development of new reproductive technologies in mammals
- Development of model animals for signal transduction diseases

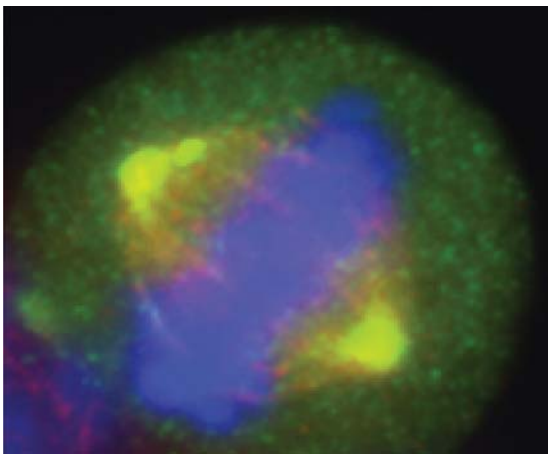
A mutant mouse lacking metabotropic glutamate receptor subtype-1 (mGluR1).

Molecular Radiology / Research Resources and Support - Radiation Biology

http://www.cdbim.m.u-tokyo.ac.jp/english/index.html

We are investigating the molecular mechanisms of DNA double-strand break repair as the scientific basis of radiation therapy and chemotherapy in medical oncology. We also promote the basic research that contributes to the development of a novel therapeutic strategy by examining a link of the DNA metabolic network including DNA replication and cell cycle control with chromosome instability.

- Molecular mechanisms of homologous recombinational repair
- Mechanisms of the choice between homologous recombination and non-homologous end-joining
- Molecular mechanisms of DNA rereplication
- Mechanisms of the genesis of aneuploidy
- Functional analysis of meiotic recombination genes



Centrosome fragmentation which may lead to aneuploidy

Research Resources and Support - Bioinformatics

http://www.cdbim.m.u-tokyo.ac.jp/english/index.html

Targeting biomedical research support using information technologies, the division performs management of the research network and the central servers of the Graduate School of Medicine, and researches on knowledge infrastructure and processing techniques (e.g. information model, ontology, natural language processing, machine reasoning, etc.) and their application to clinical practice.

- Biomedical research support using network system
- Medical terminologies and ontologies
- Standardization of healthcare information and information models
- Natural language processing and its application to the medical domain
- Machine reasoning and clinical decision support systems

Computer System for Biomedical Research