



# Newsletter

## No.8

**Center of Excellence for Interdisciplinary Studies on  
Environmental Chemistry, Ehime University**  
Global Centers of Excellence (Global COE) Program of  
the Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT)

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( Hiroyuki Sato, Kentaro Misaki and Natsumi Suga )		Modeling studies upon the transport and distribution of POPs in ocean currents and accumulation of POPs in food chain and their seasonal and spatial distributions in Japanese coastal areas and open seas were discussed.
Editor's Note -----	10	Bioremediation and the trial of removal of contaminants by many bacterial forms and coexisting species and the

#### **Report on the Annual Progress Report Meeting of the Global COE Program, FY2010**

The Annual Progress Report Meeting of the Global COE Program, FY2010 was held on March 1 and 2, 2011 in Media Hall, Ehime University, Japan. The meeting coupled with The Global COE Report Meeting of Research Grant for Young Scientists, FY2010. Many

irdegradation mechanisms were also explained.

Many interesting posters were also exhibited. The status of pollution in many developing countries was introduced. Several studies reported the development and suitability of bioassay for the evaluation of toxic compounds in wildlife and environmental samples. Posters on the modeling and bioremediation were also presented in the poster session. Active and intriguing discussions were made in the poster exhibition floor.

– **Kentaro Misaki (Postdoctoral Research Fellow, CMES)**

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< **Sub-theme 1** >

**Status of Contamination,**

**Temporal and Spatial Distribution and Future Trend**

The Annual Progress Report Meeting, FY2010 of the Global COE Program “Center of Excellence for Interdisciplinary Studies on Environmental Chemistry” was held at the Media Center of Ehime University on March 1–2, 2011. On the first day, Assoc. Prof. Shin Takahashi opened the report sessions by summarizing the progress of Project 1, highlighting new results on monitoring of emerging persistent organic pollutants (POPs) and their metabolites in cetaceans, monitoring and risk assessment of POPs and trace elements in human-related samples, case studies of toxic evaluation and identification using CALUX bioassays applied to indoor environments and wildlife samples, trace element behavior in sediment cores, and development of new analytical methods for pharmaceutical and personal care products (PPCPs) and perfluorinated compounds (PFCs). Then, the other speakers reported on several sub-projects in more detail. Results of the studies on hydroxylated and methoxylated PBDEs in whales from Japanese coasts was reported by Dr. Kei Nomiya’s group who found evidences for 6OH-BDE47, 2’OH-BDE68, Meo-PBDEs and 2,4,6-triBRP being of natural origin rather than from PBDE metabolism. Dr. Tomohiko Isobe presented his results on POPs in small cetaceans from Hokkaido, reporting an increasing trend of brominated flame retardants from 1980 to 2009. Dr. Ramaswamy Babu Rajendran presented the analytical method for triclosan, triclocarban, paraben preservatives and his monitoring data of these compounds in fish from the Philippines. Oral presentations related to trace elements were made by Dr. Takaaki Itai, on hypoxia-induced mobilization of manganese from bottom sediment of Lake Biwa, and by Dr. Sawako Hirata, on health effect assessment of lead contamination in a battery recycling area based on blood sample analysis and an adapted neurobehavioral test.



The reports on Project 2 were presented on the second day. First Prof. Satoru Suzuki summarized the progress of the sub-project on combination and diversity of oxytetracycline and mercury resistance genes in bacteria near a Taiwanese chemical factory, highlighting the wide distribution of *tet* and *merA*, with various combinations found in 9 of 25 resistant isolates. The occurrence of antibiotic- and metal-resistant bacteria in coastal waters was reported by two PhD students. Notably, multiple antibiotic resistant bacteria (MARB) have been found in abundance, especially in Misaki and Osaka coastal area. Meta-transcriptomic analysis of communities associated with mixed metal contamination conducted by Dr Natsuko Hamamura revealed that genes involved in heavy metal transport and sulfur metabolisms were more abundantly expressed with higher arsenic (As) concentration whereas those involved in As transformation occurred in a saline lake and antimony-contaminated soils. Dr Mitsuhiro Yoshida reported a decrease in bacterial numbers with heavy-oil contamination (< 100 µg/ml), which could be explained by induction of prophage.

The meeting was a good opportunity for discussion on many G-COE research topics, especially for young scientists during the poster session. With great progress made by various studies, we are looking forward to exciting results during next year.

– **Nguyen Tue Minh (Postdoctoral Research Fellow, CMES)**

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< **Sub-theme 2** >

**Modeling Pollutant Behaviors and Dynamics**

The Annual Progress Report Meeting of the Global COE Program, FY2010 was held in the media hall, Ehime University during 1-2 March, 2011. At this meeting, researchers of the sub-theme 2 group presented reports on their studies. The sub-theme 2 relating to the topic “Development of dynamic transport model and food-chain model for persistent organic pollutants (POPs) in the ocean” was divided into 4 sub-groups, including “Modeling of the global POPs and their environmental risks on different areas”, “The dynamic



modeling of the POPs in the East China Sea”, “The modeling on the POPs in the low-trophic level oceanic ecosystem” and “Modeling on the oceanic food web”.

At the beginning of the presentations, Dr. Xinyu Guo, the project leader, briefly introduced the research progress and future plan of the sub-theme 2 and then he reported his research on the response of nutrient concentrations and primary production over the shelf in the East China Sea to changes in oceanic and riverine nutrient input, by using a three dimensional coupled biophysical model. Dr. Jun Ono presented the results simulated by a three-dimensional and high-resolution model for POPs in the East China Sea. He applied this model to PCB 28 and PCB 101 and then compared with the results of PCB 153. Dr. Naoki Yoshie gave a talk on the ecosystem responses to the intrusion of oceanic water in Bungo Channel, Japan. They observed Kyucho and bottom cold water intrusion in the summer of 2010. Dr. Koji Omori presented his research results on the ecosystem dynamic model built for the 9 subsystems in the Seto Inland Sea. Dr. Todd Miller introduced his observations made in Phan Thiet Bay, Vietnam. His group used community structure analysis to examine the structure of the epibenthic food web with respect to bottom substrate. Dr. Jun-ya Shibata explained his study on the variable food web structure in the subsystem basins of Seto Inland Sea using stable isotope analysis.

Except for the reports mentioned above, some other reports and posters were also presented by the members belonging to sub-theme 2. These reports and posters covered physical, chemical and biological studies of the marine ecosystem. These presentations received profound attention by the participants. They will help us in understanding better about the transport dynamics of POPs and their influence on the food web in the ocean.

– **Qingji Li (Doctor Course Student, CMES)**

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< **Sub-theme 3** >

**Toxic Effects and Risk Assessment**

The Annual Progress Report Meeting was organized by the global COE program at Ehime University during 1-2

March 2011, which aimed to analyze the latest research developments of the GCOE researchers. The members (Professors, Post Docs, PhD students) of sub theme-3 “Toxic effects and risk assessment”, presented their research accomplishments during 2010-2011. The sub theme-3 progress report was started with the presentation of Prof. Iwata Hisato, the leader of one of the research projects (project 4) of sub theme-3. His presentation was focused on the outline of the research project 4 - “Development of bioassay systems for detecting the effects of environmental chemicals and evaluation of species-specific responses in higher trophic animals”- and the findings that have been obtained by his team so far. All the presenters belong to this group explained about bioassays that can evaluate the potential toxicities of environmental chemicals in biological systems including receptor signaling, lipid metabolism/excretion, nervous and immune systems, as well as for unraveling the mechanisms that govern the species-specific toxicities of and susceptibility to chemical exposure. These kinds of bioassay systems are expected to be powerful tools, which would contribute to the comprehensive risk assessment in wild animals. The other research project of sub theme-3 (project 5) was presented by Prof. Kitamura and group. He reported about “Toxicological investigation of polycyclic aromatic hydrocarbons (PAHs) and alkylated PAHs in fish”. This group is focusing more on the effect of chemicals on immune and nervous systems. The project 5 team consists of experts of toxicology, neuroscience, mathematical analysis and infectious diseases. This project aimed to reveal the effects of chemicals on fish immune and nervous systems at molecular, cellular and individual levels and also to construct a model for the relationship between chemical pollution and infectious disease occurrence. The effects of chemicals on immune and nervous systems have not been completely understood so far. Therefore, further research is necessary for a better understanding.

The presentations were well attended by the audience and we had lively discussions after each presentation. I hope the development of bioassay systems would be a revolutionary step in the scientific field as this could help to assess not only the effects of chemicals but also to evaluate the species-specific responses in various animals including the endangered species. Similarly, further investigations on PAHs and alkylated PAHs in fish would be helpful to understand the poorly explored factors regarding the effects of chemicals on immune and nervous systems.

– **Thuruthipallil Leena Mol (Doctor Course Student, CMES)**

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## Report on the 3<sup>rd</sup> Global COE Career Development Seminar

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### Career Development for Young Scientist in Environmental Science

**Prof. Mayumi Ishizuka**

(Department of Environmental Veterinary Sciences,  
Laboratory of Toxicology, Hokkaido University, Japan)

February 15, 2011

The 3rd Global COE Career Development Seminar, co-sponsored by Women Career Center was held on 15th February 2011 at the meeting room of the Science Research Building 1, Ehime University. Prof. Mayumi Ishizuka who has a long research career in environmental science delivered a talk on “Career development for young scientists in environmental science.” She has obtained the doctoral degree in 1998 from the Graduate School of Veterinary Medicine, Hokkaido University, Japan. After completing her PhD in Hokkaido University, she was a Japan Society for the Promotion of Science (JSPS) Postdoctoral Research Fellow in Hokkaido University from 1998 to 1999, and then worked in National Institute for Environmental Studies during 1999-2000. In the year 2000, she became a Research Assistant of Graduate School of Veterinary Medicine, Hokkaido University. She was promoted as an Associate Professor in 2004 and promoted as a Professor in 2010 in the same university. She is the first Woman Professor in Veterinary Medicine, Hokkaido University. Not only in the Hokkaido University but also other universities in Japan, female professors are very rare. Prof. Ishizuka focuses her research work on African countries. Her research includes cytochrome P450 signal pathway system, effects of environmental pollutants on this system and their effects on organisms and ecosystems. During the seminar, she explained the background history of her research and the present situation of female researchers in Hokkaido University.



To the question asked by the chairperson, Prof. Ishizuka replied that “I’ve never felt any inconvenience of being woman researcher. If I have to say something, the hardest part of my research was that I could not go alone for sampling to Africa.”

It seems that Prof. Ishizuka’s answer fits her character.

I feel that the female scientists should have strong will, passion and optimism like her. For women, continuing research is difficult during the birth, care and nursing of their children. Recently, the systems and conditions to support female researchers are becoming better in Japan, and will be improved further. But the most important things are to increase the opportunity to exchange information and to receive support from staffs. The collaborators and partners are very important essence for supporting women. To promote the researches by female researchers, our society should accept and allow them to respect the lifestyle of female scientists without any male-female prejudice.

– Midori Iida (Doctor Course Student, CMES)

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## Report on the 30<sup>th</sup> Global COE Special Seminar

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### Overview and Outcome of Okinawa Cutting-edge Genome Project

**Mr. Masatoshi Tsukahara**

(Tropical Technology Center Ltd., Japan)

November 12, 2010

The 30th Global COE special seminar was held on November 12, 2010. Mr. Masatoshi Tsukahara, Tropical Technology Center Ltd., Japan delivered a lecture on “Overview and Outcome of Okinawa Cutting-edge Genome Project”.



Okinawa Cutting-edge Genome Project was started from 2008 to support the economic developmental activities of Okinawa, by using the Next-Generation Sequencer (NGS). NGS has an ability to identify the whole mount genomic sequences. NGS identifies

the short but enormous nucleotide sequences and these sequences are put together as in a puzzle game, based on the already-known genome information. Here, Mr. Tsukahara introduced the genomic analysis of *Aspergillus awamori*, the yeast used for brewing Awamori sake (Japanese alcoholic drink).

Unfortunately, during World War II, many of the Awamori Breweries in Okinawa have been destroyed. Subsequently, a stable brewing system was established, but it made the taste of Awamori uniform, due to the

absence of diversified *Aspergillus* strains. In the traditional Awamori brewing process, two types of *Aspergillus* strains were used for fermentation. Compared to the single yeast derived Awamori, the dual yeast derived one showed the higher level concentration of the vanillin precursor, the major component of old vintage-specific flavor. Additionally, NGS showed that two types of *Aspergillus* strains have remarkable difference in their genome sequence. These data suggested that the combination of the genetically diversified *Aspergillus* strains was the reason for the different taste of Awamori.

Although NGS can identify twenty thousand times of nucleotide sequences than the general sequencer, it is difficult to analyze such a huge amount of information. In Okinawa Cutting-edge Genome Project, the human genome analysis towards generation of new drug is also performed. However, for the effective utilization of NGS, it is essential to find “What sequence should be analyzed by NGS?” and “What is the purpose of using NGS?”. In the present day research, NGS is used only for human and model organisms, whose whole genome information has been already known. It might be a key innovation in future to apply NGS for analyzing the nucleotide sequences of the wild animals, which have no genomic information. Since NGS can identify short but enormous nucleotide sequences, it might be able to predict the gene construction of the wild animals by detecting homology of each fragment based on the related model organisms. This trial might be useful for the contamination studies on environment and wildlife.

–**Nguyen Tai Tue (Doctor Course Student, CMES)**

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## Report on the 31<sup>st</sup> Global COE Special Seminar

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### **The Effects of Environmental Pollutants on Wildlife: A Toxicological Approach Prof. Mayumi Ishizuka**

(Department of Environmental Veterinary Sciences,  
Laboratory of Toxicology, Hokkaido University, Japan)

February 15, 2011

The 31st Global COE Special Seminar was held on February 15th, 2011 at the Center for Marine Environmental Studies (CMES), Ehime University. The guest speaker was Prof. Mayumi Ishizuka, Department of Environmental Veterinary Sciences, Laboratory of Toxicology, Hokkaido University, Japan. Her talk was on

“The Effects of Environmental Pollutants on Wildlife: A Toxicological Approach”.

First, Prof. Ishizuka talked about species difference and pleomorphism by taking sensitivity of wild rodents and birds to a rodenticide as an example. Repeated and long-term treatments with a particular rodenticide have caused emergence of wild rodents called as “super rats” with strong resistance to the rodenticide, all over the world. A mutation in target molecule of the rodenticide in the rodent species is considered to be a possible mechanism of resistance. According to the results of a comparison analysis between rodenticide-resistant rats in



several areas of Japan and super rats of the world, any mutation at the position reported in super rats was not found in the Japanese rodenticide-resistant rats. However, several mutation patterns at different positions were found. Rodenticide detoxification activity of rats

with mutation found in Japan was very high, although rodenticide-resistance of them was not so high. From these results, Prof. Ishizuka demonstrated that rodenticide-resistant rats in Japan have acquired rodenticide-resistance through two mixed mechanisms of mutations in target molecule of the rodenticide and an accelerated rodenticide detoxification system involving cytochrome P450. It has also been reported that dispersal of the rodenticide caused serious secondary harm in birds. According to the results of an analysis in a variety of birds, it was revealed that there is a species difference among birds and that a low rodenticide detoxification activities account for high-sensitivity to the rodenticide in birds of prey which there have been peculiarly numerous reported secondary harm of the rodenticide.

Furthermore, Prof. Ishizuka explained the effects of environmental pollution on animals in Africa by taking wild rodents and cattle of Republic of Zambia for example. Republic of Zambia is known for abundant mineral resources; however, heavy metal pollution by mining and refining of lodes has become a matter of major concern. She analyzed bioaccumulation of metals in animal tissues and organs, their effects on immune-related genes in leukocytes, and the correlation between the two. As a result, high levels of metal accumulation that can cause neurotoxicity and growth suppression were noticed in animals of this area and also these metal levels showed a positive correlation with immune-related genes such as inflammatory cytokines. From these results, a possibility of biological effects

such as reduction of resistance to bacteria and suppression of cellular immunity by heavy metal pollution could be suggested.

Research by Prof. Ishizuka not only provides important information on risk prediction for wild life and human by chemicals, but also has many hints that are applicable for interdisciplinary study. Such seminar would be essential to cultivate interdisciplinary ability of the students in environmental science.

– **Saimi Tokunaga (Postdoctoral Research Fellow, CMES)**

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### **Report on the 32<sup>nd</sup> Global COE Special Seminar**

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#### **Biomonitoring Phthalate Metabolites in Human Urine and Assessing Exposures to Phthalates in Several Asian Countries**

**Prof. Kurunthachalam Kannan**

(Wadsworth Center, Department of Environmental Health Sciences,  
State University of New York at Albany, New York, USA)

March 1, 2011



On March 1, 2011, Ehime University warmly welcomed Dr. Kurunthachalam Kannan, from State University of New York at Albany, who is an alumnus of Ehime University for the 32<sup>nd</sup> Global COE Special Seminar for giving a lecture on “Biomonitoring of Phthalate Metabolites in Human Urine and Assessment of Exposures to Phthalates in Several Asian Countries”. Dr. Kannan introduced the use of Phthalates as plasticizers in many products globally to more than 1 million tons/year. His lecture furthermore explained the toxic effects of Phthalates, such as reproductive toxicity, creating allergies and especially the involvement between high phthalate exposure and children’s intelligence and behavior. Phthalates, therefore, were added to the list of “chemicals of concern” by the U.S Environmental Protection Agency (EPA). Dr. Kannan also highlighted the presence of 14 phthalate metabolites in human urine samples collected from seven Asian countries: China, India, Japan, Korea, Kuwait, Malaysia and Vietnam and this finding indicated widespread exposure of human to phthalates in these countries. The highest concentration of phthalate metabolite was found in samples collected from Kuwait, followed by India, China, Vietnam, Japan, Korea

and Malaysia, in decreasing order. Monomethyl, monoethyl, mono 2-isobutyl, mono-n-butyl phthalate, and metabolites of di-(2-ethylhexyl) phthalate were the dominant compounds. At the same time, he showed that the profiles of urinary phthalate metabolite concentrations varied among the samples. Besides, the estimated results of daily intake rates indicated that people in these seven Asian countries are exposed to DEP, DBP, and DEHP at levels well below the reference doses (RfD) suggested as unsafe by the U.S. EPA. The estimated exposure doses to DEHP in Kuwait, however, were above the RfD recommended by the EPA. The lecture attracted attention of many Professors, students, and members of Global COE program in Ehime University as it was very interesting and closely related to our research which is currently focusing on the effects of environmental chemicals in wild animals and human. The seminar by Professor Kannan became very much informative to all the members and also because of the many questions asked by them and the answers by Dr. Kannan.

I feel that I am very lucky and pleased to attend such a wonderful seminar as it gave me a great opportunity to obtain a basic knowledge on environmental pollutants and gave me ideas to generate new projects for me to study the effects of these compounds on the nuclear receptors. From Dr. Kannan’s precious lecture, I fully understood that human activities are the main causes of increasing environmental pollution. I do hope that, with the knowledge obtained from such lectures and my other research ventures, I will be able to raise awareness on environment protection among people.

– **Pham Thi Dau (Doctor Course Student, CMES)**

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### **Report on the 33<sup>rd</sup> Global COE Special Seminar**

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#### **Trends of Legacy and New Contaminants in the Arctic and the Importance of Sample Archives**

**Dr. Derek Muir**

(Environment Canada / Aquatic Ecosystem Protection Research  
Division, Burlington ON Canada, Canada)

April 14, 2011

As part of the Global COE seminar series, a lecture on “Trends of Legacy and New Contaminants in the Arctic and the Importance of Sample Archives” was delivered by Dr. Derek Muir, Senior Research Scientist with Environment Canada. His talk centered on the Arctic as an indicator of global pollution (radionuclides, mercury,

POPs); archived samples of snow/ice, sediments, wildlife and human tissues; inferring sources and time trends of chemical contaminants (mercury, PCBs, PBDEs and fluorinated chemicals) in marine mammals and other wildlife with the help of archived samples; contaminants in indigenous people, and climate interactions. His talk first touched on the major physical pathways (atmosphere, ocean currents, rivers) transporting contaminants to the Arctic and location of radionuclide sources, and showed a timeline for radionuclide deposition and uptake in plants, animals and people, illustrating that global transport of toxic contaminants can be a problem in remote environments. He added that following the 1986 Chernobyl explosion, elevated cesium ( $^{137}\text{Cs}$ ) in reindeer and humans were detected and in 1991, Arctic monitoring and assessment program began in all the eight circumpolar countries. He explained that reindeer feed on lichen and took up  $^{137}\text{Cs}$  after the Chernobyl incident. Among the lessons learned from radionuclide deposition studies in the Arctic are: transport from the mid-latitudes can bring pollutants to the arctic via the atmosphere and ocean currents; pollutants accumulate through the food web into arctic wildlife and people. Dr. Muir added that emissions of  $^{137}\text{Cs}$  from the Fukushima incident are reported to be similar to Chernobyl so may eventually reach the Arctic.

On Arctic mercury contamination, Dr. Muir said there was clear evidence for historical increases judging from temporal trends in biota albeit there has been recent increasing concentrations in some wildlife and declines in others. Could it be due to climate change? He rhetorically asked. Dr. Derek stated that Asia is estimated to be the source of 29-37% of all gaseous elemental mercury in North America and Asian emissions are growing.



They generate most long range transport events, which can be explained using the Global/Regional Atmospheric Heavy Metals model by Durnford *et al.*, 2010. Dr. Muir continued that between the 1970s and 1980s, there was emerging realization that persistent organic pollutants were appearing in the Arctic far from known sources, vis-a-vis elevated mercury in humans and wildlife; high levels in marine mammals important to Inuit diet; and the recognition that human exposure was higher than in people living in southern Canada, Western Europe etc. Some studies on mercury have concluded that:

- Mercury has increased in hard tissues of arctic marine top predator biota by about 10 times since the 1300s. The “man-made” contribution is estimated at 92% based on comparison of historical and present day samples.
- Mercury concentrations in livers of ringed seals (>5 yrs age) based on collections from 1996-2004 vary widely and assumed to be mainly from geological background. Year to year variation is high at Canadian sites.
- Trends of mercury in ringed seal muscle in recent years showed no significant increase or decline; No major diet changes based on  $\delta^{15}\text{N}$ .
- Mercury time series (1975-2008) for thick-billed murre eggs and northern Fulmar eggs from Prince Leopold Island depict significant increase from the 1970s although no change from 2003.
- Total mercury concentrations in blood of mothers, pregnant women and women of child-bearing age in the circumpolar countries revealed high percentage exceedence of US NRC guideline ( $5.8\mu\text{g/L}$ ) in Greenland and Canada.

Dr. Muir explained that analysis of samples from wildlife and human specimen banks has provided valuable information on trends of POPs and mercury in the Arctic and mentioned the major tissue banks with Arctic biological samples as:

- Sweden- Swedish Museum of Natural History, Stockholm
- Canada- National Wildlife Research Centre, Environment Canada, Ottawa
- Denmark- National Environmental Research Institute, Roskilde
- Japan- es-Bank, Center for Marine Environmental Studies, Ehime University
- USA- National Institute of Standards and Technology (NIST), Charleston SC

On Arctic contamination by persistent and bioaccumulative organic chemicals, Dr. Muir summed various studies as follows:

- ❖  $\beta$ -HCH is increasing in ringed seals in Canadian Arctic areas influenced by Pacific Ocean waters: temporal trends unrelated to global emission estimates.  $\beta$ -HCH in ringed seals influenced by Pacific Ocean waters but not Atlantic water.
- ❖ PCBs are declining slowly in female ringed seals in the Canadian arctic and in Greenland: no significant temporal trends and little relation to

global emission estimates.

- ❖ PCB 153 levels in blood of mothers, pregnant women and women of child-bearing age in the circumpolar countries exceeded the 5 µg/L guideline for total PCBs in blood.
- ❖ Trends of penta-PBDEs in ringed seal blubber at Lancaster, Beaufort, Hudson and East Baffin locations showed that concentrations seemed to have peaked based on samples from 2005-2008, in comparison with production.
- ❖ Albeit detection of perfluorinated alkyl acids and alcohols including perfluorooctanesulfonate (PFOS) at elevated concentrations in the Arctic was unexpected, temporal trends of perfluorinated compounds in East Greenland polar bear livers showed very high exposures of increasing concentrations. Higher concentrations of PFOS in blood of mothers, pregnant women and women of child-bearing age were associated with the consumption of fish and marine mammal meat.

On climate contaminant interactions, Dr. Muir said shifts of atmospheric and oceanic transport pathways may impact delivery of contaminants; increased biomass burning fires may mobilize volatile contaminants (e.g. mercury, PAHs) and transport non-volatiles on soot particles, and glacial melting may mobilize contaminants. Dr. Muir concluded his lecture by saying that environmental specimen banks are an important component in the assessment of contaminant trends in the Arctic, and times series in wildlife are getting longer and more useful for assessing trends and sources of contaminants. Several questions were asked after his talk and Dr. Derek Muir took pains to answer them. The young scientists showed much enthusiasm which was very encouraging.

– Kwadwo Ansong Asante (Doctor Course Student, CMES)

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**Report on the 15<sup>th</sup> Global COE Seminar  
by the Association of Young Scientists**

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**Mechanism of organogenesis in *Xenopus laevis***

**Dr. Tomohisa Katada**

(Department of Pharmacology and Toxicology, School of  
Medicine, Kyorin University, Japan)

January 28, 2011

On January 28, 2011, the 15th “Global COE Special Seminar by the Association of Young Scientists” was held in the Science Research Building I. Dr. Tomohisa Katada, Assistant Professor, Department of Pharmacology and Toxicology, School of Medicine, Kyorin University gave a presentation on “Mechanism of organogenesis in *Xenopus laevis*”. In this seminar, Dr. Katada delivered a talk on Basic and Applied Embryology from the past experimental data of his research team, focusing on the relationship of Notch signaling pathway and regulatory factors.

Embryology is an important part of scientific study when we try to understand regenerative therapy, reproductive medical science, etc. In general, only 1% of teratogenesis occurs spontaneously. Antiepileptics, anticancer drugs, and antibiotics also induce approximately 1% of teratogenesis. In other words, it can be presumed that spontaneous teratogenesis occurs at a same rate by exposure of environmental chemical compounds at the early developmental stage through the placenta, as it occurs naturally.

Notch signal plays important roles with cell-cell interaction at various stages of development. Mastermind gene binds the intracellular domain of Notch (NICD) complex and Su (H), and trimeric complex enhances transcription activity of target genes.



Dr. Katada explained his experiment promoting overexpression or inhibition using *Xenopus laevis* embryo to clarify functional analysis of Mastermind gene. In specific analysis, it was found that Mastermind gene induced neurogenesis without interaction of NICD and Su(H) under the Notch signal inhibitory condition. Hence, it was clearly found that the function of Mastermind gene led to the nerve gene expression in a Notch signal-independent manner.

Many questions were asked by the participants showing the high level of interest on this lecture theme. Dr. Katada replied to many of these questions using many recent and unpublished information.

– Sogo Nishimoto\* (Postdoctoral Research Fellow, CMES)

\* Current Position: Postdoctoral Fellow, Laboratory of Nutraceuticals and Functional Food Science, Graduate School of Marine Science and Technology, Tokyo University of Marine Science and Technology

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## Report on the 16<sup>th</sup> Global COE Seminar by the Association of Young Scientists

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### Job and Research Opportunities for Young Scientists in Private Companies in Japan

**Dr. Masaaki Okabe**

(Food and Health R&D Laboratories, Meiji Seika Kaisha, Ltd., Japan)

February 18, 2011

The 16th Global COE Seminar by the Association of Young Scientists was held on February 18th, 2011 at Ehime University. Dr. Masaaki Okabe, Food and Health R&D Laboratories, Meiji Seika Kaisha, Ltd., Japan gave a presentation entitled “Job and Research Opportunities for Young Scientists in Private Companies in Japan”. He is an alumnus of Ehime University as he was a Global COE Researcher from April 2008 to August 2010, and now works for Food and Health R&D Laboratories, Meiji Seika Kaisha, Ltd., Japan. As he has conducted studies on the functional food and the risk assessment of agricultural chemicals like herbicides, he has become interested in the issues on food safety. In this seminar, Dr. Okabe explained the ways and needs for finding employment in his and allied companies and prospective life style as a researcher in a private company.



At the seminar, Dr. Okabe emphasized the importance of a network of contacts. He said that young scientists should not be satisfied by not only participating in academic meetings but should also create and develop as many personal exchanges as possible. Actually, he only can create his own career by obtaining intellectual assets and developed network. Dr. Okabe also said that even though the private companies are mainly profit motivated, they promote the research and development studies also in a parallel pathway. Amid ongoing diversification of career paths, Dr. Okabe suggested several options for career development.

This seminar provided a good opportunity for young researchers, because it is difficult to get a chance to increase communication between the corporate researcher and young researcher and obviously, Dr. Okabe's lecture showed as ways to have such communication. I believe that these advices will be beneficial to our career development.

–Masashi Hirano (Postdoctoral Research Fellow, CMES)

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## Self-introduction of Global COE Postdoctoral Research Fellows

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**Hiroyuki Sato** – I have been working as a G-COE Researcher since May 2010. I received higher education in the Department of Agriculture, Tohoku University. After finishing the Master course in its graduate school, I worked for the Sumitomo Chemical Company, which originated from the mining business at the Besshi Copper Mine in Niihama City, Ehime Prefecture. In 2004, I moved to the Dr. Auwerx Laboratory at the Institute of Genetics and Molecular and Cellular Biology (Institut de Génétique et de Biologie Moléculaire et Cellulaire, IGBMC in French) as a Ph.D student in the University of Strasbourg. I obtained my Ph.D in Life Science from the University of Strasbourg in 2007. After that I came back to Japan and worked for the National Cardiovascular Center as a Staff Scientist for two and half years.



I have been studying mainly glucose, lipid and energy metabolism, and life style-related diseases such as obesity and the metabolic syndrome consequent upon their metabolic abnormalities. In my Ph.D course, I analyzed the physiological function of bile acids and their receptor mediating effects together with my colleagues. We could find out that bile acids can work as signal compounds in the peripheral tissues after diet consumption. For example bile acids enhance energy expenditure via the activation of bile acid receptor, TGR5 in human muscle. We have also succeeded in developing some bile acid derivatives and triterpene compounds as potent TGR5 agonists. They are now used for developing further processes of drug development for the treatment of life style-related disorders.

In this G-COE program, I am working with Dr. Fujino, Associate professor at the Integrated Center for Sciences (INCS). I am analyzing the possible associations of the xenobiotic exposure in humans with the prevalence of life-style related or autoimmune diseases.

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**Kentaro Misaki** – I am Kentaro Misaki, working as Global COE researcher since June 2010. I received my Ph.D. in Department of Environmental Engineering, Graduate School of Environmental Engineering,



Kyoto University, Japan in March 2007. Then I was a postdoctoral fellow at the Institute for Environmental and Gender Specific Medicine, Graduate School of Medicine, Juntendo University, Japan from 2007 to 2010.

So far, I studied mainly about atmospheric pollutants. I synthesized mutagens (nitro derivatives of oxygenated polycyclic aromatic hydrocarbons (oxy-PAHs) which are predicted to exist in automobile exhausts and atmosphere, and found their high mutagenicity. Furthermore, I found that several oxy-PAHs in atmospheric environment showed significantly high aryl hydrocarbon receptor (AhR) activity (it is pointed that AhR is related to endocrine disrupting activity, asthma, pollinosis and immunotoxicity.), and it was also found by using bioassay that high AhR active PAHs and several oxy-PAHs exhibit high tumor promoting activity.

In CMES, as a member of sub-theme 1, I started to do research about the activity contribution ratio of known toxicants and the identification of unknown toxic compounds in wildlife tissues and environmental samples, by combining bioassay and chemical analysis. At present, I do research on the relation between the concentration of persistent organic pollutants (POPs) such as organochlorine pesticides and anti-androgenic activity in the tissue extracts of several species. I categorized different species in which *p,p'*-DDE has high and low activities. Additionally, for my future research I want to investigate atmospheric pollutants in developing countries and elucidate what kind of polycyclic aromatic compounds contribute to the mutagenicity and AhR activity in urban areas in the light of my current experience.

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**Natsumi Suga** – I am working as Global COE researcher since April 2011. I received my Ph.D. in Environmental Science at the Graduate School of Environmental Sciences, Hokkaido University, Japan in March 2011. My special field of study was Biogeochemistry,



I studied material cycling in the brackish lagoon at Hichirippu (Hokkaido, Japan). Hichirippu lagoon supports rich natural and sustainably high fishery resources. Hence I focused on the primary production process that supports fishery in the lagoon. In general, the freshwater input plays an important role in controlling estuarine primary production. My study showed that in Hichirippu lagoon the nutrient import from the adjacent sea has an important effect on the primary production rather than the freshwater input.

Then I estimated microphytobenthic resuspension flux in the lagoon. It was the first direct estimate of microphytobenthic resuspension flux in shallow estuaries. The study showed that the resuspension phenomenon had little effect on the population of microphytobenthos in sediment; however, the resuspended microphytobenthos had a major impact on the total micro algal biomass in the water column.

In Global COE program at Ehime University, I am studying bacterial response to material transport across water-sediment interface. I'm sure that my prior research experience will be helpful for my present research motives. Further, I will be working on the behavior of antibiotics in water-sediment environment, on which there is very little information. These processes may affect bacterial structure in sediment. This study may explain the mismatch of spatial distribution between antibiotics and the resistant gene. This will be important information that may be useful to predict the diffusion of antibiotic resistant bacteria.

#### Editor's Note

We cordially invite you to attend the GCOE symposium, titled "International Symposium on Advanced Studies by Young Scientists on Environmental Pollution and Ecotoxicology", August 4–6, 2011, at Ehime University. The International Symposium will provide young scientists with a window of opportunity to deepen their knowledge in the areas of environmental chemistry and toxicology. For more details, visit our web site.

-Hisato Iwata (Prof., CMES)

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