In FOCUS

ACS chemical biology

The First Asian Chemical Biology Conference Meets at Seoul National University

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The first Asian Chemical Biology Conference (ACBC) was held at the campus of Seoul National University (SNU) June 25−27, 2010. The organizers, Jaehoon Yu (SNU) and Injae Shin (Yonsei University), assembled a diverse array of speakers and associated poster presenters who are based in Hong Kong, Japan, Korea, and Singapore. This was the first pan-Asia conference on this topic and therefore heralds the increasingly global spread of chemical biology.

PEPTIDES AND PROTEINS

Hisakazu Mihara from Tokyo Institute of Technology described his research involving arrays of structured peptides that were used to establish affinity fingerprints of cells and to discover cell penetrating peptides (*1*). Chu-Young Kim from the National University of Singapore presented preliminary data on a new cell-penetrating peptide, Entritin, which should prove to be more biocompatible because it is protease-resistant and uncharged. Itaru Hamachi from Kyoto University described a new strategy for selective protein labeling that utilizes a specific ligand conjugated to a probe through a tosylester functionality. Upon ligand binding, the sulfonate is attacked by nucleophilic groups proximal to the ligand binding site (*2*). Hitoshi Ishida from Kitasato University described his work on the design of bipryidine-containing small peptides that fold in the presence of ruthenium (*3*). Shiroh Futaki from Kyoto University presented his design of novel proteins that are responsive to metals (*4*). In one he reassigned a canonical cysteine residue to aspartic acid, which reduces the protein's affinity for zinc, thereby affording a sensor for the metal where the response is based on gene transcription. Koichi Fukase from Osaka University described his research to interrupt protein−protein interactions by employing a branched peptide assembled through a 1,3-dipolar cycloaddition (*5*) to mimic the Grb2 SH2 domain. Ikuo Fujii from Osaka Prefecture University used phage display to discover "micro antibodies" based on helix−loop−helix peptides (*6*). Masao Ikeda-Saito from Tohoku University described studies on the enzyme heme oxygenase, which is involved in heme catabolism (*7*). Byung Woo Han from SNU discussed variable lymphocyte receptors (VLRs) from jawless vertebrates and described the crystal structure of a VLR bound to a trisaccharide blood cell antigen (*8*). Zhihong Guo from Hong Kong University of Science and Technology described his research to investigate the role of macromolecular crowding on protein function and how the nonribosomal peptide synthesis machinery that produces enterobactin increases its specificity under crowding conditions (*9*).

NUCLEIC ACIDS

Jaehoon Yu from SNU described his work focusing on RNA as a drug target. He described the use of designed helical

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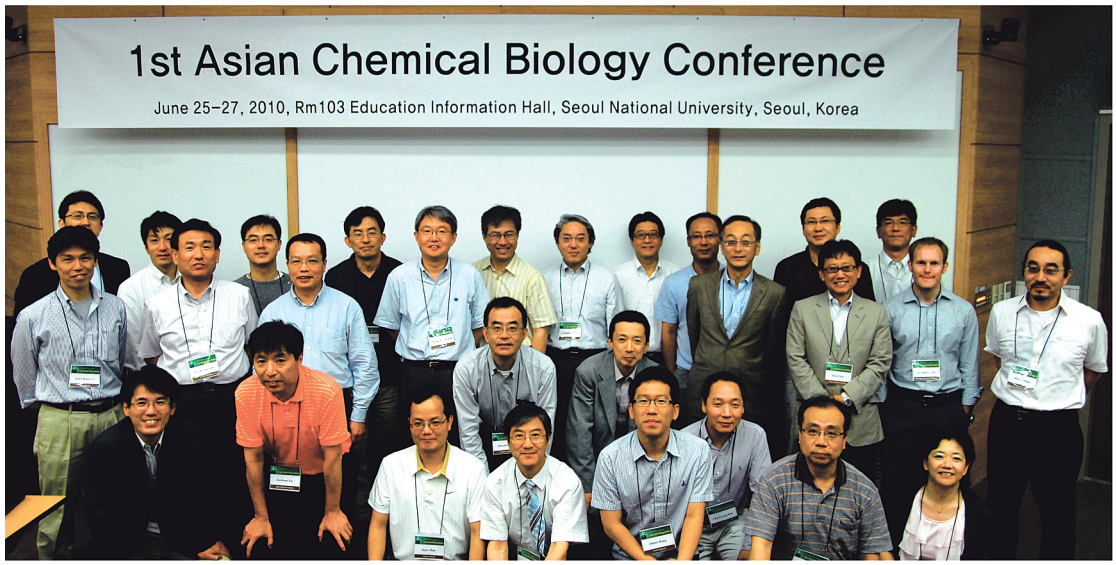

Figure 1. The participants of the first Asian Chemical Biology Conference, at Seoul National University, Seoul, Korea. Photograph by Jaehoon Yu.

peptides that target hairpin pre-miRNA (*10*). Takehiro Wada from Tohoku University described the use of peptide ribonucleic acids (PRNA), which are nucleic acids that have the PNA-analogous peptide connectivity but retain the RNA backbone ribose sugar (*11*). This strategy was employed to achieve cancer-specific cell-targeting using pH-responsive, antisense with a nucleoside that shifts the *syn-anti* conformation of the sugar/base rotamer through the pH-dependent formation of a boronate at the 2' and 3′ hydroxyls, thereby turning on and off base-pairing. Fumi Nagatsugi from Tohoku University reported her use of vinyl purines to cause double strand nucleic acid crossing linking and a resulting antisense affect to control gene expression (*12*). Dong-ki Lee from Sungkyunkwan University described the use of short, asymmetric duplex siRNAs to knock down the STAT3 pathway and tripodal RNAs to knock down three genes at once (*13*). Byeang Hyean Kim from Pohang University of Science and Technology described quencher-free molecular beacons that could detect single-site base mismatches (*14*). Shigenori Takenaka from Kyushu Institute of Technology disclosed a bis-intercalator labeled with a fluorescent probe (*15*). Because it is specific for A—T base pairs and has a built-in internal standard, it can be used to determine the degree of cytosine methylation when coupled to a bisulfite assay. Naoki Sugimoto from Konan University described his studies into the role that molecular crowding plays in G-quadruplex formation (*16*) and into the development of a "universal ribozyme" utilizing a single-stranded oligonucleotide with an extended base that can distort its complement so that it is susceptible to 2′-hydroxyl backbone cleavage in the presence of metal.

IMAGING AND SENSING STRATEGIES

Kazuya Kikuchi from Osaka University described the use of a bifunctional imagining strategy that places a gadolinium chelate in close proximity to an ^{19}F-rich functionality. Cleavage of the linker results in T2 recovery and a resulting MRI signal in analogy to FRET (*17*). Jong-In Hong from SNU described his research using a bis-zinc-dipicolylamine sensor (*18*) to follow phosphatidylserine on cell surfaces to identify apopotosis. Takashi Morii from Kyoto University discussed his development of biosensors for a series of inositol phosphate secondary messengers based on selective plecksin homology (PH) domain proteins (*19*). Yoshinobu Baba from Nagoya University described his research to follow the progress of stem cell-based cell therapies using quantum dots (*20*).

SMALL MOLECULE-BASED APPROACHES

Naoki Kanoh from Tohoku University described his research to generate small molecule arrays using light-induced carbene immobilization (*21*). Injae Shin from Yonsei University described the discovery of a number of biofunctional organic molecules including those, derived from sulfonamide and imidazole libraries, that induce neurogensis, apoptosis, or abnormal heart development in zebrafish (*22*). Motonari Uesugi from Kyoto University described his studies with the small molecule adhesamine, which functions as a fibronectin functional mimic to aid in the adhesion of cells and acts through the binding of heparin sulfate (*23*).

BIOTECHNOLOGY

Hiroaki Suga from University of Tokyo described the structural basis of his Flexizyme, ribozyme-based strategy for charging tRNAs with unnatural amino acids (*24*) and presented his RAPID strategy for screening libraries of cyclic peptides using mRNA display. Duhee Bang from Yonsei University

described a method for efficient, cost-effective, and low-error, whole genome synthesis using circular assembly amplification (*25*).

MATERIALS

Juyoung Yoon from Ewha Woman's University described his research to recognize ATP with imidazolium-based receptors and anionic surfacatants with imidazolium-polydiacetylene conjugated polymers (*26*). Keigi Aoi from Nagoya University described his work with asymmetric amphiphilic dendrimers for the development of smart nanomaterials. Brendan Orner discussed his research to understand the fundamentals of ferritin self-assembly (*27*) and the use of these proteins in the templation of inorganic nanomaerials. Hee-Seung Lee from KAIST described his research with β-peptide foldamers that self-assemble into unique and easily controllable microarchitectures (*28*). Yoonsik Lee from SNU described his work to develop molecular barcodes of solid phase libraries using surface enhanced Raman scattering beads (SERS dots).

The first Asian Chemical Biology Conference brought together chemical biologists from across Asia who presented their freshest research fusing chemistry and biology with a unique Asian flavor. The high quality of science and the level of excitement generated in the conference bodes well for further expansion of chemical biology in Asia and Asian-style chemical biology throughout the rest of the world at this dawn of The Asian Century.

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