JASIS 2014

Japan Analytical & Scientific Instruments Show

24 Mon March 2014

9:00～16:40 Admission Free

Breakthrough and Discovery
Biopolis, Matrix Building

Organizer : JAIMA(Japan Analytical Instruments Manufacturers' Association)

Sponsor : A*STAR BMRC(Biomedical Research Council)

Advanced Diagnostics Forum
Organized by JAIMA, and co-hosted by A*STAR BMRC

The Agency for Science, Technology and Research (A*STAR) is the lead agency for fostering world-class scientific research and talent for a vibrant knowledge-based and innovation-driven Singapore. A*STAR oversees 14 biomedical sciences and physical sciences and engineering research institutes, and six consortia & centres, located in Biopolis and Fusionopolis as well as their immediate vicinity.

JASIS (Japan Analytical & Scientific Instruments Show) has newly been renamed in a commemoration of the 50th holding celebration of the Analytical Instruments Exhibition (JAIMA EXPO organized by JAIMA: Japan Analytical Instruments Manufacturers' Association) as well as the 35th holding in Tokyo of the Scientific Instruments Show (SIS organized by JSIA: Japan Scientific Instruments Association).

As progress in analytical measurement technologies has supported rapid development in genetic analysis, protein marker discovery, metabolomics discovery, and cell research, the bio-research market has been emerged as a new segment of the market including genomics, proteomics and metabolomics. Medical treatment is also going to advance. Tailor-made treatment is starting to become a reality, preventive health is a growth market segment, and work environments are being transformed by advanced instruments, reagents, software and other products.

JASIS is now trying to establish a new program named " Advanced Diagnostics Innovation" in order to accelerate in near future advanced diagnostics using an analytical instrumentation, high technological devices, tools and chemistry at the new market creation in 2013. JAIMA will have a great opportunity to make any business alliance possibility between Japanese industry and A*STAR/Biopolis where a lot of interesting application contents are developed at an increased rate.

The Advanced Diagnostics Forum co-organized by JAIMA and co-hosted by A*STAR is designed to set the stage for communication among many people from various industries, and for early industrialization of advanced diagnostics. This booklet consists of presentations by guest speakers and members of JAIMA will hopefully become a support tool for your business and acceleration of your business opportunities.

We wish the Advanced Diagnostics Forum at Biopolis in Singapore will be able to give you a great opportunity to open a door in your business development in Life Science market.

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Agency for Science, Technology and Research A*STAR
Singapore Bioimaging Consortium (SBIC)
Professor Patrick J. Cozzone, Executive Director

The Singapore Bioimaging Consortium: From Genes to Man

P R O F I L E

Patrick J. Cozzone is the Executive Director of the Singapore Bioimaging Consortium of A*STAR. He is Professor Emeritus of Biophysics at the Faculty of Medicine of Aix-Marseille University and a honorary member of the Academic Institute of France where he held the chair of Biophysics from 1998 to 2008. He holds a PhD in Organic Chemistry (Marseille), a "Doctorat ès-Sciences" in Biochemistry (Marseille) and a MBA (University of Chicago). He has previously held research/faculty positions at Stanford University (Pharmacology Department of the School of Medicine and Stanford Magnetic Resonance Laboratory), the Universities of Tunis and Sfax and the Pasteur Institute in Tunis (Tunisia) and the Institute of Biological Chemistry in Marseille. He is the founder (1986) and was director of the Centre de Résonance Magnétique Biologique et Médicale (CRMBM) until 2012. CRMBM has specialized in preclinical and clinical studies of heart, muscle and brain using all modalities of magnetic resonance spectroscopy and imaging. CRMBM is jointly operated in Marseille by CNRS, Aix-Marseille University and the University Hospital, with a strong interface with industrial partners. P. J. Cozzone has co-authored over 400 peer-reviewed papers and directed 40 PhD theses. He has served in several French research agencies (CNRS, INRA, ANR, etc.) and international organizations, was an adviser to the French Minister of Research, has presided ESMRMB (European Society for Magnetic Resonance in Medicine and Biology), and is currently a member of the IUPAB Executive Committee and the Editor-in-chief of MAGMA. He is a Laureate of the French Academy of Sciences (1981), the recipient of the 1998 European Magnetic Resonance Award in Basic Sciences, a fellow of ISMRM (2007) and a member of the Academy of Sciences, Literature and Arts, Marseille (2011). He was knighted in the French national order of the Legion of Honor in 2013.

Abstract

The Singapore Bioimaging Consortium (SBIC) is one of the research institutes of the Agency for Science, Technology and Research (A*STAR) in Singapore.
As a research institute, it aims to advance and apply life imaging technology to better understand the pathophysiological and biochemical underpinnings of selected diseases using pre-clinical models in a translational manner. To this end, SBIC has built a competitive platform of state-of-the-art imaging instruments, offering all available modalities for preclinical imaging. Scientists and engineers at SBIC have strong and internationally recognized know-how and skills in the development of chemical and biological probes, metabolic phenotyping, SERS and optical imaging, multimodal MR imaging and spectroscopy, nano SPECT, micro PET and image processing. SBIC research, development and transfer activities are conducted in close connection with other leading academic institutions in Singapore and overseas, major industrial partners and the clinical community.
As a national consortium, SBIC aims to harness existing imaging expertise and capabilities in Singapore, bringing together substantial strengths in the physical sciences and engineering with those in the biomedical and clinical sciences. Through an array of focused collaborations and joint appointments, the goal is to foster and support the growth of multidisciplinary research activities in the field of bioimaging across local research institutes, universities and hospitals, in order to accelerate the development of biomedical research discoveries.
The vertical integration of competence from genes to humans within SBIC, and the accompanying horizontal network of collaborations across institutions and disciplines, confer SBIC a unique capacity to promote rapid “bench-to-bed” transfers of results in animal and human imaging research onto the clinical environment, to the immediate benefit of patients. It also ensures the development of financially sound and sustainable contractual research with industrial partners (pharma, nutrition, personal care ...) in support of A*STAR Biomedical Research Council strategic research thrusts.

Genome Institute of
Singapore /POLARIS
Dr. Christopher W. Wong

Harnessing the Power of Genomics for Clinical Application

P R O F I L E

Dr Christopher Wong trained as a cancer biologist at the University of Pennsylvania, receiving his PhD in 2001, and MBA from Singapore Management University in 2012. A founding scientist at the Genome Institute of Singapore (GIS), he is an expert in microarray technology development and applications. During the SARS outbreak, he invented the SARS Resequencing Chip, which was used for epidemiology studies of the SARS virus in Singapore. Subsequently, this technology was adapted for Dengue Resequencing as well as H1N1(2009) Resequencing.
From 2008-2011, he was concurrently Head of the Biopolis Shared Facilities, responsible for managing the shared scientific services laboratories. From 2009-2013, he was appointed as Chief Scientific Officer at the GIS, responsible for translating GIS research discoveries in cancer genomics and infectious diseases into products which can be used for patient care in the hospitals, and for commercialization. In 2011, he founded PathGEN Dx Pte. Ltd., a spin-off company developing Infectious Disease Diagnostics products based on technology licensed from GIS. He is currently Chief Operating Officer for POLARIS at GIS, which is developing the infrastructure to enable Precision Medicine by developing and implementing genomic assays, in collaboration with clinicians.

Abstract

Harnessing the Power of Genomics for Clinical Application
Christopher W. Wong, PhD, MBA
Chief Operating Officer, POLARIS,
Genome Institute of Singapore

The maturation of Next Generation Sequencing technologies, data sharing mechanisms such as the Global Alliance for Genomic Health and endorsements by celebrities have increased the profile and feasibility of personalized or precision medicine. Many academic institutes, hospitals and companies globally have set up initiatives to promote and enable precision/stratified medicine. In Singapore, we have established POLARIS™ (Personalized Omic Lattice for Advanced Research and Improving Stratification), which will enable and promote the use of genomic technologies in the clinic. CAP-accredited sister laboratories are being established at the Singapore General Hospital and the Genome Institute of Singapore. This would enable both precision medicine using established biomarkers, as well as facilitating the rapid translation and validation of novel biomarkers from clinical trials and clinical research projects. Our initial focal diseases are lung cancer, gastro-intestinal cancer, eye disease (corneal dystrophy) and tuberculosis resistance. I will highlight our progress and challenges in establishing this platform. For more information on POLARIS, please refer to our website: http://polaris.a-star.edu.sg

Invitrocue Pte Ltd
Spinoff from A*STAR Institute of Bioengineering and Nanotechnology
Dr. Isabel Hui

Collaborative Platforms for Digital Pathology and in Vitro Hepato-toxicity Testing

P R O F I L E

Dr Isabel Hui Hui is Vice President of Business Development at InvitroCue. She has worked in Europe and Asia including China with thorough understanding of the biotech market.
Prior to joining InvitroCue, Dr Hui Hui worked as a researcher in Europe and Asia, for example in the Department of Physiology at the National University of Singapore, the Department of Pain Management at the Nanshan Hospital, Shenzhen/China, the Faculty of Life Sciences at the University of Manchester, UK or the Department of Biomedical Science at the University of Sheffield, UK.
Dr Hui Hui holds a Bachelor of Science in Pharmacology from the Wuhan University, China and graduated with a Doctor of Philosophy degree in Biomedical Science from the University of Sheffield, UK in 2007. She has published 5 peer-reviewed journal articles and was awarded with an overseas research scholarship by the British Government.

Abstract

InvitroCue Pte Ltd enables pharmaceutical companies; CROs & research institutes make informed and collaborative scientific decisions thereby saving cost & time for drug development. Our proprietary in vitro culture models, which mimic physiologically relevant responses, and image analytic tools that provide quantitative data with high resolution enable better prediction of drug safety and drug efficacy. The image analytics solutions are administered via our integrated digital pathology solution consisting of board certified pathologists.

InvitroCue

Technologies for High Sensitivity Diagnosis

KONICA MINOLTA, INC.
Technology R&D Center 1,
Corporate R&D Headquarters
YOSHIHIKO SUDA

P R O F I L E

Yoshihiko Suda is fully responsible for the development of advanced technology for medical and life science business of Konica Minolta, Inc.
He received his master degree in chemistry from the University of Tokyo in 1983, and joined Konica Minolta, Inc. (Konishiroku Photo Industry Co., Ltd. in those days) the same year. In the company, he had been engaged in R&D of photographic and imaging materials and systems. Since 2005, he has been in charge of R&D of medical and life science field.

Abstract

For the improvement of quality of life and the realization of well-being society, the development of the diagnosis technology to contribute to prophylaxis, early detection of the disease, prevention of recurrence, and the decision of the treatment policy is demanded. As for in vitro diagnostic, precise detection of a very small amount of biomarker such as cell, nucleic acid and protein concerning disease from the body fluid such as the blood is required. On the other hand, to decide the application of molecular targeting drugs the development of which is focused on by pharmaceutical companies and academic organization, correct companion diagnosis is indispensable.
Konica Minolta used to be a company dealing photographic materials and cameras. However, main products today are business machines such as printers and copiers. It also manufactures optical components such as plastic lenses, functional films, sensing apparatus, and medical imaging systems especially X-rays imaging. These products are based on the technologies of optics, material, image processing and their combination and sophistication. In light of such backgrounds, we have been contributing to the realization of well-being society by applying our technologies to the detection of a very small amount of biomarkers mentioned above. Here, I introduce two representative examples in the technologies that we are developing.
First, I introduce SPFS (Surface Plasmon field-enhanced Fluorescence Spectroscopy). This is produced by using well known SPR (Surface Plasmon Resonance) principle, and improving the sensitivity. The principle of SPFS is shown in Fig.1. Its high sensitivity is achieved by performing the sandwich immunoassay of a fixed antibody on a gold film over a prism and another antibody labelled with fluorescent dye. The bound fluorescent dye is excited by the strong SPR-generated evanescent field, which causes the high sensitive detection of antigen. Because most of the free fluorescent dye away from the gold surface is not activated by the evanescent field, the reduction of noise is achieved without B/F separation. We work on achieving the practical use of this system through accelerating the reaction speed, reducing the cost of consumables and instruments.
Another example is the fluorescence nanoparticles with exceptional brightness, which can be applied to pathological examination. Though Immunostaining using enzyme antibody technique has been used to realize the high sensitive detection of protein in the histopathological specimen section, the quantitativity is not enough. The fluorescence detection using quantum dots was expected to improve it, but the toxicity was a problem. The fluorescence nanoparticles we developed have features both of high brightness and less toxic, and designed adequate for pathological examination. As shown in Fig.2, expression of the protein can be quantified by counting a number of bright spots appeared on a pathology image. We believe this fluorescence nanoparticles are very useful in the immunohistochemistry including companion diagnostic. In addition, this technology must be helpful for the development of molecular target drugs.
We, Konica Minolta, make effective use of own technologies to realize the high sensitivity diagnosis. However, the cooperation with other companies or organizations may sophisticate the technology and accelerate developing the products. I hope that a new collaborative relationship is born here in Singapore.

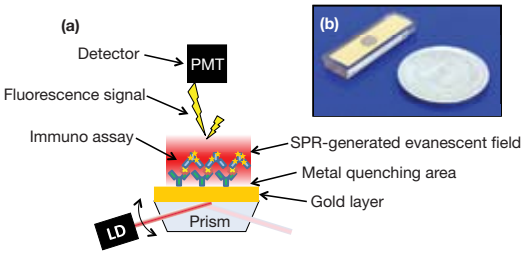


Fig. 1. Schematic view of surface plasmon field-enhanced fluorescence spectroscopy (SPFS) with immunoassay (a) , and the picture of SPFS sensor plastic prism with one-yen coin (b) .

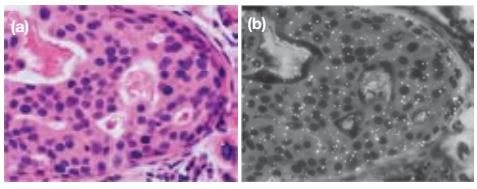


Fig. 2. Histopathological images of breast cancer tissue using hematoxylin and eosin stain (a), and superimposed with fluorescence nanoparticle spots detecting HER2 protein (b).

Industrialization of Genetic Testing with Microarrays - Introduction of Japanese Microarray Platform Companies

Japan MicroArray Consortium
Secretariat
HIROKI NAKAE

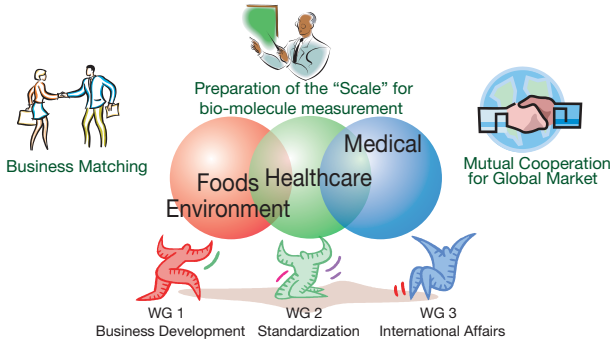
P R O F I L E

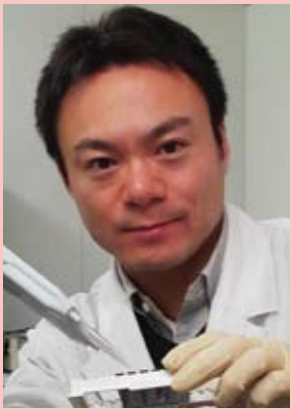
Neuroscience background had been built in Toshiba Corporation from 1986 to 1999 including post-doc research in Germany. In Hitachi Ltd., the main affairs were development of bio-informatics platform for pharmaceutical companies. After the carrier continued in several venture companies as a board member, present position is Director-General of Japan MicroArray consortium (JMAC).

Abstract

Genetic testing markets are expanding from research to industrial use including IVD, diagnostic laboratory, food testing and so on. In the research market, the measurement platforms for the genetic testing are evaluated and compared mainly based on their performance, and frequently neglected their costs, productivity, usability and sometime even accuracy. As a result, brand-new technology drove-out the conventional methods and crushed the sales of the product with the methods. In contrast, price, usability and accuracy are big elements for the selection of the platforms for industrial market. The price and usability could be improved by the efforts of platform manufactures. Accuracy of the platforms is, however, very difficult to be proven by single company because there is no" scale" to measure the accuracy of the platforms for the bio-industry. This is one of big issues preventing the expansion of the industrial market for bio-technological applications including genetic testing.
In Japan, several companies including Toshiba, Toray, Mitsubishi Rayon, Sumitomo Bakelite and Toyo Seikan Group Holdings produce various platforms for various genetic testing. Each platform has cutting-edge technologies and widely fit for the various and complicated needs at the front of the IVD development and/or testing services. Several companies producing platforms for genetic testing will be introduced in this talk, too.
Considering the Japanese situation that the various platforms are available in the industrial market as stated above, it is very important to harmonize the understanding of the "scale" for the measurement. Otherwise, all platforms will lose the basis for explaining the performance and have difficulties to convince the customers and, in some cases including medical use, regulation authority. For such harmonization, manufacturer related to platforms of the genetic testing in Japan structured a consortium, named JMAC (Japan MicroArray Consortium). JMAC has been continuing the project of standardization related to the microarray measurement in addition to the business matching meeting since the establishment in 2006.(Fig. 1) JMAC has about 40 microarray-related company members. Thus we would also be a channel to the Japanese companies for discussing co-development and co-marketing.
For the standard material development, JMAC has evaluated the standard material of DNA or RNA used as the "scale" for microarray measurement, supported by Cabinet Office and Ministry of Economy, Trade and Industry (METI), and collaborated with Advanced Industrial Science and Technology (AIST). As a result, it has been shown that those standard materials will help to assure the compatibility among the platforms. In addition to it, a standard describing general definitions and requirements for the microarray measurement including the usage of the standard materials are proposed to ISO/TC 34/SC 16 committee and published recently as ISO 16578. This activity might be a first step for the global understanding of the scale of accuracy for the genetic testing that is indispensable for the industrialization of bio-technology.

JMAC : Japan MicroArray Consortium
- Actions leading to busines development
sustaining healthcare industris for the 21st century -





Tamagawa Seiki Co., Ltd.
Development Section,
Biotronics Laboratory
KOTARO TERADA

Magnetically Promoted Immunoassay Systems Using Fluorescent Magnetic Beads

P R O F I L E

Tamagawa Seiki has taken up the challenge of angular precision for control equipment, such as high-precision sensors, motors and gyros, and successfully delivered such equipment to its customers. In 2003, we began R&D for the magnetic nanobeads in cooperation with Tokyo Institute of Technology. In this context, we have recently accomplished mass production of fluorescent magnetic nanobeads used for a rapid and high-sensitive immuno-assay system.

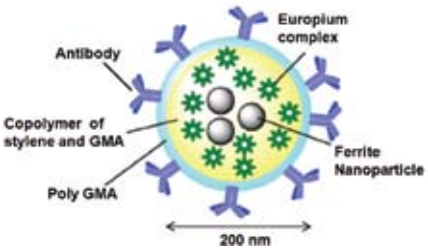
Abstract

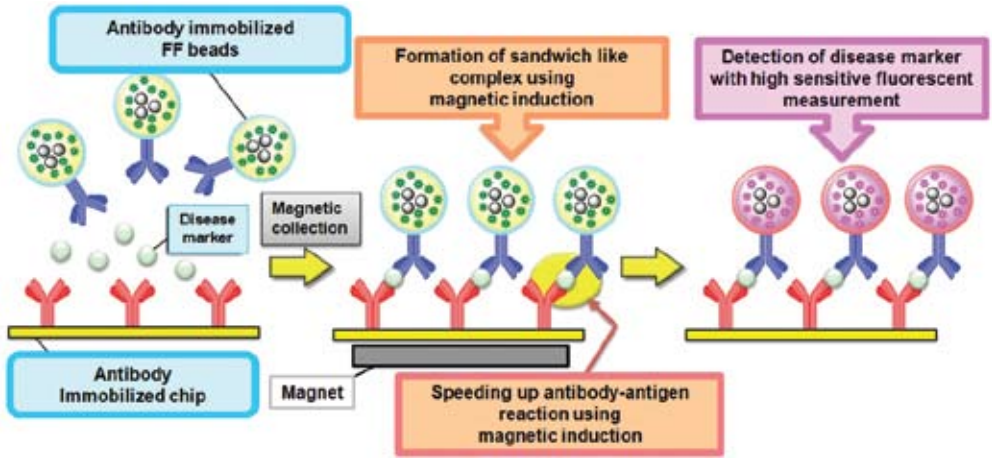
Immunoassays such as ELISA are widely used in both the research and clinical arenas. Although ELISA is a well-established method and commonly used, it is a time-consuming and relatively complex approach. This directly indicates that rapid detection and monitoring of disease-related biomarkers would be beneficial and important for appropriate disease prevention and treatment. To achieve more rapid biomarker detection, efficient immunoreactions using magnetic beads have been reported. They have mainly involved magnetically-assisted separation of antibody-immobilized magnetic beads from reaction medium to facilitate assay processes. In this context, we have recently developed a magnetically promoted very rapid and sensitive immunoassay system with unique submicrometer polymer-coated fluorescent ferrite (FF) beads containing both ferrite (magnetic iron oxide) and highly analytically sensitive fluorophores (Europium complexes). FF beads and the immunoassay system employing the beads were originally developed by Professor Handa at Tokyo Institute of Technology and subsequently we accomplished mass production of FF beads.

We performed sandwich immunoassays using magnetic collection of antibody-immobilized FF beads for brain natriuretic peptide (BNP) and prostate specific antigen (PSA). In addition, an immunohistochemical staining using magnetic collection of antibody-immobilized FF beads onto carcinoma cells were performed.

The sandwich immunoassays detected target antigens within 5-10 min of sample addition. Without magnetic collection, the sandwich immunoassay using the FF beads required long times to obtain results, similar to conventional immunoassays. In the PSA immunoassay, we confirmed that the constructed immunoassay system showed the detection limit of 1 pg/mL within 10 min of sample addition. In contrast, although the detection limit of a conventional high sensitive chemiluminescent enzyme immunoassay (CLEIA) was also 1 pg/mL, it required about 50 min to finish the assay. In the immunohistochemical staining, the use of magnetic collection of antibody-immobilized FF beads enabled discrimination of carcinoma cells within 20 min.

We are now developing automated immunoassay equipment to be operated rapidly and easily for health-care workers, which will be achieved by combining the bead technology with our original machinery technology. At the same time, some cooperative R&Ds with diagnostics companies in Japan are actually progressing. In the future, we would like to cooperate with overseas industry and academia.





Waseda University
Waseda Bioscience Research Institute in Singapore (WABIOS)
MADOKA SUZUKI

Microscopic Thermometry in a Living Cell by Uorescent Nanoprobes

PROFILE

Dr. Madoka SUZUKI is a Principal Investigator in WABIOS, Waseda University, since 2009. He received his Ph.D. from Waseda University in 2005, and his MBA in Technology Management from Waseda University in 2008. His research interests includes the structural and functional reconstruction and molecular mechanisms of muscle contractile system, and the force measurement and functional analysis of molecular motors in in vivo and in vitro.

Abstract

At homes and workplaces, thermocouples are widely used to measure our body temperature or the room temperature. Infrared cameras can image the temperature distribution of objects as large as or larger than human bodies. At the scale of single cell (< ~10^1 μm), especially in aqueous solution, fluorescent temperature probes have advantages in spatial resolution. They are well compatible with the optical microscope that is one of the standard equipments for the wide range of researches especially in the biological and medical fields. We have previously shown that the heat pulse, the short-lived localized temperature distribution, applied externally modulates the intracellular protein activities non-invasively, thereby causing Ca^{2+} dynamics in single HeLa cells [1] and Ca^{2+}-independent contraction in single cardiomyocytes [2]. In pursuit of the physiological significance of theses cellular responses to heat pulses and the endogenous thermogenesis possibly generating heat pulses inside the cell, we are developing fluorescent "small" thermometers. I will present the initial development of our methods using glass micro needles filled with temperature sensitive fluorophores for the thermometry at the scale of single cells [3] and its application [4]. In this probe, glass wall is enough transparent for heat to transfer, but it intercepts any objects to reach the fluorophores that are sensitive to intracellular parameters such as pH and ionic strength. Then I will report new nanothermometers composed of fluorescent dyes embedded in polymer nanoparticles [5, 6]. These nanothermometers are sensitive selectively to the temperature but not to other intracellular parameters. I will show the characterization of these materials and new findings obtained in HeLa cells by the temperature measurement in real-time under optical microscope. The nanothermometers can probably be coupled with heat-therapy. This combination may provide the clinical device with dual functions of thermal imaging and thermal treatment, or theranostics, of the diseases.

[1]V. Tseeb, M. Suzuki, K. Oyama, K. Iwai and S. Ishiwata, HFSP J., 3 (2009) 117-123.
[2]K. Oyama, A. Mizuno, S.A. Shintani, H. Itoh, T. Serizawa, N. Fukuda, M. Suzuki and S. Ishiwata, Biochem. Biophys. Res. Commun., 417 (2012) 607-612.
[3]V. Zeeb, M. Suzuki and S. Ishiwata, J. Neurosci. Methods, 139 (2004) 69-77.
[4]M. Suzuki, V. Tseeb, K. Oyama and S. Ishiwata, Biophys. J., 92 (2007) L46-48.
[5]K. Oyama, M. Takabayashi, Y. Takei, S. Arai, S. Takeoka, S. Ishiwata and M. Suzuki, Lab Chip, 12 (2012) 1591-1593.
[6]Y. Takei, S. Arai, A. Murata, M. Takabayashi, K.Oyama, S. Ishiwata, S. Takeoka and M. Suzuki, ACS Nano, 8(1) (2014) 198-206.

Shimadzu Asia Pacific, Singapore
Analytical Sales
SANDY NARGUND

Advanced Imaging & Mass Spectrometry Analysis for Early Diagnosis of Critical Illnesses

P R O F I L E

Sandy completed her Masters degree in 'Microbiology and Analytical Chemistry' in year 1990. She has worked in few Pharma companies initially as Chemist and then joined "Harman Finochem", a leading API industry in India, as 'Senior Executive'. She has a wide experience in every field of Pharma such as Quality Control, Quality Assurance , R&D, Validations and so on. She was the Team leader of QC Department for USFDA Audit. She is well versed with all regulatory compliances.

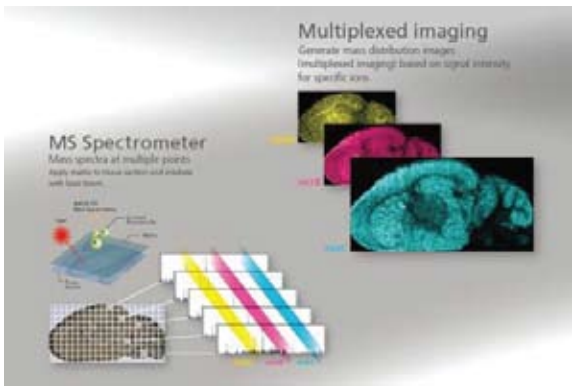
After migrating to Singapore, Sandy Joined 'Alpha Analytical Pte Ltd' as 'Application Specialist' for a range of Mass Spectrometry range of instruments from Thermo- Fisher Scientific such as GCMS, LC, Triple Quadrupole Mass Spectrometers, Ion Traps and Orbitraps. She has conducted many User trainings as well as advanced Application trainings for various fields in Proteomics and Small molecules. Sandy has worked extensively on many advance softwares like Mass Frontier, MetWorks, SIMCA-P, Proteome Discoverer etc and successfully trained many users. Sandy has been a speaker for many seminars including SSMS [Singapore Society of Mass Spectrometer] in year 2008 and 2010.

Sandy is currently working as 'Manager, MS & Chromato' in 'Shimadzu Asia Pacific'. She is responsible for Marketing of all MS and Chromatography products in South East Asia region. Sandy has been involved in various promotional activities for launching new LCMS/GCMS product lines. Actively initiated Food Safety forum and been a speaker in many 'Food Safety Seminars' and various other analytical technology based seminars in the South East Asia regions.

Abstract

Imaging technology is well accepted in clinical diagnosis and very high resolution imaging techniques are available however the current imaging techniques are capable of diagnosis at later stages of diseases and often not enough to detect the diseases at early stage. The current imaging techniques are limited to detection till tissue however it is still a challenge to diagnose the diseases at cell level.

Imaging Mass Spectrometry is a novel development which enables identification and distribution of biomolecules in tissues without any labeling. The unique combination of a High resolution microscope with a High Resolution mass spectrometer is most awaited combination for direct observation of biomolecules or medicines related to aging, diseases and other biological functions in tissues. This technology is exceptionally helpful to understand molecular anatomy of various biological functions and also to identify possible biomarkers. This presentation explain some unique applications of Imaging Mass Spectrometry that can be useful for advanced clinical diagnosis of various diseases.



Apart from such advanced discovery studies, use of mass spectrometers in routine diagnostics is also becoming popular. Triple quadrupole Mass spectrometers are becoming choice of instrument due to high specificity, accuracy and sensitivity. Conventional Immunoaasay techniques are non specific and have many limitations in accurate diagnosis. The speaker will introduce the capabilities of high speed and high sensitivity Triple quadrupole mass spectrometers in various diagnostics tools.

Dr Chiraz FRYDMAN,
Dr Ramdane BENFERHAT,
HORIBA Scientific

Improving Allergy Diagnosis by Simultaneous Detection of Various Allergens by Surface Plasmon Resonance Imaging

Abstract

According to the World Health Organization, allergy is the 4th major public health problem. Milk allergy affects 2-3% of young children in developed countries. The biological diagnosis of type I hypersensitivity reactions is based on the quantification of specific IgEs. However, the IgE titer is not always strongly related to the clinical symptoms or predictive of the evolution of the disease. Instead, the specificity and affinity of antibodies of other isotypes may give additional information about the allergic status of the patient.

In this study, Surface Plasmon Resonance imaging (SPRi) was used to detect simultaneously the complex antibody response to various milk allergens and to measure the avidity of the antibodies directed to each allergen. In fact, the label-free and multiplex capabilities of SPRi allow the parallel study of many different molecular interactions using a single biochip.

The binding of specific antibodies to α-lactalbumin, β-lactoglobulin and caseins was monitored in real time by SPRi. The sensitivity and specificity of the method were compared to those obtained by ELISA, which is currently the reference method.

The specificity of the antibodies characterized by SPRi was identical to the one obtained by ELISA. Although, the sensitivity was about 8-10 times lower than ELISA, SPRi analysis was faster and provided complementary information about the association/dissociation kinetics of the antibody/allergen interaction.

Agilent Technologies Japan, Ltd.
Life Sciences and
Chemical Analysis
MASAHIKO ENDO

Advancing the Elemental Dynamics of Life Science Applications with Tandem Mass Spectrometry - Japan's and World's First Agilent 8800 Triple Quadrupole ICP-MS (ICP-QQQ)

P R O F I L E

Spectroscopy Marketing manager of Life Sciences and Chemical Analysis, Agilent Technologies Japan.
Graduated Electrical and Electronic Engineering of Sophia University in 1989 Joined Yokogawa Corporation as ICP-MS R&D developemnt department. Now Working at Agilent Technologies as Spectroscopy Marketing manager.

Abstract

Agilent 8800 Triple Quadrupole ICP-MS, operating in MS/MS, has been used for the trace measurement of phosphorus (P) and sulfur (S) with the lowest absolute detection limits not possible before. Coupled with LC, it enables non-species specific quantitation of proteins and peptides by measuring the heteroatoms S and P contained in the target compounds.
Additionally, Laser Ablation (LA) coupled ICP-MS for sample surface mapping has developed as another life science application.
This presentation will show the ICP-MS opportunity in life science applications.

Fig.1 Agilent 8800 Triple Quadrupole ICP-MS

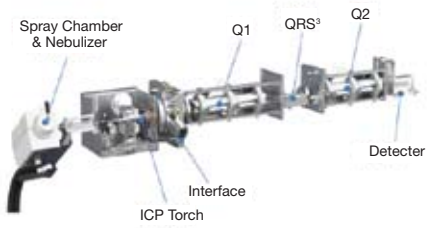


Fig2 Agilent 8800 Triple Quadrupole ICP-MS Diagram

Scientist and Application
Specialist in Biological Sciences
Anindito Sen Ph.D

The Next " Paradigm Shift " in the Research of Biological Sciences with JEOL

P R O F I L E

Dr. Anindito Sen is a 'Scientist and Application Specialist for Biological Sciences' at JEOL. After receiving his PhD from University of Calcutta in 2004, he joined National Institute of Health (NIH),USA as a Postdoctoral Fellow. He had been a staff scientist at the University of Auckland for couple of years and following that as an Assistant Professor (Project) at University of Tokyo for a similar duration. He joined JEOL at his present position in February of 2014. He has been working on the analysis of biological macromolecular complexes by employing Cryo-Electron Microscopy and Computational Image Processing for the last 14 years and still continues to remain involved in the same field.

Abstract

Our life is under continuous menace from the pathogenic micro-cellular and viral entities that surround us. With the constant emergence of several pathogenic viruses and bacteria that have developed the potential of drug resistance, pose significant challenges to the medical field and biological research. Such a situation calls for immediate attention for the development of more advanced and user-friendly scientific instruments to aid the scientists and medical professionals to develop possible avenues to combat the concerning scenarios and develop alternative medicines for treatment. From JEOL which, manufactures a wide variety of ultra-sophisticated scientific instruments, we here, present three latest state-of-the-art scientific instruments that are primarily designed and developed with the above mentioned challenges in mind and to fulfill the interests of the researchers in the biological and medical fields.

At the onset, we present a new multi-purpose Transmission Electron Microscopes (TEM) called JEM-1400Plus. Its application can be found in a wide range the fields primarily focused in the study of soft materials and beam-sensitive biological samples like thin tissues. The instrument has the ability of studying biological samples fixed on grids under extreme cold conditions using cryogens like liquid ethane. In order to avoid the contaminations from the extremely cold cryo-grid holder, an inner fin is attached in close vicinity of the holder. A computer with touch-controls to operate the entire microscope and its functions, a high precision 8 megapixel camera for acquiring images, a treasure-trove of automated features like auto focusing and auto exposure along with Energy Dispersive Spectroscopy System, all bundled together makes this TEM to stand ahead of its counter-parts in its zone. It can also be utilized in the study of asbestos, various nano-materials along with tomographic analysis of biological samples like tissue sections and single cell microorganisms. This TEM, however, does not function as a dedicated instrument for any specific field but can contribute in many fields (as mentioned above) and therefore can be thought of an instrument which, is the Jack-of-All-Trades in the TEM category.

Next we present a revolutionary new TEM. Over the past few years, development in the field of Electron Optics with the introduction of Zernike Phase Plates (ZPP) in the TEM, structural analysis of macromolecular biological complexes like pathogenic viruses, bacteria, molecular motors like Dynein and Kinesin have taken a sudden surge. These ZPP are set at the backfocal plane of the objective lens of a TEM, flips the phase contrast transfer function from a sine to cosine function thus making it possible to obtain dramatic enhancement in the contrast of the images of samples recorded near to an absolute zero defocus. Such images are important to obtain much improved and better computationally calculated density maps of biological samples using Tomography and Single Particle Analysis (SPA). Maturation and interaction of viruses with their host cells have recently been studied using a Zernike Phase Contrast (ZPC) TEM. Interestingly, using ZPC-TEM, electron density maps of protein complexes like pathogenic viruses can be achieved to a very high resolution which, in turn, will prove helpful in designing new drugs for treatment. JEM-2200FS is a TEM that can be equipped with ZPP as an attachment, dedicated for such medical and biological research works. Figure 1A is an electron micrograph of cryo-fixed Hemocyanin, recorded using a ZPC-TEM at zero defocus (Figure 1B) yet possessing significant contrast to analyze the samples (Figure 1C).

Finally we put forward a new and user-friendly Scanning Electron Microscope (SEM) that is named as Serial Block Face (SBF)-SEM. In this instrument, a highly coherent electron beam scans the surface of the biological sample of interest, mounted inside the microscope, thereby generating a profile of the surface. A sophisticated ultra-microtome with a diamond knife then sections out an ultra-thin slice from the top of the sample. Once cleaved out, the electron beam then re-scans the newly obtained surface of the sample thereby generating the next profile. A series of such profiles are created in a continuous manner and are
then used by an advanced software package to generate a Three-Dimensional (3D) profile of the whole sample under study. This 3D iso-surface profile reveals details about the structural arrangement of cellular organelles along with presence of atypical cells or such cellular entities, if any, and throws light on several
unknown sub-cellular activities. Such experiments with SBF-SEM also provide valuable insights about the growth process of abnormal and unwanted cells that result in tumors which, may be benign or cancerous in the organs. Figure 2 represents a SBF-SEM and a 3D density map of Synapse generated using the instrument. So, an excellent combination of advanced and precise instrumentation along with a user-friendly yet robust algorithm makes the SBF-SEM an instrument of tremendous potential in the fields of fundamental clinical research like that of cancer, dermatology etc.

Thus, with a wide range of high precision and sophisticated instruments in combination with innovatory and amiable programs for computational image analysis, we strongly feel that such developments will prove pivotal in bringing a substantial and positive drive to the biological and medical research fields in recent future.

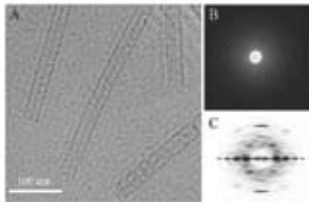


Figure 1.A:Cryo-fixed Hemocyanin imaged in ZPC-TEM at Zero Defocus.
B:Powerspectrum of imaji 'A' showing the absence of diffranction rings indicating the defocus is almost "Zero".
C:Fourier Transform of the imaged Tubes in 'A' showing the meridonal and non-meridonal reflections thus indeicating their helical nature. The pattern is obtained irrespective of the Zero defocus of the image recording condition.

SBF SEM:JSM-7100F

Reconstructed Density Map of Sysnapse using SBS SEM

Introduction of Latest Technologies and Applications on Scanning Electron Microscope

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P R O F I L E

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Abstract

The completely new SU3500 SEM (Fig. 1) features novel and innovative electron optics and signal detection systems affording unparalleled imaging and analytical performance. Designed with intuitive logic, the new user-friendly GUI provides comprehensive image observation and display functions. Engineered for a wide range of applications, including biological specimens and advanced materials, the SU3500 SEM will be the workhorse microscope in any laboratory.
The electron optics design yields unmatched imaging performance (Fig. 2). The SU3500 employs a new-aberration objective lens and improved bias function that provides higher emission current at low kV. These improvement gains allow the SU3500 to achieve 7nm image resolution at 3 kV accelerating voltage and 10 nm BSE image resolution at 5 kV accelerating voltage.
The new Ultra Variable-Pressure Detector is a higher sensitive detector for low vacuum mode, which is optimized for imaging surface details at low accelerating voltage. The UVD image provides compositional contrast information at higher accelerating voltage. The combination of the UV (Fig. 3) and BSE detectors (Fig. 4) simultaneously provides details, complimentary compositional and surface information.

Figure 1 Hitachi Scanning Electron Microscope SU3500

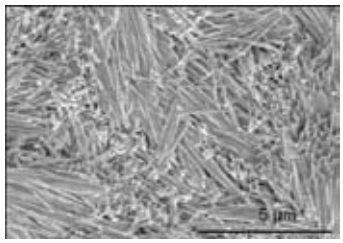

Figure 2 Low acceleration voltage image
Sample: Tablet (Confectionery)
Acceleration Voltage : 1.5 kV
Magnification: x10,000
Without metal coating

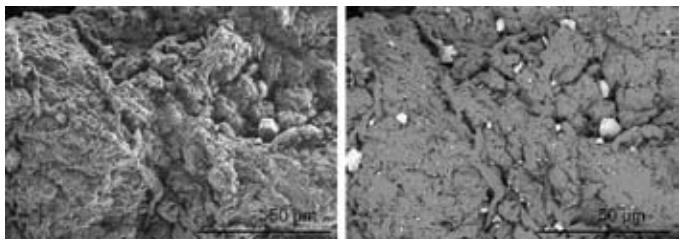

Figure 3 (a) and BSE image (b)

Figure 3 (b)

Figure 3 Polyvinyl Alcohol taken by UVD image (a) and BSE image (b)
Acceleration Voltage : 3 kV Vacuum: 60 Pa Magnification: x1,000
Without metal coating

"JAIMA EXPO"/"SIS" has been renamed "JASIS".

JASIS 2014

Japan Analytical & Scientific Instruments Show

September 3 Wed ▶ 5 Fri

AM10:00 - PM5:00 Admission free

at Makuhari Messe, Japan

Concurrent Events:
New Technology Seminars and Presentations/JASIS Conference

Organizer Japan Analytical Instruments Manufacturers' Association
Japan Scientific Instruments Association

Sponsors Ministry of Economy,Trade and Industry/Ministry of Education,Culture,Sports,Science and Technology/
Ministry of the Environment/U.S.Commercial Service,Embassy of the United States of America/Embassy of Canada/Others (planned)

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