

Vol. 8, September 2014

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■ News

University-level agreement with Universiti Putra Malaysia concluded

Okayama University concluded a university-level agreement with Universiti Putra Malaysia (UPM) on 18 April 2014.

Seven people from UPM including the Vice Chancellor, Prof. Dato' Dr. Mohd Fauzi Hj. Ramlan, and ten people from Okayama University including Vice-President, Dr. Masaru Araki (Executive Director of Social Responsibility and International Affairs) and Dr. Hiroshi Kanzaki (Dean of Graduate School of Environmental and Life Science) attended the signing ceremony.

Vice Chancellor, Prof. Dato' Dr. Mohd Fauzi Hj. Ramlan, and Vice-President, Dr. Masaru Araki, signed the agreement.

In his speech Vice-President Araki said: “We would like to promote greater interactions in all fields as well as the agriculture field which we cultivated for years.” Vice Chancellor, Prof. Dato' Dr. Mohd Fauzi Hj. Ramlan, said: “We would like to deepen the current cooperative relationship and look forward to developing interactions in new fields through this agreement.”

UPM and Okayama University have nurtured exchanges through the project of the Japan International Cooperation Agency (JICA) for five years from 1990, and Faculty of Agriculture concluded a faculty-level agreement in 2000. This time the faculty-level agreement was upgraded to the university-level agreement for greater interaction.



Participants at the signing ceremony



Vice Chancellor, Prof. Dato' Dr. Mohd Fauzi Hj. Ramla (left) and Vice-President Dr. Masaru Araki sign the agreement.

■ News

BIOtech Japan 2014: Okayama University presents its latest research achievements at the Asia’s largest bio event

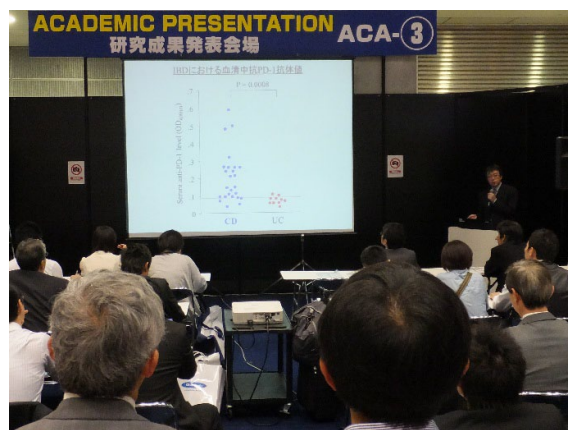
Okayama University participated in Asia’s largest bio event—the 13th International Bio Technology Exhibition & Conference (BIOtech Japan 2014), Tokyo Big Sight, 14-16 May 2014. The Okayama University delegates presented and exhibited the latest research achievements in cancer, immunology, vaccines, medicine, diagnostic products, medical treatments, diagnostic devices, and innovative drug development.

The exhibition included achievements of seven researchers including Assistant Professor Yasuhiro Miyake (Okayama University Hospital), Professors Masahiro Nishibori and Heiichiro Udono (Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, both).

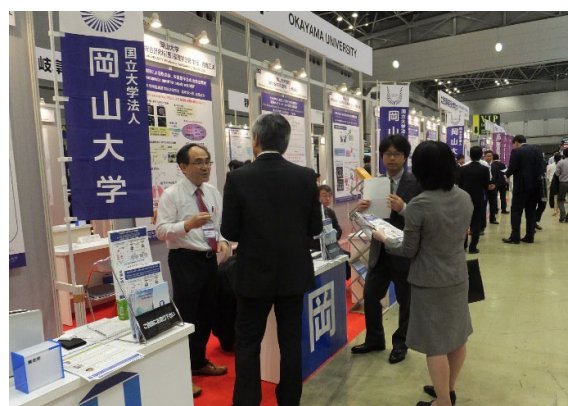
Professor Udono discovered that Metformin, used for the treatment of type II diabetes, has effects to revert exhausted T-cells within tumor tissue, and gives rise to anti-cancer effect.

At the business partnering event, Okayama University researchers exchanged views with visitors from pharmaceutical related organizations about joint research.

The Organization for Research Promotion & Collaboration of Okayama University will continue to actively support the participation of its members in exhibitions in order to promote and spread the University’s research achievements and transfer technology.



Assistant Professor Miyake giving his talk.



Professor Nishibori (left) describing his research



Professor Udono giving a talk.

News

International Dental Center opens in Hai Phong University of Medicine and Pharmacy, Vietnam

Okayama University Dental School and Hai Phong University of Medicine and Pharmacy (Hai Phong, Vietnam) opened the International Dental Center in Hai Phong University Hospital, with the opening ceremony held on May 30.

The center was established to play not only the role of providing an advanced dental care center for the increasing number of Japanese people living in the northern part of Vietnam due to the increase in Japanese companies setting up here, but also as an organization to lead the education and research for students and dentists at Hai Phong University of Medicine and Pharmacy and other institutes.

Approximately a hundred people, including the first secretary of the Embassy of Japan in Vietnam, Yoko Tsuruya; Counsellor and Medical Attache Teiko Nakai; Dean of Okayama University Dental School, Takuo Kuboki; Research Scholar, Ryu Nakajima; Rector of Hai Phong University of Medical and Pharmacy, Pham Van Thuc; and the Dean of School of Odonto-Stomatology, Pham Van Lieu, attended the ribbon cutting opening ceremony.

The center will be recognized as an international dental care center in northern Vietnam not only for Japanese living in Vietnam but also for people who desire high quality dental care.



Dean Kuboki of the Okayama University Dental School



Staff of the Center



Ribbon cutting ceremony

Japanese dentistry equipment manufacturers supported the opening of the center in many ways, and it is expected to be a good model for industry, academia, and government cooperation to export high-tech Japanese medical services.



A clinic at the center

■ News

Assistant Prof. Miho Nishimura Spoke of Her Aspiration as Female Researcher at TEDx Tokyo 2014

At “TEDx Tokyo 2014,”* an international event where leading experts of diverse technology, entertainment, and design fields present a broad range of creative ideas which was held at Shibuya Hikarie in Tokyo on May 31, Assistant Prof. Miho Nishimura, Department of Biology, Faculty of Science, Okayama University Graduate School of Natural Science and Technology (Science) Bioscience made a presentation.

Speaking of her current research into the mechanism of plant photosynthesis, Assistant Prof. Nishimura explained how plants sustain life under harsh environmental stress through photosynthesis as well as how she collaborates with researchers around the world to elucidate the photosynthetic mechanism.

Assistant Prof. Nishimura recalled why she entered the world of science although she was not interested in science when she was young saying, “I didn’t know what I wanted to do in the future. So I decided to try what I don’t like.” “I am fascinated by science now. So if you don’t like something and you’ve never tried it, please jump into it. There must be a chance and discovery you’ve never seen. Trying to do a challenging thing is a key to the future,” she added.

In 2009, Okayama University established the “Woman Tenure Track (WTT)” Program to secure and develop talented young researchers and to increase the number of female professors, which offers female researchers fixed-term employment as well as an opportunity of permanent employment based on their research achievement during the tenure-track



Assistant Prof. Nishimura speaking of her aspiration and how interesting science can be
(c)TEDx Tokyo 2014. Photo by michaelholmesphoto.com



Audience attentively listening to the presentation
(c)TEDx Tokyo 2014. Photo by michaelholmesphoto.com

period (i.e. probationary period). Being selected for the “Program to Disseminate and Secure the Tenure Track System” by the the Ministry of Education, Culture, Sports, Science and Technology and received the Grant-in-Aid for Science and Technology Human Resources Development, the university has been making proactive efforts to further develop and improve the program. Meanwhile, Assistant Prof. Nishimura who appeared in TEDx Tokyo 2014 was recruited as a first generation WTT assistant professor in April 2010 and received a permanent position in April 2013 due to her excellent research achievement. Her appearance in TEDx Tokyo 2014 not only reflects high recognition of our efforts to develop female human resources, but also motivates female students who aspire to pursue research career.

* TEDx Tokyo

Started in 1984 in the US, TED (Technology, Entertainment, Design) is a conference where leading experts of various fields appear and make presentation. Under the slogan of “Ideas Worth Spreading,” a wealth of creative ideas are introduced to the world. Marking its 6th year, TEDx Tokyo 2014 featured a theme of “Connecting the Unconnected.”

TEDx Tokyo 2014:<http://www.tedxtokyo.com/en/> <http://www.tedxtokyo.com/#about{Japanese}>

Spinach and photosynthesis: Miho Nishimura at TEDxTokyo 2014

<https://www.youtube.com/watch?v=Eep9KeVd5ds>

<http://www.youtube.com/watch?v=tUAWtc8scYg{Japanese}>

■ News

Prof. Kano Elected as Executive Committee Member of Global Young Academy

At the Fourth International Conference for Young Scientists & Annual General Meeting of the Global Young Academy (GYA)*, an international academy of young scientists which aims to contribute to society through science and technology, held in Santiago de Chile, Chile, from 21 to 25 May 2014, Prof. Mitsunobu Kano, Department of Clinical Evaluation and Development of Pharmaceutical Biomedicine, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, was elected as a member of the Executive Committee (EC).

Prof. Kano, who is also the Vice Chairman of the Young Academy Committee, Science Council of Japan (SCJ), ran for the EC. In his speech as a candidate, Prof. Kano emphasized the importance of new value creation through collaboration across borders, cultures, and academic fields, thereby contributing to society. Prof. Kano won the highest confidence of 70% among 18 candidates and notably, Prof. Kano is the only Japanese member. Last year there was only one EC member from Asia. Consequently the GYA EC is composed of 9 members from 8 nationalities: US, UK, Egypt, Netherlands, Kenya, Turkey, Japan and Bangladesh. It is anticipated that cultural background of East Asia will be better understood and taken into account in order to lay foundation for a system in which each region can make equal contribution.

“I wish to create new values in collaboration with the GYA and its splendid members and ultimately to contribute to the global society. Through this experience, I would also be more than happy if



Prof. Kano speaking of new value creation and contribution to society



Prof. Kano elected as a member of the Executive Committee (fourth right)
(c) the GYA/Florian Wiencek



Participants of the GYA General Meeting
(c) the GYA/Florian Wiencek

I could contribute to the values of a variety of initiatives underway to promote Japan's advanced science and technology to the world and to make use of its capability, such as initiatives to strengthen research capabilities of universities including the program for promoting the enhancement of research universities by the Ministry of Education, Culture, Sports, Science and Technology," said Prof. Kano.

* Global Young Academy (GYA)

Founded in 2010, the Global Young Academy (GYA) is an international academy of young scientists which aims to contribute to society through science and technology. The GYA is the only international academy of its kind which has close relations with the Inter Academy Panel (IAP), a global network of science academies around the world. In 2014, members of the GYA were invited to speak at the Opening Ceremony of the Scientific Advisory Board created by the United Nations Secretary-General Ban Ki-moon.

■ Feature

Ad-REIC vaccine: A magic bullet for cancer treatment

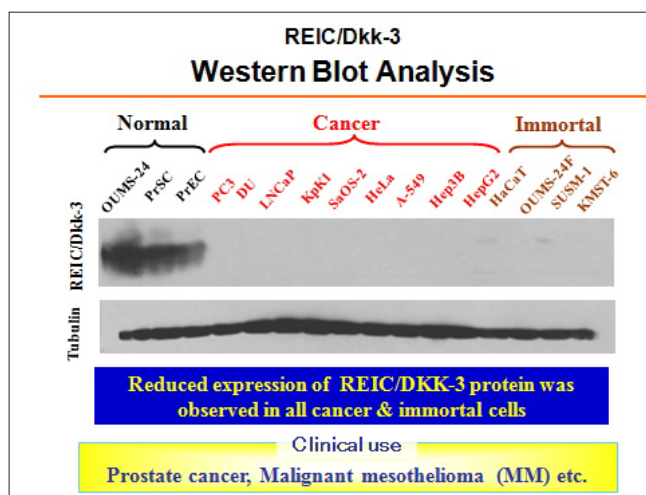
Hiromi Kumon

Director, Innovation Center Okayama for Nanobio-targeted Therapy (ICONT) Okayama University Graduate School (Department of Urology)

Direct targeting and induction of immunological attacks on cancer cells are two widely used approaches for the treatment of cancer. But Professor Hiromi Kumon and colleagues at Okayama University have developed a third and potentially more effective approach based on Reduced Expression in Immortalized Cells (REIC)—a tumor suppressor gene discovered at Okayama University. “In 2005 researchers at the Okayama University Medical School forced its expression using adenoviral vector (Ad-REIC) and discovered it caused selective death (apoptosis) of prostate cancer cells without damaging normal cells,” explains Kumon. “Our approach is a combination of targeting and immunology for the treatment of cancer. Some people have referred to this as a ‘magic bullet’. We are working with international partners to develop an Ad-REIC/DKK3 vaccine to treat various intractable solid tumors.”



Professor Hiromi Kumon, Director, Innovation Center Okayama for Nanobio-targeted Therapy (ICONT), Okayama University Graduate School (Department of Urology).



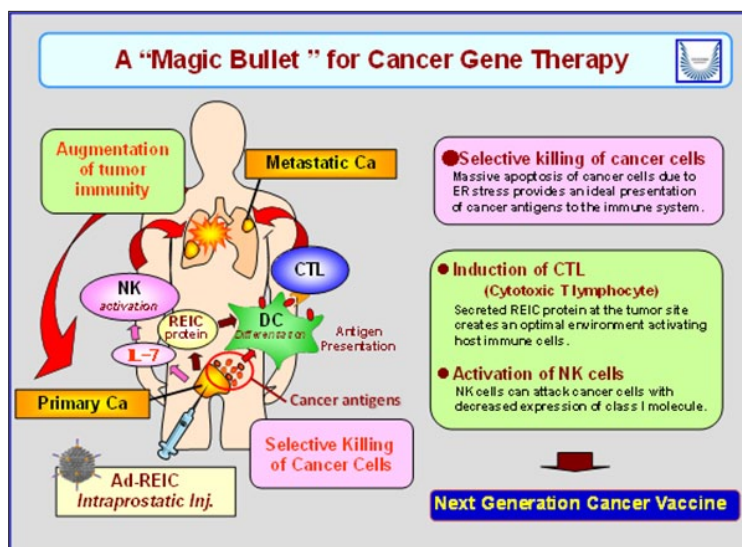
REIC/Dkk-3 Western Blot Analysis

The important aspect of cancer treatment using Ad-REIC is that it is highly selective, and normal cells are not affected, where the action of Ad-REIC occurs almost 100% in prostate cancer, ~90% in malignant mesothelioma, and also high rates in other cases including kidney cancer. “Our experiments show REIC will be applicable to a wide range of cancer treatment, ”says Kumon. “The Ad-REIC is a cancer therapeutic gene that acts via the activation of JNK-c-jun pathway due to endoplasmic reticulum (ER) stress.” [1-3]

Kumon and colleagues are currently collaborating with international teams of researchers and clinicians on Phase I/II clinical studies for prostate cancer and malignant mesothelioma using Ad-REIC. These ‘proof of concept’ studies are being carried out in the USA and Japan to lay the foundations for innovative medicine for cancer, with the ultimate aim of collaborate with pharmaceutical companies to produce cancer vaccines.

In Japan, Momotaro-Gene Inc—an Okayama University venture company—and Okayama University own the intellectual property for this treatment.

Furthermore, in July 2014 Professor Kumon was selected by the Japan Science and Technology Agency (JST) as a recipient of the competitive and prestigious “NexTEP” program. This funding will be used to work with industrial partners to develop Ad-REIC cancer vaccine.



A "Magic Bullet" for Cancer Gene Therapy

Reference and further information

- [1] F. Abarzua et al, "Adenovirus-mediated overexpression of REIC/Dkk-3 selectively induces apoptosis in human prostate cancer cells through activation of c-Jun-NH2-kinase", **Cancer Res 65:9617-9622, (2005)**.
- [2] Yuji Kashiwakura et al, "Down-regulation of Inhibition of Differentiation-1 via Activation of Activating Transcription Factor 3 and Smad Regulates REIC/Dickkopf-3-Induced Apoptosis", *Cancer Res* 68:8333-8341, (2008).
- [3] M. Sakaguchi et al, "Overexpression of REIC/Dkk-3 in normal fibroblasts suppresses tumor growth via induction of interleukin-7", *J Biol Chem* 284, 14236-14244, (2009).
- [4] 2008 Momotaro-Gene Inc. website: http://www.mt-gene.com/index_e.html
- [5] Japan Science and Technology Agency: <http://www.jst.go.jp/EN/index.html>

Research Highlights

Anti-aging properties of drinking hydrogen-rich water on periodontal tissues

Oxidative stress is involved in age-related inflammatory reactions. Molecular hydrogen is considered to be a novel antioxidant that can reduce oxidative stress. Therefore, drinking hydrogen-rich water may suppress age-related oxidative stress and inflammatory reactions in the periodontal tissues.

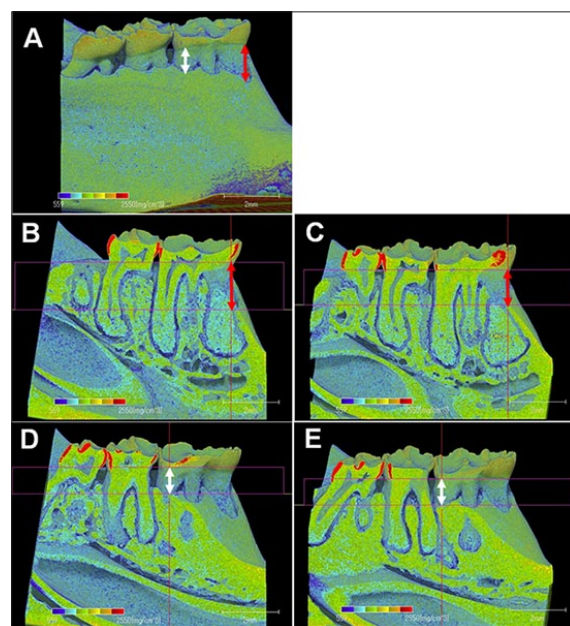
However, it remains unclear what the effects drinking hydrogen-rich water would be over the course of a lifetime.

Takaaki Tomofuji and colleagues at Okayama University have shown the anti-aging effects of drinking hydrogen-rich water on periodontal tissues.

Four-month-old male Fischer 344 rats (n=12) were divided into two groups: the experimental group (hydrogen-rich water intake) and the control group (distilled water intake). The rats consumed hydrogen-rich water or distilled water until they reached 16 months in age.

At 16 months, the periodontal levels of oxidative stress were higher in the control group compared with the baseline level ($p < 0.05$), and lower in the experimental group than in the control group ($p < 0.05$). The values of the linear distance between the cemento-enamel junction and alveolar bone crest were significantly lower in the experimental group than in the control group at the mesial root regions ($p < 0.05$). Although protein expression of interleukin- 1β did not differ, gene expression of Nod-like receptor protein 3 inflammasomes was activated in periodontal tissues from the experimental group as compared with the control group.

These findings indicate that drinking hydrogen-rich water could suppress oxidative stress, but did not affect inflammatory reactions in aging periodontal tissues.



The 3D image model of the mandibular regions in rats (A). In the mesial root regions, the level of alveolar bone loss (white arrows) was greater in the control group (B) than in the experimental group (C). In the distal root regions (red arrows), the level of alveolar bone loss in the control group (D) was similar with that in the experimental group (E).

Reference:

- Authors: Tomofuji T, Kawabata Y, Kasuyama K, Endo Y, Yoneda T, Yamane M, Azuma T, Ekuni D, and Morita M.
- Title of original paper: Effects of hydrogen-rich water on aging periodontal tissues in rats.
- Journal, volume, pages and year: *Scientific Reports* **4**, 5534 (2014).
- Journal website: <http://ousar.lib.okayama-u.ac.jp/metadata/52810>
- Digital Object Identifier (DOI): 10.1038/srep05534
- Journal website: <http://onlinelibrary.wiley.com/journal/10.1002/549-4918>
- Affiliations: Department of Preventive Dentistry, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences.

Research Highlights

Shoulder and Elbow Surgery

Dr. Keiichiro Nishida, Associate Professor of Department of Human Morphology, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, has developed a new linked elbow prosthesis (PROSNAP[®]) in cooperation with Kyocera Medical (Osaka, Japan) which possesses a unique assembly system, initially to be used for the relatively small bony structure of Japanese patients.

PROSNAP[®] has been in clinical use in Japan since November 2007, and the clinical results of total elbow arthroplasty (TEA) for the reconstruction of problematic rheumatoid arthritis (RA) elbow joints using the PROSNAP[®] elbow prosthesis were recently published in the *Journal of Shoulder and Elbow Surgery*.

TEA has become a reliable procedure for the reconstruction of damaged RA elbows. However, previous reports have described a number of issues related to linked elbow prosthesis, including intraoperative fracture, prosthesis disassembly, or polyethylene wear and late failure of the locking mechanism. In the PROSNAP[®] system, bone grafting between the anterior flange and the humerus is deemed unnecessary by selecting the proper size of the modular flange. The shaft at the joint portion of the humeral component is fitted, with a snap-in system, into the UHMWPE sleeve of the ulnar component, allowing the assembly of each component after cement fixation.

In the current report, the short-term clinical results of 17 elbows in 14 RA patients replaced with a PROSNAP[®] elbow were evaluated with the mean follow-up period 47.7 months (range, 32-69 months). The preoperative



Fig. 1 Appearance of PROSNAP[®] elbow prosthesis



Fig. 2 Articulation of PROSNAP[®] elbow prosthesis, showing hand drum-shaped humeral shaft, UHMWPE articulation and sleeve for snap-in fitting of ulnar component.

conditions of the elbows were arthritis mutilans (n=10), an ankylosed or stiff elbow with a preoperative range of motion of 45 degrees or less (n=4), and loosening of a primary total elbow arthroplasty (n=3). The mean Mayo Elbow Performance Index improved from 57.6 points preoperatively to 97.1 points postoperatively. Complications were noted in 1 elbow (6%) with postoperative fracture. The authors concluded that the PROSNAP[®] elbow prosthesis can be safely implanted through a relatively easy procedure and provides satisfactory short-term clinical outcomes for the reconstruction of severely damaged RA elbows.

Reference:

- Authors: Nishida K, Hashizume K, Nakahara R, Ozawa M, Harada R, Machida T, Nasu Y, Ozaki T, Inoue H.
- Title of original paper: Short-term results of the PROSNAP[®] linked elbow prosthesis with a snap-in structure and modular flange for the reconstruction of severely damaged rheumatoid elbows
- Journal, volume, pages and year: *J Shoulder Elbow Surg*; 23(6):837-42, 2014.
- Journal website: [http://www.jshoulderelbow.org/article/S1058-2746\(14\)00010-X/abstract](http://www.jshoulderelbow.org/article/S1058-2746(14)00010-X/abstract)
- Digital Object Identifier (DOI): doi: 10.1016/j.jse.2013.12.031.
- Journal website: <http://www.jshoulderelbow.org>
- Affiliations: Department of Human Morphology, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences.

Research Highlights

New Topical Hemostatic Agent: Neutral Self-Assembling Peptide Hydrogel

Self-assembling peptide is characterized by a stable β -sheet structure and known to undergo self-assembly into nanofibers that could further form a hydrogel. Self-assembling peptide hydrogels have already been employed for tissue engineering, drug delivery systems, and wound healing. In addition, self-assembling peptide hydrogels are effective as topical hemostatic agents. However, their low pH raises the possibility of harmful effects on living tissues.

Now, Seiji Komatsu and colleagues at Okayama University have demonstrated the efficacy of SPG-178 hydrogel, a neutral self-assembling peptide hydrogel as a topical hemostatic agent.

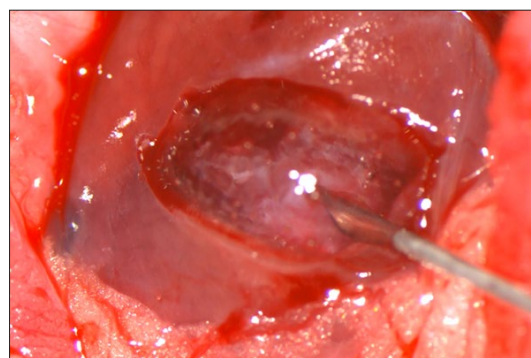
First, they measured the bleeding duration of incisions made on rat livers after application of SPG-178 (1.0% w/v), SPG-178 (1.5% w/v), RADA16 (1.0% w/v), and saline. Second, they observed the bleeding surfaces by transmission electron microscopy immediately after hemostasis. Third, they measured the elastic and viscous responses (G' and G'' , respectively) of the hydrogels using a rheometer.

Their results showed that the duration of bleeding was significantly shorter in the SPG-178 group than in the RADA16 group and that there were no significant differences in transmission electron microscopy findings between the groups. The greater the G' value of a hydrogel, the shorter was the bleeding duration.

SPG-178 hydrogel is effective and has several advantages over other hydrogels: it is non-biological, transparent, non-adherent and neutral, and can be sterilized by autoclaving. The researchers are confident that SPG-178 hydrogel is applicable in many surgical procedures.



SPG-178 hydrogel. SPG-178 is a synthetic peptide with a neutral pH range. The primary structure is RLDLRLALRLDLR; R = arginine, L = leucine, D = aspartic acid, and A = alanine.



Hemostasis in a rat liver laceration model. Incision was made on the left hepatic lobe. Bleeding decreased immediately following application of the 1.5% (w/v) SPG-178 hydrogel to the bleeding surface. Because SPG-178 hydrogel is transparent, the bleeding surface was visible.

Reference:

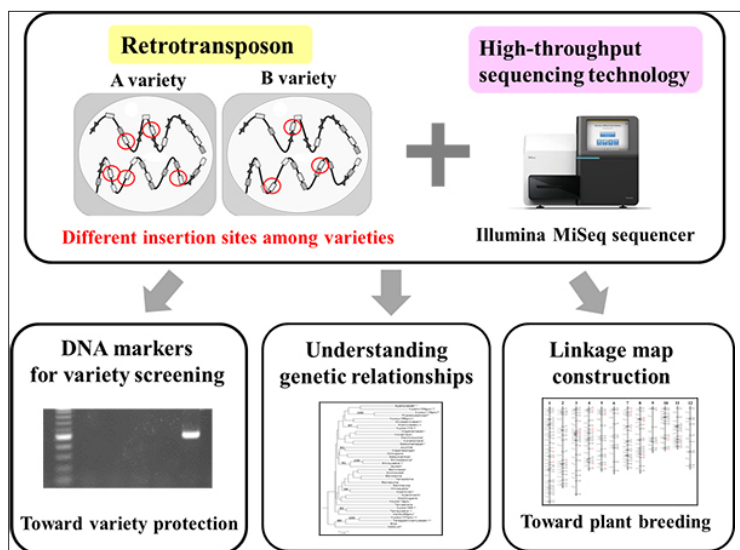
- Authors: Seiji Komatsu, Yusuke Nagai, Keiji Naruse, Yoshihiro Kimata.
- Title of original paper: The Neutral Self-Assembling Peptide Hydrogel SPG-178 as a Topical Hemostatic Agent.
- Journal, volume, pages and year: *PLOS ONE* 9, e102778 (2014).
- Journal website: <http://ousar.lib.okayama-u.ac.jp/metadata/52799>
- Digital Object Identifier [DOI]: 10.1371/journal.pone.0102778
- Journal website: <http://dx.plos.org/10.1371/journal.pone.0102778>.
- Affiliations:
 - Department of Plastic and Reconstructive Surgery, Okayama University.
 - Department of Cardiovascular Physiology, Okayama University.
 - Department of Plastic and Reconstructive Surgery, Okayama Saiseikai General Hospital.
 - Menicon Co., Ltd.,
- Department website: <http://www.okayama-u.ac.jp/user/keisei/>

Research Highlights

Next-Generation Sequencer applications: Innovation to turn ‘junk DNAs’ into genetic markers

A series of the Next-Generation Sequencer (NGS) applications are being developed to utilize ‘junk DNAs’ as distinctive genetic analysis systems for crop species.

Many nucleic DNAs do not have any known biological functions. Such DNAs are referred to as ‘junk DNAs’. Having accumulated genomic copies throughout evolution, retrotransposons constitute a major portion of junk DNAs. Although most copies have lost copy-making ability, small groups of the retrotransposons still remain competent. The copies of an active group are inserted at markedly different genomic positions, even among closely related varieties of the crop species.



High-throughput sequencing of retrotransposon insertion sites and its applications.

Identification of the active groups is, however, challenging as they are concealed by numerous non-active groups. Additionally, DNA sequences of the numerous positions where active groups are inserted must be efficiently determined for genetic population under study.

Yuki Monden and colleagues at Okayama University, National Institute of Genetics, and Tochigi and Fukuoka Prefectural Agricultural Research Stations have prepared the NGS (HiSeq2000) sequence library of strawberry, which exclusively contains terminal sequences of a major retrotransposon type (LTR: Long Terminal Repeat), and have successfully identified the active groups using novel NGS sequence analysis.

In another study, the insertion site library for two active groups was constructed over 38 sweet potato varieties. The NGS analysis determined 2024 inserted positions, of which 91.4% occurred in a single variety or varieties of different combination.

The series of NGS applications on active retrotransposons provide efficient genetic analysis systems, especially for variety fingerprinting, linkage map construction, and lineage analysis of the crop species [1,2].

Reference1:

- Authors: Yuki Monden, Nobuyuki Fujii, Kentaro Yamaguchi, Kazuho Ikeo, Yoshiko Nakazawa, Takamitsu Waki, Keita Hirashima, Yosuke Uchimura, Makoto Tahara.
- Title of original paper: Efficient screening of long terminal repeat retrotransposons that show high insertion polymorphism via high-throughput sequencing of the primer binding site.
- Journal, volume, pages and year: *Genome*, (2014).
- Journal website: <http://ousar.lib.okayama-u.ac.jp/metadata/52815>
- Digital Object Identifier (DOI): 10.1139/gen-2014-0031
- Journal website: <http://www.nrcresearchpress.com/doi/abs/10.1139/gen-2014-0031#.U96WD-OKVJL>
- Affiliations: Graduate School of Environmental and Life Science, Okayama University.
- Department website: http://www.gels.okayama-u.ac.jp/index_e.html

Reference2:

- Authors: Yuki Monden, Ayaka Yamamoto, Akiko Shindo, and Makoto Tahara.
- Title of original paper: Efficient DNA Fingerprinting Based on the Targeted Sequencing of Active Retrotransposon Insertion Sites Using a Bench-Top High-Throughput Sequencing Platform.
- Journal, volume, pages and year: *DNA Research*, (2014).
- Journal website: <http://ousar.lib.okayama-u.ac.jp/metadata/52816>
- Digital Object Identifier (DOI): 10.1093/dnares/dsu015
- Journal website: <http://dnaresearch.oxfordjournals.org/content/early/2014/06/13/dnares.dsu015>

■ Intellectual Property and Enterprise

Photoelectric dye-coupled thin film as a novel type of retinal prosthesis

Eye doctor Dr. Toshihiko Matsuo and polymer science engineer Dr. Tetsuya Uchida have been developing a new type of retinal prosthesis that is based on a photoelectric dye. The photoelectric dye is an organic molecule that absorbs light and converts light energy into electric potentials. The dye molecules are coupled to the surface of a film made of polyethylene. The polyethylene film (or polymer) is a biologically safe and stable material which is used, for example, as a component of artificial joints. The photoelectric dye-coupled polyethylene film, called Okayama University-type retinal prosthesis or OUREP™, can be implanted beneath the retina as a substitute for photoreceptor cells.

The photoreceptor cells in the retina absorb light and generate membrane potential changes as an initial process in sight. Patients with a hereditary disease called retinitis pigmentosa, gradually lose the photoreceptor cells in their lifetime and become totally blind. These vision-impaired patients are known to maintain other retinal neurons that connect to the brain. Thus, the implantation of something artificial called retinal prosthesis to replace the lost photoreceptor cells, would lead to the recovery of vision in blind patients.

A prevailing type of retinal prosthesis is the so-called “camera-image-capture and electrode-array output system”. The image is captured by a digital video camera attached to glasses, and converted to electric signals. These signals are transmitted to a receiver implanted in the body, and finally, electric currents are outputted from an electrode array that is



Figure 1. Photoelectric dye-coupled polyethylene film (OUREP™): a novel type of retinal prosthesis.

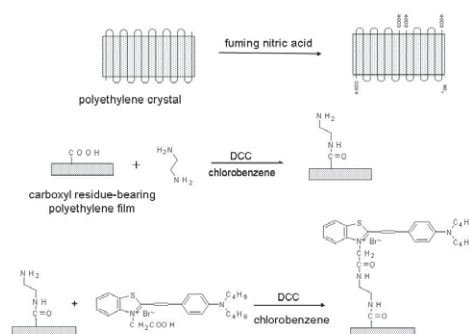


Figure 2. Manufacturing process of photoelectric dye-coupled polyethylene film (OUREP™): a novel type of retinal prosthesis.

implanted around the degenerated retina. In 2013, Argus II™ Retinal Prosthesis System, by Second Sight, Inc., which uses this camera-capture and electrode-array system, was approved by the US Food and Drug Administration (FDA).

Okayama University-type retinal prosthesis—OUReP™—would provide the following advantages over the Argus II™ Retinal Prosthesis System. First of all, OUReP™ does not require a camera or data processing system, or wiring to the retina. A single sheet of OUReP™ would be implanted into the subretinal space by currently-used standard vitreous surgery, just as to treat retinal detachment. A large size of the thin film, up to 10 mm in diameter, could be implanted in the eye, which would provide a wide visual field. Dye molecules in high density on the polyethylene surface work as both an image (light)-receiver and a neuron-stimulator, leading to high resolution of images. In contrast, the Argus II™ System with 60 electrodes provides low resolution of images.

The biological safety of OUReP™ has been already proven by standardized tests, based on ISO 10993, “Biological evaluation of medical devices”. In addition, the photoelectric dye, used for OUReP™, has no toxicity at all. Rats with retinitis pigmentosa, called RCS rats, had their vision restored by subretinal implantation of OUReP™. Manufacturing and quality control has been established at the laboratory of Polymer Materials Science in a Faculty-of-Engineering Building. Dr. Matsuo and Dr. Uchida are now preparing a first-in-human clinical trial at Okayama University Hospital, in consultation with Pharmaceuticals and Medical Devices Agency (PMDA, counterpart of US FDA), based on the Pharmaceutical Affairs (Pharmaceuticals and Medical Devices) Act in Japan.

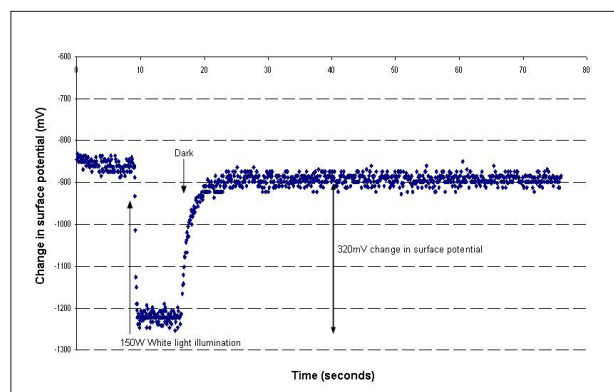


Figure 3. Fast on-off response to light of electric potentials on the surface of photoelectric dye-coupled polyethylene film (OUReP™): a novel type of retinal prosthesis.

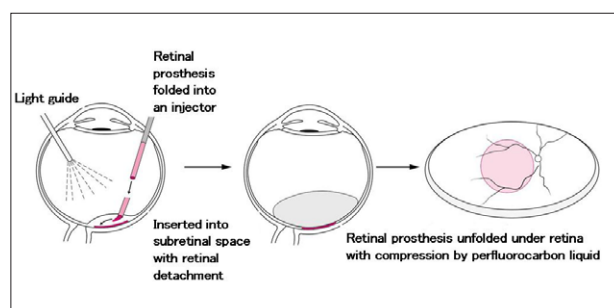


Figure 4. Schematic drawing of vitreous surgery to implant a sheet of photoelectric dye-coupled polyethylene film (OUReP™), a novel type of retinal prosthesis, beneath the retina.

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2. Matsuo T, Uchida T, Takarabe K. Safety, efficacy, and quality control of a photoelectric dye-based retinal prosthesis (Okayama University-type retinal prosthesis) as a medical device. *J Artif Organs* 2009;12:213-225.
3. Alamusi, Matsuo T, Hosoya O, Tsutsui MK, Uchida T. Behavior tests and immunohistochemical retinal response analyses in RCS rats with subretinal implantation of Okayama University-type retinal prosthesis. *J Artif Organs* 2013;16 :343-351.

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▪ Topics : Letters from alumni

Ir. Dr. Ahmad ‘Athif Mohd Faudzi

Senior Lecturer
Centre for Artificial Intelligence (CAIRO)
Universiti Teknologi Malaysia

I studied for my doctorate at the System Integration Laboratory under the supervision of Professor Koichi Suzumori and Associate Prof Takefumi Kanda and received a Doctor of Engineering degree from Okayama University in October 2010. Currently I am a Senior Lecturer at the Centre for Artificial Intelligence (CAIRO) of Universiti Teknologi Malaysia.

One of my most memorial experiences of my stay in Japan is about the research culture. The regular meetings, ‘zemi’ or ‘kenkyukai’; the ‘welcome and farewell’ parties; get together programs between lab members; and many other in-lab activities will always be my sweet memories. I can feel the strong bonds between the students and their respect for the supervisor. Through these meetings I learned a lot about discipline, attitude, hard work, and team spirit. I also learnt a lot about the spirit of ‘monotsukuri’; or ‘making things’, which is the specialty of the lab in developing new actuators and their applications. During my research I actively started writing manuscripts and under the guidance of my supervisor published three papers in journals and gave 12 talks at conferences. I also received the IRIS 2010 best presentation award and OMSA Excellent Award 2010.

After graduating I have continued to collaborate with my supervisor. We are pursuing many joint activities such as staff and student exchange and research. In 2011, 2012, and 2013 I was invited as a Visiting Researcher in Okayama University. To-date we have hosted two students from Okayama University and I have sent two of my students to Okayama University for research projects.

As an academician, my post-graduate experience in



Professor Koichi Suzumori



Dinner with members of the lab at Okayama University

Japan has indeed improved my knowledge and skills in teaching and research. Also, I am using my experience in Okayama University to develop my own Actuator and Automation Lab. My experiences have been invaluable for making decisions in managing my research projects in general.

It was a privilege to have been a member of be part of the System Integration Laboratory. It is my sincere hope that we can continue to grow the strong bonds that exist between the two universities and generate ever more opportunities in other areas.



During my convocation day



My lab members: <http://a2rg.my>

■ Topics : Okayama Travelogue

The Ikeda Family Collection at Okayama University

The Ikeda Family Collection is a unique set of manuscripts, pictures and books that were donated to Okayama University when the modern structure of the University was established in 1949. The Collection was owned by the Ikeda Family that governed the southeastern part of modern day Okayama Prefecture from 1603-1867-the Edo period.

The 100,000 items of the Ikeda Family Collection are housed at the Okayama University Central Library and offer unique insights into life during the Edo period, for both veteran scholars and students.

Further information

1. The Ikeda Family Collection at Okayama University:
<http://www.lib.okayama-u.ac.jp/collections/ikeda.html>
 (In Japanese only)
2. Exhibition of the Ikeda Family Collection :“Okayama Han and the Meiji Restoration”
 Date: 1-16 November 2014 (except 10 November)
 Place: 4th Floor, Okayama City Museum
 Website:http://www.city.okayama.jp/okayama-city-museum/english/e_index.html



Kōrakuen Garden (1863) Established by IKEDA Tsunamasa in 1700 for his recreation. This picture depicts the Garden in the late Edo period. It is notable the locations of the main landmarks, such as ponds and tea houses are similar to the garden now.



List of Products from Territories in Bizen and Bitchū Provinces (1736)
 An example of 'list of parts' or 'sanbutsu-cho' submitted to Tokugawa Shogunate, which led to increased interest locally in the regions nature, history, and customs.



Chronicle of Nobunaga(Shinchō ki)
 This is a 15 volume collection designated as an Important Cultural Property.
 A war tale written in 1610 by ŌTA Gyūichi at the request of the Ikeda family about the warlord ODA Nobunaga. This collection contains unique descriptions about the activities of the Ikeda family.

■ Topics : Club Activities

Go Club at Okayama University

“The Okayama University ‘Go Club’ was established around 1968 and currently has approximately 34 active members,” explains Shota Miyake, 2nd year undergraduate at the Faculty of Law and head of the club. “Generally speaking, good players must be calm but make dynamic moves when occasions necessitate. Also, outstanding players can read many moves ahead whilst monitoring the whole of the board. The ability to gauge your opponent’s strengths and knowing whether to ‘push’ or ‘step back’ is also important.”

The ratio of male to female members is approximately 8 to 1. The club does have experienced members but many had not played before joining the club. Overseas students frequently watch the members of the club playing.

The members of the club practice by playing each other as well as pursuing games by referring to records of games played by professional players for practical experience of high level games. The members also organize an annual ‘Go summer camp’.

The club participates in competitions held throughout the year. “In 2013 the Okayama Club was third place in the All Japan Go Championship,” says Miyake. “Also, one of our members was 1st and 2nd place in the Spring 2013 championships.”

“The rules of Go are very simple but the game is very stimulating and has great depth,” declares Miyake. “Come and join us.”

Further information

Website:<http://www.geocities.co.jp/CollegeLife-Library/2671/>



Members off the Okayama University 'Go' club at a practice session.