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5 things to know before jumping on the iPS bandwagon

Induced pluripotent stem cells look just like embryonic stem cells, but are easier to create and free of the heavy ethics baggage. David Cyranoski separates fact from fiction in a burgeoning field.

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"Expertise in human embryonic stem-cell culture is absolutely critical." — Konrad Hochedlinger

Excited by their potential for biomedical research and therapy and lured by the ease with which they can be created, many researchers are looking into induced pluripotent stem (iPS) cells. Created from adult cells by a simple genetic trick, iPS cells seem to have regained an embryonic 'stemness' that might allow them to become any type of cell in the body. The concept is so appealing that some scientists and policy-makers even argue that related approaches such as therapeutic cloning and embryonic stem-cell research, which require the destruction of embryos, should be halted. But for biologists, iPS cells still present a black box. As resources pour in and patients' expectations rise, some scientists wonder whether the cells are being overhyped. Here, Nature looks at the status of the five most pertinent issues on people's minds.

1 Anyone can do it

When Shinya Yamanaka and his postdoctoral student Kazutoshi Takahashi from Kyoto University in Japan discovered that four genes could reprogram adult mouse cells, they kept it secret for nearly six months. They stopped having weekly laboratory meetings, and Takahashi fibbed to colleagues about the status of his work. All because the process is so simple. "If someone found out, they could have caught up in a flash," he says.

Familiar genes — *Oct3/4, Sox2, c-Myc and Klf4,* in Yamanaka's original recipe — do the trick[1]. The genes are cloned into viral vectors, and simply adding the vectors to a culture of skin cells under the right conditions results in reprogrammed cells.

But as simple as this procedure might seem, iPS cells are not easy to make. Kathrin Plath at the University of California, Los Angeles, estimates that each of the reprogramming genes (she used six) has only a 15% chance of making it into a given cell. Even if they all make it, the cell has only a 5% chance of being fully reprogrammed. The low efficiency presents a riddle for scientists, but with millions of cells available in a biopsy sample, it is not a roadblock. The trickiest part, says Konrad Hochedlinger from the Harvard Stem Cell Institute in Cambridge, Massachusetts, is finding the few cells that have been reprogrammed and culturing them. But the new iPS cells are picky: they require just the right culture conditions — much the same as those needed for embryonic stem cells — to stop them differentiating into more specialized cell types. "Expertise in human embryonic stem-cell culture is absolutely critical," says Hochedlinger.

Nevertheless, this type of expertise is becoming more common. Within a year, Yamanaka's results had been repeated and improved in mice by his own and two other groups. And since Yamanaka[2] and James Thomson[3] from the University of Wisconsin in Madison first produced human iPS cells independently of each other in November 2007, several other groups have now achieved that feat. The stakes are high; the technique is easy to learn; and researchers are flocking to the field, says Thomson. "The whole world is doing it now."

Status: Fact (mostly)

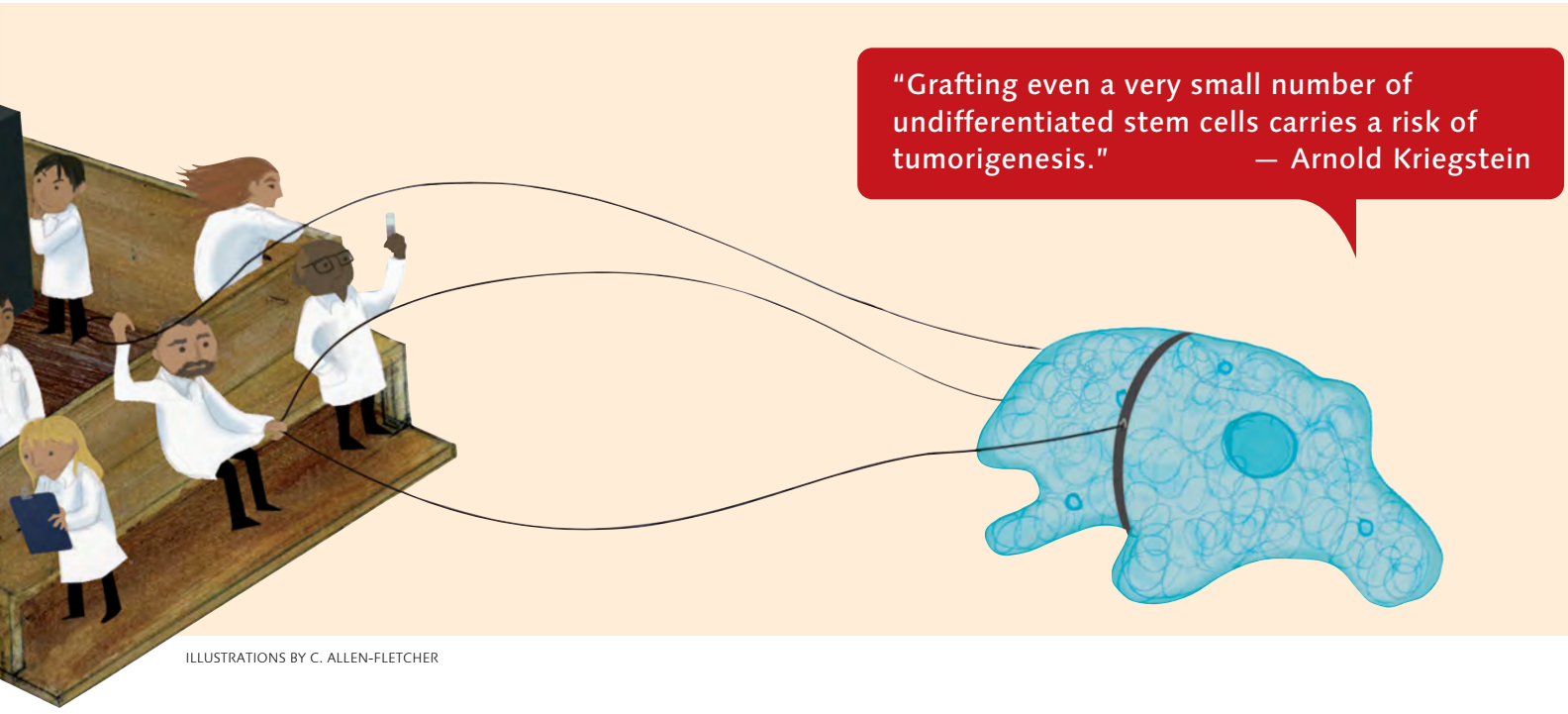
2 Everyone can have their own custom-tailored cells

'Therapeutic cloning' — cloning human embryos to generate stem cells that can be used to replace tissue that has been lost or damaged without the fear of rejection by the host's body — has floundered since it was first proposed in the late 1990s, mainly because of the unexpectedly difficult challenge of acquiring the human eggs necessary for the procedure. iPS cells are moving full-steam ahead towards the same goal, patient-specific stem cells.

But don't expect to have custom-made cells any time soon. Some of the viral vectors used to transfer the genes into cells, as well as some of the genes themselves, may cause cancer. Scientists expect that the heated race to find alternative systems, such as proteins or drugs that simulate the crucial genes, or safer ways to deliver the genes, will produce results soon — perhaps in the next two years.

Nevertheless, says Hans Keirstead of the University of California, Irvine, the "greatest challenge still exists: the generation of high-purity, clinically relevant cell populations". It takes a couple of months to establish a cell line, several more to expand it, more still to differentiate the iPS colonies into the cell types required, a few more to expand those, and then a good half-year of testing to ensure that the cells do not form tumours. The cells also have to be processed in facilities that adhere to 'good manufacturing practice', which adds greatly to the cost.

To use custom-made cells "would take a ridiculous amount of money",



ILLUSTRATIONS BY C. ALLEN-FLETCHER

says Yonehiro Kanemura, a neurosurgeon at Osaka National Hospital in Japan. It would be several times more, he estimates, than the current, rare, patient-specific skin grafts, which cost as much as US$100,000. The roughly two-year process is also too slow to treat disorders such as spinal-cord injury, which require prompt treatment if the damage is to be minimized.

Kanemura's solution is 'ready-made' iPS cells. This April, working with Yamanaka and Hideyuki Okano of Keio University in Tokyo, he will start establishing a national library of therapy-ready cell lines from donated placental and cordblood tissue. At first he plans to use viral vectors, switching to virus-free lines as these become available. Over the next five years, he aims to generate 200 iPS cell lines and 200 neuronal cell lines derived from those cells.

These cell lines will not be patient-specific, but Kyoto University's Norio Nakatsuji estimates that 50 well-chosen lines could provide close immunological matches for 90% of the Japanese population. People who need the treatment urgently could use the best immunological match, whereas those with chronic disorders might decide to fork out the money for a line specific to them, says Kanemura. Rich people might want to bank their own iPS cells for a rainy day — a desire that some companies will no doubt try to capitalize on.

Status: Fiction (unless you're rich)

3 The cures are on their way

iPS cells will probably provide models for disease first, cures later. Researchers could soon culture a 'disease in a dish' of, say, motor neurons from a patient with amyotrophic lateral sclerosis, heart muscle cells from a person with heart disease, or retinal cells from a patient with macular degeneration. Those lines could be screened and observed as they develop, and biotech companies could test preventative or therapeutic drugs on them.

The University of California, Los Angeles, and the Harvard Stem Cell Institute, among others, are discussing plans to start iPS cell banks for this purpose. Hochedlinger says that the stem-cell institute is considering "the major diseases — neurodegenerative, metabolic, cardiovascular, diabetes".

Reaching the clinic will depend, like modelling, on how faithfully iPS cells differentiate into the affected cell type as well as on the development of safe and effective ways to deliver them into the body. The foundations are already being laid.

Rudolf Jaenisch, from the Massachusetts Institute of Technology in Cambridge, for example, used blood progenitor cells created from mouse iPS cells to treat a mouse with a humanized version of sickle-cell anaemia[4]. He says that blood disorders, in which clinicians have considerable experience in transplanting cells, might see early application of iPS cells. Kyoto University's Jun Takahashi, who studied neuronal precursor cells derived from embryonic stem cells in monkey models of Parkinson's disease[5], is now pursuing clinical treatment with neuronal precursor cells derived from both embryonic stem cells and iPS cells. He hopes that the cells will be in clinical trials within five years.

Whether cultures of differentiated cells for therapeutic use still retain undifferentiated embryonic stem cells or iPS cells is a point of grave concern. "Grafting even a very small number of undifferentiated stem cells, perhaps as few as one pluripotent cell, carries a risk of tumorigenesis," says Arnold Kriegstein of the University of California, San Francisco. Everyone will be watching closely a clinical trial planned for the middle of this year — the first trial of embryonicstem-cell-based treatment — in which the pharmaceutical firm Geron of Menlo Park, California, will be implanting oligodendrocytes derived from embryonic stem cells in patients with spinal-cord injuries. "Application of iPS cells largely depends on how that trial goes," says Okano.

Unpublished work by Okano, based on iPS-cell treatment of spinal-cord injury in mice, could accelerate application. He claims that he has a method to weed out the potentially dangerous cells before they are transplanted into the mice.

Status: Too soon to tel

4 Embryonic stem cells are the same as iPS cells

"There are no major differences, yet," says Plath, based on a rigorous characterization of morphology, chromosome profile and gene expression of human iPS cells[6].

But everyone is hedging their bets as dozens of scientists start to examine the key question: whether iPS cells will differentiate as stably and diversely as embryonic stem cells. For the time being, iPS pioneers are looking at subtler hints, such as protein markers that characterize the two types of cells. But

"If you can' t tell the difference between iPS cells and embryonic stem cells, the embryonic stem cells will turn out to be a historical anomaly." — James Thomson

Hochedlinger says that "markers don't mean anything". Some tumour cell lines express protein markers of pluripotency but don't make anything other than tumour cells, for example.

And reports of the iPS cells' properties have been conflicting. Thomson, for instance, found that iPS cells not only expressed similar genes to embryonic stem cells, they also expressed them more consistently[7]. This means that their differentiation might be more predictable than that of embryonic stem cells. However, Robert Lanza of Advanced Cell Technology, a biotech firm in Los Angeles, California, says that iPS cells are much more variable. "Embryonic stem cells all do more or less the same tricks. But some iPS cells express just a few markers of pluripotency, some express all," he says. "The resulting cell types will presumably differ as well."

Even if iPS cell lines seem to differentiate into the cell of choice, some variation between lines is unavoidable. Each line will require rigorous testing, says Keirstead, who is involved in the Geron trial. "A different line may have a different tumorigenic potential, differentiation potential, migratory potential, and react with the host in a unique way. It represents a different product, so must be fully tested as such." For the same reason, Plath recommends doing any tests or drug screens with multiple lines.

Despite some scepticism about iPS cells, many key researchers embrace them as a preferred alternative to embryonic stem cells. "Only time will tell, but I know where I'm going," says Thomson, who was the first to establish human embryonic stem-cell lines in 1998. If things go as he predicts, it could be the end of an era. "If you can't tell the difference between iPS cells and embryonic stem cells, the embryonic stem cells will turn out to be a historical anomaly," he says.

Status: Fact (so far, anyway)

5 iPS cells have no ethical issues

Days after Yamanaka and Thomson announced the creation of human iPS cells, President George Bush hailed the research as a sign of "scientific advancement within ethical boundaries" — a feat for which he gives himself partial credit.

A week later, though, Yamanaka told *Nature*: "We are presenting new ethical issues, maybe worse ones, because many people can do this — and without telling anybody." Yamanaka was concerned that someone might use iPS cells to derive gametes — human reproductive cells. Eggs and sperm could both be derived from iPS cells from a man, for example, and then be used in an in vitro fertilization procedure. The result would not be an identical clone because genes reassort during formation of the gamete. But it would be "strange and potentially dangerous", says Yamanaka.

Gametes from iPS cells could meet demands for infertility treatments. And producing eggs from male iPS cells would allow a gay couple to produce offspring between them. (Lesbian couples would be out of luck, as Y-chromosome genes are needed to produce sperm.)

Such fertility treatments would be plagued by safety issues, but judging from experiments with embryonic stem cells, they won't happen soon. Morphologically similar versions of both eggs and sperm have been derived from embryonic stem cells, but only one group has reported that embryonic-stem-cell-derived gametes — mouse sperm in this case — led to live births when combined with normal eggs, and the results have yet to be repeated[8].

iPS cell adventurers might also try to create a live, cloned human. Jaenisch managed to clone mice, by transferring iPS cells into a specially developed embryo made by fusing the cells of a two-cell embryo. By putting these embryos into surrogate mothers, Jaenisch produced several fetuses that were genetically identical to the iPS cell source. (There were no live births, but Jaenisch says that is only a matter of trying.)

Repeating the experiment in humans would, according to Jaenisch, "be possible in principle". He adds, however, that because "more than 100" embryos are probably needed to make it work, it would be unrealistic and a ridiculous thing to do. But as fertilized embryos are easier to get than the fresh eggs used in cloning, some maverick might give it a try. iPS cells generated from a person could also be inserted into a fertilized embryo to make a chimaeric baby.

These reproductive strategies would probably fail, at least with the current state of the technology. But given the rapid rate of innovation and the wide range of iPS cell capabilities, dangerous experiments will be more difficult to monitor. "Before, you had a specific community to focus in on — the practitioners of assisted reproduction. [With iPS cells] it will be difficult, especially in a place such as the United States, where there is so much dependence on self-regulation," says Paul De Sousa of the Scottish Centre for Regenerative Medicine in Edinburgh.

Yamanaka's concern about the ethics drove him to lobby the government for regulation. On 21 February, Japan's science ministry sent all universities and research agencies a notification specifically forbidding "the implantation of embryos made with iPS cells into human or animal wombs, the production of an individual in any other way from iPS cells, the introduction of iPS cells into an embryo or fetus, and the production of germ cells from iPS cells".

Status: Fiction (depends on what you want to do)

Yamanaka says that society, not scientists, must quickly deal with the challenges that iPS cells present. "I am proud of this technology, but I feel a great responsibility," he says.

David Cyranoski is Nature's Asia–Pacific correspondent.

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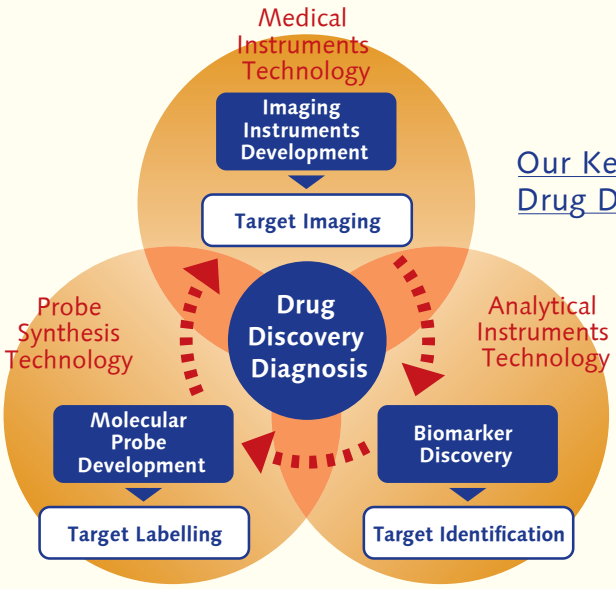
Shimadzu Corporation's prowess will support the healthcare of the future

Shimadzu focuses on molecular imaging using its world class technologies – in analytical & measuring instruments and medical equipment

Great strides have been made in biotechnology and in imaging technology, with the development of techniques such as MRI (Magnetic Resonance Imaging), PET (Positron Emission Tomography) and CT (Computed Tomography). We are in the fast developing age of molecular imaging, the visualisation of information at the molecular and cellular levels. Medical equipment manufacturers, drug companies and chemical companies are racing to develop and apply imaging technology. Shimadzu is widening the horizons of molecular imaging by combining its two great strengths - in analytical and measuring technology and in medical imaging. The company is also developing molecular probes. In this way, Shimadzu aims to contribute to the development of a new generation of healthcare which will be able to provide early-stage diagnosis and less invasive treatments.
We interviewed Koji Shimizu of Shimadzu Corporation, General Manager of the Advanced Biomedical Business Development Group, Corporate Strategy Planning Department, about the company's strategy for the development of molecular imaging technology.

Koji Shimizu
General Manager
Advanced BioMedical Business Development Group, Corporate Strategy Planning Dept.



(Figure 1)

Our Key Concept for Drug Discovery and Diagnosis

Shimadzu Corporation's prowess will support the healthcare of the future

Molecular imaging can turn the function of genes, cellular proteins and living cells into images

Molecular imaging technology "turns into images the function of genes, proteins, and also cellular processes in living subjects," says Koji Shimizu. He has great hopes that molecular imaging will be widely used for early diagnosis, effective treatment assessment and drug discovery.

Molecular imaging first of all must search for biomarkers[1], target molecules such as cancer receptors. Then, the molecular probes[2] must be developed to bind to the target molecules. In turn, equipment must be developed to visualize the molecular probes.

Shimadzu is focused on R&D in these three areas (Figure 1). Shimadzu's particular objective is to contribute to human healthcare through science and technology.

Using mass spectrometry to search for biomarkers

In the search for biomarkers, it is important to analyse the expression of proteins that are responsible for cellular function. It was a Shimadzu engineer, Koichi Tanaka, who won the Nobel Prize with his research into a novel method for mass spectrometric analyses of biological macromolecules[3]. Mass spectrometry is now an essential tool in proteomics (study of proteins) and metabolomics (study of metabolites) and is a huge aid to the search for biomarkers, the target of molecular imaging. Using the world class mass spectrometer, Shimadzu has succeeded in identifying several new candidate cancer biomarkers.

The leading-edge microscopic mass spectrometer under development at Shimadzu aims to ionize biomacromolecules of a tissue section under normal atmospheric pressure and to provide images of the section's molecular structure at a resolution of 5 micrometres. It holds promise as an effective instrument in the search for new disease-specific biomarkers. Also in the field of molecular probes, joint research is underway with Kyoto University into nanoparticles that would serve as carriers for molecular probes.

Developing PET and near infrared imaging devices

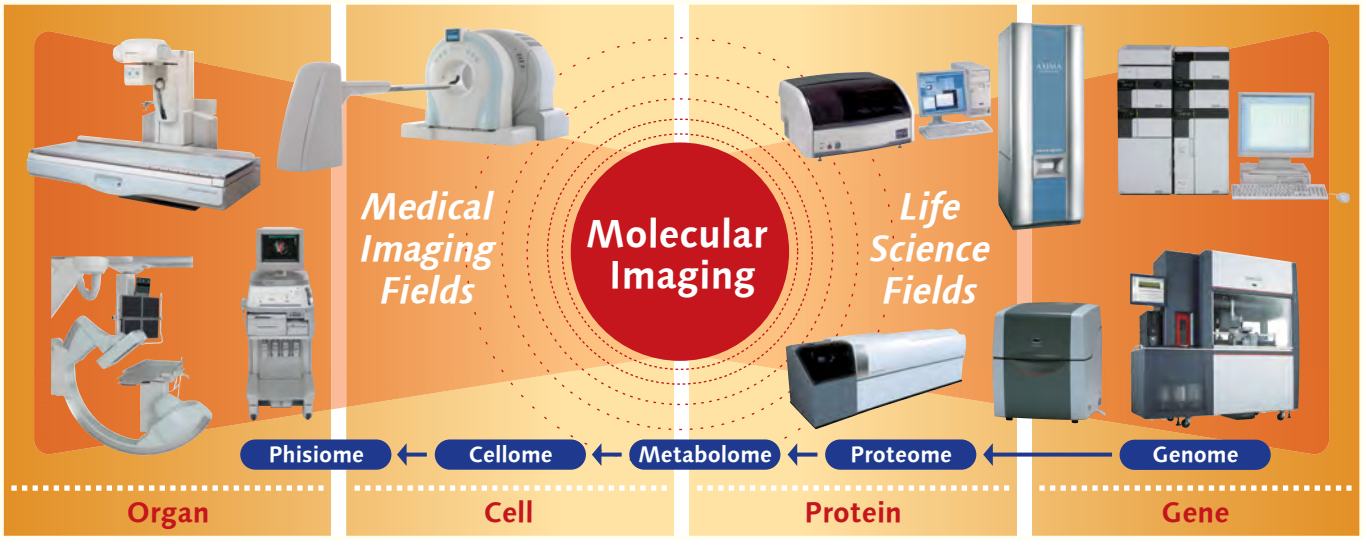
In the development of molecular imaging devices, Shimadzu is concentrating its efforts on PET and near infrared imaging (Figure 2).

Shimadzu's research into PET started in 1979, ahead of most of the world. Shimadzu is the sole manufacturer of clinical PET in Japan today. Exploiting its technology and know-how, Shimadzu has developed and commercialised small animal PET for laboratory animals used in basic medical research and drug discovery. Using the small animal PET, a contract analysis business for drug discovery has been launched in cooperation with Hamamatsu Photonics.

Meanwhile, Shimadzu is pursuing further development of the clinical PET. If the detector is too thin, the gamma rays measured by PET pass through, and if too thick, the image resolution is poor. To solve this problem, Shimadzu developed a new PET detector under a NEDO (New Energy and Industrial Technology Development Organization) project. The new detector has multiple layers of detector elements. Koji Shimizu comments, "The smaller the element the weaker the signal. Therefore, what we need is advanced technology that can realize both high sensitivity and good resolution."

Shimadzu is also undertaking the development of sophisticated PET equipped with this new detector system. The first development target is high-sensitivity PET mammography for breast cancer screening. With development cooperation from a well-known Japanese underwear maker, the detector system is optimally designed to cover the different shapes of women's breasts. In contrast to X-ray mammography, screening is painless. Evaluation of the device is to be conducted at Kyoto University from the second half of 2008. "At present, breast cancer screening is by X-ray mammography, ultrasound or MRI. This PET mammography promises to further improve diagnostic sensitivity and specificity. Future clinical research will tell us the optimal combination with other methods of screening," says Shimizu.

Another area Shimadzu is working in is the development of imaging devices using NIRS (near infrared spectroscopy). Ordinary light does not penetrate living tissue but near infrared light of about 800 nm wavelength, longer than optical light, can reach relatively deep inside living tissue. It is known as "a window to living tissue." In the mid-1980's Shimadzu began using NIRS in research on living organisms and now is producing an fNIRS (functional NIRS) imaging system for the market. "Unlike PET or MRI, fNIRS permits the measurement of brain activity even in subjects walking on treadmill. It is

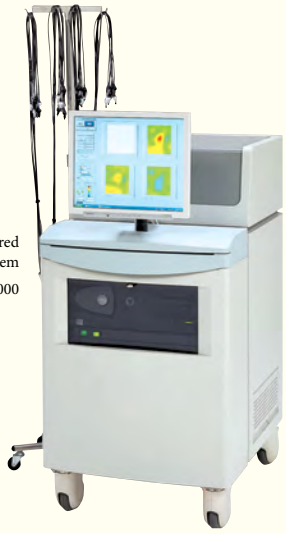


(Figure 2)

not molecular imaging but it does hold promise for, for instance, monitoring neurologic rehabilitation. In future, it may also be applied in brain-machine interfacing, directly extracting information from the brains of severely disabled people to enable them to operate machines,' says Shimizu.

Near infrared technology is also being applied to molecular imaging. Shimadzu is developing a high-performance fluorescence imaging system for small animals, which maximizes the properties of near infrared light and enables simultaneous observation of the subject from multiple directions.

Small Animal PET System
Clairvivo® PET



Functional Near Infrared Spectroscopic Imaging System
OMM-3000

Restructuring drives R&D forward

In 2006, the Advanced Biomedical Business Development Group, to which Shimizu belongs, was consolidated into the Corporate Strategy Planning Department, which is under the direct command of President Shigehiko Hattori. "With separate medical equipment and analytical & measuring instruments divisions, it was difficult to effectively develop our new generation medical business. This is an organization created to produce new solutions," according to Shimizu. The consolidation has facilitated communication and the exchange of information, providing a rich environment for generating new ideas.

Large medical equipment manufacturers are expanding or systematising their business by means such as the acquisition of other companies that have complementary capabilities. Shimadzu is a rare presence because it works in both the areas of medical equipment and analytical and measuring instruments.

"The advance of biotechnology has meant that research is moving from gene and cell levels to more complex and advanced systems. Meanwhile, diagnostic imaging devices are geared towards obtaining even more microscopic information. Molecular imaging is the field where these two domains of biotechnology and imaging technology fuse. Shimadzu will focus on the research of biomarkers, molecular probes and imaging devices in its pursuit of molecular imaging that will support early diagnosis and drug discovery," Shimizu says, outlining the company's ambitions for the future.

1 Biomarker
Objective indicator obtained from living tissue, providing information about various physiological conditions, changes in the state of disease, or responses to a therapeutic intervention

2 Molecular Probe
Substance that binds with a specific molecular target so as to provide imaging of the target's position and quantity. It comprises the ligand, which binds specifically with the molecular target, and the reporter, which indicates the position of the molecule.

3 Mass Spectrometer
An instrument that measures the mass of an atom or molecule. It ionizes a substance and measures the mass from the behaviour of the ions in electric and magnetic fields. It can also make a structural analysis of the substance. Koichi Tanaka, who developed Matrix-assisted laser desorption/ionization (MALDI) that allows the ionization of biomacromolecules, was awarded the Nobel Prize for Chemistry in 2002.

On July 18, the Center for Disease Control reported something we already knew: obesity is spreading. But it is happening faster than expected. In 2007, obese Americans accounted for 25.6% of the population, a nearly 2% increase from just two years earlier.

As the numbers have grown, in the United States as well as many other countries, medical experts and scientists have become more adept at recognizing the wide range of health problems associated with obesity. The 25% increase in diabetes over the past 20 years in the United States, for example, is due to the increase in obesity, says Charles E. Morton, the medical director for the Metabolic Surgery Center at Baptist Hospital in Nashville, Tennessee.

These problems strike the "morbidly obese" with even more severity. Morbid obesity is, roughly speaking, being 100 pounds or more above the ideal body weight. "It is called 'morbid' because of its life threatening effect on virtually every bodily organ, not to mention the often disabling social and psychological consequences," says Dr. Morton. "It remains a complex chronic disease that is poorly understood."

Clearly there is a need for more bariatric medicine, treatment specifically addressing the needs of the obese, and this puts new demands on medical facilities. Medical equipment is typically built for patients weighing up to 350 pounds. Baptist Hospital has had to accommodate patients of 625 pounds. Radiologists especially have struggled to meet the needs of these patients. "One of the major problems radiologists have with the obese population is obtaining a quality image on them," says Janet Bills, administrative director for medical imaging for the Baptist Hospital. Many hospitals worry about the liability issues they might face if equipment not designed to stand such weight should break down. Some hospitals have even transported patients to large animal veterinarian offices for imaging work.

Baptist Hospital, however, was able to handle its 625-pound patient. In fact, it has an entire care unit specifically designed for obese patients. Operating tables there are sturdier. Restrooms and entryways are larger. Beds, gowns, wheelchairs, and the lifts accommodate patients up to 1000 pounds.

The centerpiece of the hospital's bariatric care unit is Sonialvision Bariatric R/F fluoroscopic imaging system, manufactured by Shimadzu. The device can handle patients up to 700 pounds. Its table is wider and capable of being tilted to vertical if necessary. It is easily lowered or raised, decreasing the risk of an accident. "It gives head-to-toe coverage to minimize the need for repositioning," says Bills. The Sonialvision Bariatric R/F is equipped with a large view fluoroscopic and radiographic image field that enables high resolution images of the internal organs despite the extra tissue that often obscures the images produced by conventional imaging machines. The system also features a one million pixel ccd camera which produces high-definition, high-contrast photographs—at 15 frames per second.

The high quality gastrointestinal images are essential for safe and effective bariatric surgeries, the weight loss procedures that Dr. Morton and other bariatric surgeons use to correct metabolic deficiencies. Laparoscopic

Meeting the clinical needs for bariatric patient care

Shimadzu brings top-quality medical care to obese patients

adjustable gastric band (LAP-BAND) limits solid food intake by surgically inserting an inflatable band completely around the upper part of the stomach; it is a minimally traumatic, reversible procedure that does not involve cutting or stapling of the stomach or a bypass of the intestines. Gastric bypass, the most frequently performed weight loss procedure in the United States, creates a 1-ounce pouch from the original stomach to limit food intake; a new connection between the pouch and the intestine is created in such a way to limit the absorption of food. A third procedure, the duodenal switch, creates maximum weight loss with minimal food restriction by removing 75% of the stomach and bypassing some 60% of the intestine; it creates significant food malabsorption with the greatest quality of eating afterwards. "By offering the patients a choice in surgical procedures, we believe the treatment team can select a procedure that will ensure the best chance for success," says Dr. Morton.

All three types of bariatric surgery offered at Baptist Hospital require fluoroscopic imaging with the Sonialvision Bariatric R/F beforehand. "This allows the surgeon to be sure there are no abnormalities prior to surgery," says Bills. In many cases, imaging is done afterwards to monitor the progress of recovery.

Dr. Morton says that following surgery, patients can expect dramatic improvements in most conditions associated with obesity: a 95% reduction in type 2 diabetes, a 92% reduction in high blood pressure, an 87% reduction in high blood lipids, a 75% reduction in sleep apnea, a 98% reduction in acid reflux, an 87% reduction in stress incontinence, and an 82% reduction in osteoarthritis.

Each month 125 patients walk into the Baptist Hospital asking about bariatric surgery. Currently 800 are in the process of being certified. 600 patients get the surgery each year. While the Sonialvison Bariatric R/F is essential for pre-surgery examinations in these cases, Baptist Hospital radiologists use it on another 3400 patients each year. "We like the room and the device so well that we use it for both bariatric and other patients," says Bills. "It can be used for any patient."

Few places have a weight problem worse than Tennessee. It is only one of three states where, according to the latest CDC survey*, more than 30% of the population is obese. But the problem is spreading quickly throughout the United States and the rest of the world in pandemic proportions. Baptist Hospital is one of 340 facilities designated as a center of excellence by the American Society for Metabolic and Bariatric Surgery. Some 15 groups visited Baptist Hospital, curious about its efforts to meet this medical need. Most of them decided to buy the Sonialvision Bariatric R/F. "As the physical size of today's Americans continues to expand, so must medical equipment to adequately and safely treat bariatric patients," says Bills.

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[http://www.cdc.gov/nchs/data/databriefs/db01.pdf]

Sonialvision Bariatric R/F fluoroscopic imaging system


Charles E. Morton
Medical Director
Metabolic Surgery Center
Baptist Hospital


Janet Bills
Administrative Director
Medical Imaging
Baptist Hospital

Shimadzu Medical Systems expects 'Safire' to dazzle the market

Taking a leaf out of Aesop's Tortoise and Hare tale, Shimadzu Medical Systems (SMS) USA is betting that taking its time to get it right the first time, will help it move ahead of competitors that rushed to launch flat-panel detector FPD equipment used for diagnostic imaging. With the release of its advanced Safire (Shimadzu Advanced Flat Imaging Receptor) FPD direct-conversion systems in 2003, SMS believes such advantages as dose efficiency, accelerated diagnosis and higher image quality will see the technology win out over the indirect-conversion systems that came to market earlier.

"It's true we took a bit longer to launch than some competitors, but our Safire direct-conversion technology is cutting edge in the way it converts X-rays directly into electronic signals, making it superior to indirect-conversion," says Tom Kloetzly, vice president of national sales for SMS. "What's more, the technology enables us to offer new applications like digital tomosynthesis, which stacks the individual tomographic layers on top of each other to build a full image in no time. We believe Safire is going to put us out in front."

SMS's parent company, Kyoto, Japan-based Shimadzu Corporation, has a long history of producing innovative scientific instruments, stretching back to 1875. It built Japan's first medical X-ray equipment in 1909, and in 2002 Shimadzu's Koichi Tanaka was awarded the Nobel Prize in Chemistry. Today its 9,500 employees help it compete worldwide in a number of fields, including aircraft and industrial equipment, measuring instruments and medical systems. Its US medical subsidiary, SMS, was established in 1985 in Torrance, California and is responsible for all of North America and the Caribbean region.

While Shimadzu's medical arm produces a wide range of high-end equipment, SMS keeps its focus centred on X-ray equipment—a market segment where Shimadzu leads the industry—and ultrasound systems.

"You can think of us as a company highly specialized in a couple of key segments," says Kloetzly. "To market and support this equipment, we've established a hybrid sales organization of 33 dealerships and our own growing direct sales force based in Texas." Sales last fiscal year reached almost $75 million.

SMS, however, is about more than sales and support. It is also involved in R&D and was responsible for developing the world's first digital radiographic mobile X-ray system, which is used to diagnose immobile patients.

"We saw the need for this equipment and developed a prototype," says Don Karle, manager of national service, technical support and operations for SMS. "Because of the advanced nature of the medical market in the US, we see trends developing early." SMS convinced Japan HQ of the system's potential and Shimadzu took over its manufacture. "Today, SMS is the number one supplier of these mobile X-rays in the US," Karle adds. "And due to strong customer satisfaction, we are also seeing sales climb in general X-ray and digital radiography products."

Another area where SMS has helped Shimadzu forge ahead is in bariatrics: the treatment of the morbidly obese. "This is becoming a major problem in America and elsewhere," says Kloetzly. "It's not easy imaging a 600lbs patient without risking breaking the equipment. So we've developed specialized equipment for these patients."

In ultrasound, the focus has been on OB/GYN and urology. However, emerging markets in such clinical applications as musculoskeletal treatment, pain management, rheumatology and in-vitro fertilization promise strong growth for SMS, given the high quality of its ultrasound imaging and outstanding performance and reliability.

"In order to compete with the major domestic manufacturers, we have to provide products of the very highest quality and reliability," says Karle. "So we like to say our best service is that which is not seen."

Rather like the tortoise that wasn't seen by the hare until it crossed the finishing line first.

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MobileDaRt Evolution: Mobile Digital X-ray Systems Provides Sharp, Blur-Free Images in Any Location, Immediately After Exposure

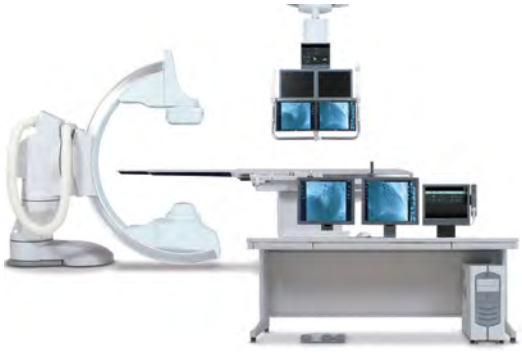
Equipped with a portable flat-panel detector, this mobile X-ray system is easily moved to patient rooms, operating rooms, emergency treatment areas, or other locations away from X-ray facilities, and can immediately confirm each X-ray image. Sharper, less blurry images thanks to higher X-ray output than previous models, a new quieter motor and a larger monitor all help to improve examination efficiency.

Safire 3D-C CT-Like Imaging for Detailed Confirmation During Abdominal Endovascular Therapy

Safire 3D-C CT-like Imaging is an option of the BRANSIST safire angiography system, which incorporates a 17-inch wide-field-of-view direct-conversion flat-panel detector. With endovascular therapy becoming increasingly popular in recent years, this function provides CT-like tomographic images during therapy without moving the patient, improving both safety and confirmability of the therapeutic efficacy in a variety of examinations and treatments.

New BRANSIST safire Slender C-arm System with 9-Inch Direct-Conversion FPD

With this new BRANSIST safire angiography system, a conventional C-arm mechanism has been refined to create a more slender design. Slimmer, newly designed flat-panel detector and C-arm X-ray tube components allow deeper angles for fluoroscopy and radiography and enhance operability, ensuring smoother angiographic examinations and endovascular therapy.



Prominence UFLCXR Provides Accurate and Rapid Separation of Trace Impurities in Drugs and of Trace Residual Pesticides in Foods to Ultimately Improve Productivity

Prominence UFLCXR provides twice the separation performance of conventional ultra-fast liquid chromatographs, while maintaining ultra-fast speeds. Also, twice the separation performance level of normal liquid chromatographs in only 1/4 the analysis time ensures more precise, accurate analysis of ultra-trace amounts of compounds, enhancing your work efficiency and improving productivity.

Comprehensive SMX Series of X-ray Fluoroscopy Inspection Systems for Quality Control in a Variety of Industrial Fields

With our SMX-2000 microfocus X-ray TV system, the time needed to display a fluoroscopic image after setting up a sample is only as long as it takes to click a mouse. Both multi-functional and easy to use, this instrument is equipped with various functions such as automatic measurement and pass/fail evaluation for minute regions during observation. Our SMX-3500 provides efficient, on-site inspections of large cast-aluminum parts, such as aluminum wheels and cylinder blocks for automobiles. Both these and other instruments in our comprehensive lineup include a full range of inspection functions. (Photograph: SMX-2000)

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