Seven Breakthroughs in Healthy Ageing

Ageing is a well-recognised global challenge. Researchers at HKU are conducting cutting-edge research in gerontechnology to meet the challenges, and are actively pursuing technology transfer opportunities with industry to turn their findings into real applications.

New Cartilage Regeneration Technology

“...The unique part of our work is that we provide a 3-dimensional environment so cartilage cells can grow into native-like cartilage tissue with the appropriate structural organisation. One of the advantages of this technology is that a simple minimal invasive procedure can take bone marrow cells so we don’t need to hurt the patient’s own cartilage. We hope this technology can be developed to treat early degeneration in the joints so that we can reduce invasive joint replacement surgery for the elderly.”

Professor Barbara Chan 陳佩
Department of Mechanical Engineering

Next Generation Bone Implant for the Elderly

“...Our team is developing a hi-tech screw that holds together the fragments of bone and the main difference in our case is that we are using a soft polymer as we discovered that materials that were softer were able to maintain a really firm yet gentle hold on bones while they’re healing. Then the polymer is able to expand and spread out the stress on the bone so that you don’t end up having many small fractures that can eventually add up to a failure of the implant. In the future, even if more people have osteoporosis, the implants that they are getting are safer and more effective.”

Sloan Kulper (PhD Year5) and faculty members
Department of Orthopaedics and Traumatology

The Magic of Chinese Yam for the Treatment of Menopausal Syndrome

“I extract a bioactive protein from Chinese yam. Chinese yam can increase the secretion of estrogen in women’s ovaries and without the side effects such as the increased risk of breast cancer and ovarian cancer. So it is a safer alternative to hormone replacement therapies. In 2016, we got the US patent based on our discoveries. The clinical trials will be launched soon. We hope in the future our product can be developed as health supplements and drugs which can help women who suffer from menopausal syndrome.”

Dr Stephen Sze 施祖榮
School of Chinese Medicine
Prevention of Ageing-associated Neurodegeneration in Alzheimer’s Disease and Glaucoma with a Wolfberry Extract

In our experiment, we find that wolfberry extract can prevent neuronal loss triggered by the toxins in Alzheimer’s disease, stop neurodegeneration in the retina, and can preserve eyesight. This means one stone can hit two birds. With our increasing ageing populations, more and more people will suffer from Alzheimer’s disease and Glaucoma than ever before. We hope our discovery in wolfberry extract can help people to use more Chinese medicines in future to prevent neurodegeneration and to cure these two diseases.

Dr Raymond Chang 鄭傳忠
School of Biomedical Sciences

A Soft Robot Hand for Neural Rehabilitation of Degenerative Neurological Diseases and Strokes

The existing robotic systems use rigid controls that are not flexible but the soft robotic hand uses gas or fluid in tubes to make (soft) hand movements. The advantage of the soft robotic hand is that with the friendly interface it adapts to your motions and follows the intentions of the subject. The use of this new technology can train and help patients rehabilitate their hands efficiently without any extra assistance. Even we can allow patients to use chopsticks in future.

Dr Yong Hu 胡勇 (PhD 2000)
Department of Orthopaedics and Traumatology

Technology-based Management of Swallowing Difficulties

My first area of research is the use of repetitive transcranial magnetic stimulation to improve swallowing functions in stroke patients. So what it does is that we have a big magnet on the head and this magnet will create an electrical stimulation to the brain, hoping to improve the swallowing functions. The other part of my research is to develop an app for swallowing and communication exercises that can be practised at home. We are also looking into the use of acupuncture to improve swallowing in post-stroke patients. We hope that this will help them to eat and drink more safely.

Dr Karen Chan 陳文琪 (BSc(Sp&HearSc) 2000; PhD 2005)
Faculty of Education (Division of Speech and Hearing Sciences)

Wearable Transcranial DC-Stimulator Helps Patients with Degenerative Brain Diseases

Many patients suffering from neurodegeneration and trauma in the brain want to be able to take care of themselves at home, but this is not always possible. That’s why we developed this transcutaneous stimulator that can be used at home by the patient themselves. This device is unique from others as it has a dry electrode and a self-control system. It uses a nanoparticle coating on the dry electrode to connectivity between the electrode and surface of the brain. This stimulator is only for the modulation of brain activity so it can change the level of response to treat depression and cognitive disorders, and other conditions.

Dr Yong Hu 胡勇 (PhD 2000)
Department of Orthopaedics and Traumatology

Gerontechnology Innovations at HKU:
http://www.ke.hku.hk/story/innovation/gerontechnology
The current findings are a major step in furthering our fundamental understanding of the origins and roles of brain-wide functional connectivity. They also signify the potential of Resting-state Functional MRI and neuromodulation for early diagnosis and enhanced treatment of brain diseases including Alzheimer’s disease, dementia, epilepsy, schizophrenia, transient global amnesia, and post-traumatic stress disorder.

A research team led by Professor Ed Wu of the Department of Electrical and Electronic Engineering has made a major breakthrough in unveiling the mysteries of the hippocampus, a part of the brain not previously well-known to scientists.

Alzheimer’s disease and other forms of dementia are known to affect and damage the hippocampus, resulting in various symptoms including short-term memory loss and disorientation early on. Experiments conducted by the team revealed that low-frequency activities of the hippocampus, which usually occur during slow-wave sleep, can drive the functional integration between different regions of the cerebral cortex and enhance the responsiveness of vision, hearing and touch, as well as learning and memory. These results indicate that the hippocampus can be considered the heart of the brain, a breakthrough in our knowledge of how the brain works.

These current findings are a major step in furthering our fundamental understanding of the origins and roles of brain-wide functional connectivity.
Souped Up

“The soup helps prevent and ameliorate the side effects of chemotherapy without altering its efficacy, thereby not only improving the patients’ quality of life but also potentially reducing the chances of not completing the chemotherapy treatment.”

A research team at the School of Chinese Medicine (SCM) has developed a medicinal dietetic soup that helps to ameliorate the side effects of chemotherapy, which can include reduced white blood cell count, alopecia, fatigue and the discolouration of the skin and nails.

Team leader Dr Chen Jian-ping 陳建萍, Associate Professor at the SCM, said they are still doing clinical trials, but the mid-term results of the research show that the soup may prevent and ameliorate the side effects of chemotherapy without altering its efficacy, thereby not only improving the patients’ quality of life but also potentially reducing the chances of not completing the chemotherapy treatment.

“Advances in cancer diagnosis and treatment mean that the survival rate of cancer patients has been increasing, yet the side effects of chemotherapy can still be acute and affect the quality of life of patients. So I started looking for a way to help,” said Dr Chen.

The dietetic soup has taken more than three years to develop and combines a mixture of Dr Chen’s knowledge and clinical experience of traditional Chinese medicine (TCM). Jessie You 游傑舒 (PhD Year 5), Dr Chen’s PhD student who is doing the clinical trials, said the soup ingredients are not ordinary foods but what they term as “function foods”. It is a mixture of processed medicinal food, including black soya beans, coarse cereals and phycomycetes.

In addition to soup packs, the team has also produced it in teabag form. They have now applied for a patent and want to move to the next stage of developing further products, hoping that an important outcome of this research will be to open up more medical practitioners to the possibilities of TCM.