Tissue engineering is based on the concept that the human body or parts of it can be regenerated using stem cells. Since the 1980s, several kinds of tissues and organs have been generated worldwide using cultured living cells. Dental Tribune Asia Pacific in cooperation with FDI’s Worldental Daily spoke with Dr Minoru Ueda from Nagoya University in Japan about key tissue-engineering strategies and their potential for dentistry.

DTWD: Dr Ueda, tissue engineering is a relatively new approach in regenerative medicine. How did it find its way into dentistry?

Dr Minoru Ueda: The basic concepts and strategies for tissue regeneration are generic. To regenerate any tissue, we need stem cells, growth factors and a scaffold. In the field of dentistry, we have made much scientific progress in terms of materials, which gives us an advantage over other fields of medicine. We began with developing high-quality materials and then expanded to using stem cells.

Is it possible to reconstruct complex tissue defects made up of multiple cell types?

Yes, it is. We have succeeded in reconstructing the structures that make up periodontal tissues, which are cementum, bone and periodontal ligament in humans.

What key tissue-engineering strategies are currently being developed for dentistry and how do they work?

The most important tissue for dentistry is bone. We are establishing technologies for bone tissue engineering and apply these clinically to implant surgery. Secondly, we are focusing on stem cell science. Oral tissue contains a kind of powerful stem cell that can be used to treat systemic diseases such as bony infections or heart infarction. The dental pulp stem cell is one of the most important cells derived from oral tissue.

What effect will tissue engineering have on the dental practice of the future 25 years?

Tissue engineering could provide a new treatment method for diseases that have not been treatable thus far, such as severe periodontitis and atrophied alveolar ridges. Also, cosmetic therapy using tissue engineering in the oral and maxillofacial areas, especially into the face because cosmetic problems such as wrinkles are a dis-ease. The surface structures of an implant are very important, but this is not a main factor for enhancing the living cell around the fixture.

Is it possible to reconstruct periodontal defects caused by bone loss?

We can do basic research using animal cells and human stem cells, but research using embryonic stem cells (ES) and induced pluripotent cells (iPS) must be performed under the control of the ethical committees of each university. In order to use ES or iPS, we need special permission from our university and government. Clinical studies based on basic research also require approval from our university and government. It is actually very difficult to gain approval compared to other countries. So it is easy to conduct basic research but very difficult to conduct clinical studies in Japan.

Current debate in the field of cosmetic dentistry centres on whether dentists should be allowed to inject osteogenic cells into patients for non-dental reasons. What is your opinion on this matter?

Dentists should not be allowed to inject any cells by themselves for non-dental reasons. However, for cosmetic reasons, dentists can inject stem cells into the oral and maxillofacial areas, especially into the face because cosmetic problems such as wrinkles are a dis-ease. The surface structures of an implant are very important, but this is not a main factor for enhancing the living cell around the fixture.

Which dental conditions will be the first to be treated or cured by tissue engineering?

Atrophied alveolar bone and severe periodontal disease.