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Tissue engineering of the inner ear

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Electronic interfaces between living cells or tissues and conducting surfaces that serve to pass signals between the electronic devices and a living organism present an enormous scientific and technological challenge. Such bioelectronic interfaces are now widely used in medical devices including pace makers, cochlear implants and neurostimulatory implants. These devices have become indispensable in many situations and extended or dramatically improved the lives of millions of people.

For example, worldwide cochlear implants have been performed in more than 100.000 persons and the current installed base of pacemakers is presently about 600.000 in the United States alone. Thus even modest improvements in these devices would quickly translate into improvements in human health and substantial advances would have tremendous impact. There is also a great deal of activity in other types of devices based on bioelectronics interfaces.

Strategy to rescue hearing and auditory nerve was developed using micro-contact technique. Surface for nerve guidance was designed with favorable extracellular proteins to promote the outgrowth of the neurons. Micro-contact imprinting provided a versatile and useful technique for patterning the guidance surface. Imprinting generated a patterned surface in a controllable, predictable, and quantifiable manner. A range of events followed the patterning including alignment, polarity and directionality was reported and observed by morphological and microscopic description. The dynamic microenvironment that results from the synergistic combination of extracellular guidance cues and Schwann cells selectively instruct and direct the terminal extension of neurons into uni- or bi-polar fate. Applying new factors such as molecules, cells and surfaces provides unique possibilities to recruit spiral ganglion neurons into their regenerative ability. In summary, creating an environment that incorporates multiple molecular and cellular cues will offer exciting opportunities for elucidating the mechanisms behind nerve regeneration and highlight specific considerations for the future tissue engineering.

Biography

Shaden Khalifa is a certified physician with bachelor degree in Medical and Surgical Sciences. Shaden has completed her Master Degree at biomedical Science from Uppsala University and her PhD from Karolinska Institute, Stockholm, Sweden after 2 years of research visit to Keio University, Japan. Dr. Shaden has published 10 papers in reputed journals most of them are within the area of tissue engineering and regenerative medicine.

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