Biomaterials used in the cochlear implant

- Siliconeo

  The implantable section of the cochlear implant is covered with silicone. This includes the transmitter coil, the electrodes (also with platinum contacts), the cochleostomy area, and a silicone cable is situated in the middle ear. Through the polymerization of silicon and oxygen atoms, silicone is formed. This process also produces hydrocarbon radicals. Silicone is often found to be one of the many ingredients in an implantable medical device due to its biostability. However, there have been signs indicating that once silicone is implanted, its properties become altered; usually referred to as an ‘ aging’ process. The internal anatomy of the human body can produce implications of the decay process of the silicone. Although silicone possesses outstanding biocompatibility, further potential advancements need to occur.

- Platinumo

  Platinum contacts are primarily used for the electrode production. Platinum is usually favoured as a contact material during electrical stimulation process. This is because they contain low chemical reactivity and possess high resistance to corrosion. Despite its superior properties, precious metals (gold, silver and platinum) can somewhat disintegrate or produce deranged surface films. Approximately two thousand hours of animal and ten thousand hours of human testing has been conducted. The results specify that there was not any stimulus-induced corrosion observed.

- Titanium

Titanium carries many valuable properties that make it suitable for casing the electronic constituents of the cochlear implant, including its low weight, high resistance to corrosion and its rigidity. The recommendation to use titanium for the housing of the electronic compartments was extracted from its already successful implementation with cardiac pacemakers.

- Ceramics

  Ceramics were first used for the housing of the cochlear implant’s electronic segments. Manufacturers currently prefer titanium because it has been determined that ceramics possess deficiency of leak-tightness generating implant failure. Also, its mechanical resistance to external forces compared to that of titanium is inferior. Ceramics consist of a non-metallic lattice consisting of a base substance that is combined with a diverse range of other materials. Depending on which of these materials is chosen, distinguishes its resulting properties. Ceramics that are used for medical appliances are fundamentally grounded on aluminium oxide. In regards to the cochlear implant, ceramics are predominantly used for securely sealing the domain where the wires appear from the implant case and provides casing for the electronic compartments. Benefits when using ceramics is that the receiver wire can be situated inside the casing because ceramic materials do not produce substantial negative impacts on signal transmission. Although, ceramics are more susceptible to deterioration when exposed to sufficient mechanical stress.