Edible neuroprosthetic devices

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With the ultimate goal of avoiding infections due to a prolonged stay and risks related to surgical retrieval, functional silicon-based electronic devices able to dissolve within the biological environment have been engineered in the past few years [1,2]. These advancements, in combination with the present trend of incorporating polymers as flexible substrate or for drug-release purposes in bioengineering devices, have led to the idea of fully polymer-based transient electronic devices. Our aim is indeed to fabricate probes for neural signal recording entirely based on biocompatible and biodegradable polymers. In the specific case, we rely on Polycaprolactone (PCL) [3] as substrate and Poly(3,4-ethylenedioxythiophene)-poly(styrenesulfonate) (Pedot:PSS) as conductive conjugated polymer. With these materials as building blocks, a series of passive neural probes were fabricated and implanted in mice brains (visual cortex area) to assess their *in-vivo* durability. Several time-points (1, 3, 6 and 9 months) have been established for the implants analysis in order to have a better comprehension of the degradation process within the biological environment and the response of the biological environment itself to the insertion of an external object. Preliminary results show that after one month of implantation the astrocytes are visibly activated as expected, whereas there is no evidence of activated microglia. Further results demonstrate that after 3 months of implantation the PCL layer starts to show signs of bulk degradation. In the near future, implantation of active neural probes will give insight also on the recording capability of the devices.

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