industrial field and everyday use, making them a major contributor to pollution in both terrestrial and aquatic environments. Of all the types of plastics produced, almost 20% is polypropylene (PP), extremely popular in the production of surgical masks and single-use packaging. The accumulation and dispersion of PP plastic waste poses an obvious threat for both animals and humans. Indeed, plastics do not decompose into biodegradable compounds, but instead, by means of biotic and abiotic processes, degrade into smaller pieces known as microplastics (MPs) and nanoplastics (NPs). These particles have harmful effects on both terrestrial and aquatic organisms, as they can accumulate in their tissues and deplete energy reserves, reducing nutrition, survival and immune response. Although numerous studies have already shown the negative impact of MPs and NPs on various vital processes, little is still known about their effect on wound healing and tissue regeneration. To this end, the effect of PP MPs and NPs on tissue regeneration processes following injury was evaluated in the freshwater invertebrate model *Hirudo verbana*, well-suited for evaluating inflammatory and tissue remodelling processes, both involved in proper wound healing.

By means of morphological, immunofluorescence, histoenzymatic and molecular analyses, we have clearly demonstrated that PP MPs and NPs inhibit angiogenesis, activate the innate immune system and induce excessive collagen production leading to the formation of a fibrotic tissue that interferes with the correct muscle tissue regeneration.

***Mytilus galloprovincialis* as sentinel to detect marine hydrocarbon contamination: an integrated approach**

F Bertini[1,2], M Dara[1,2], L Bisanti[1], M Staropoli[1], C La Corte[1], L Scirè Calabrisotto[1], D Parrinello[1,2], MG Parisi[1,2], V Catania[1,2], M Cammarata[1,2]
[1]Department of Earth and Marine Sciences, University of Palermo, Palermo, Italy
[2]NBFC, National Biodiversity Future Center, Palermo, Italy

Oil spills cause significant impacts on the coastal marine ecosystem. Studying and investigating the immune mechanisms that contribute in hydrocarbon (HC) detoxification processes is crucial to better understand the responses of marine organisms under pollutant exposure. The mussel *Mytilus galloprovincialis*, due to its filtration behaviour and the evidence about its ability to response early to environmental stressors, is considered an excellent model species for ecotoxicological studies. In this work, specimens of *M. galloprovincialis* were exposed for 4 days to different concentrations of diesel-engine oil mixture. Increasing concentrations of the mixture significantly decreased the phagocytic activity of the haemocytes. Enzymatic analyses of the main oxidative stress and inflammation markers confirmed the immunomodulation resulting from short-term exposure to the mixture. Histomorphological analyses on digestive gland showed that HCs mixture compromised the microtubules's tissue structures, inducing necrosis especially for the highest concentrations. Furthermore, the modulation of the molecular markers HSP70 and HSC70 was also assessed by western blot, demonstrating their involvement in maintaining the organism's homeostasis. Finally, the effects of HCs mixture on the diversity and structure of microbiome of hepatopancreas and haemolymph were also evaluated by Automated Ribosomal Intergenic Spacer (ARISA) and 16S rRNA gene sequencing analyses. The exposure to increasing HCs concentrations has a positive effect on microbial diversity, with an increase in relative abundance of several known degrading bacterial genera. These results confirmed the role of *M. galloprovincialis* as a sentinel of environmental pollution, thanks to its ability to respond sensitively and quickly to hydrocarbon pollution.

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***Octopus vulgaris* as a model for studying indeterminate growth and regeneration**

G Bergamini[1], G Fiorito[1,2], P Imperadore[1,2]
[1]Stazione Zoologica "Anton Dohrn", Naples, Italy
[2]Associazione Cephalopod Research-ETS, Italy

Regeneration is a widespread phenomenon in which damaged structures regrow after injury. Among invertebrates, coleoid cephalopods are able to regenerate several structures, including appendages and nervous tissue. In *Octopus vulgaris* these processes have been well described; and the involvement of hemocytes have been documented during regeneration in both the arms and pallial nerve. In the latter, hemocytes are involved in debris removal of the degenerating tissues and represent the main source of proliferating cells. Additionally, they appear to be involved in the release of factors that foster regeneration of axons. Knowledge gathered so far allows to hypothesize a possible stem-like behaviour of the immune cells in octopus.

Here, we use the tip of *O. vulgaris* arm as a model for studying regeneration and indeterminate growth, a condition where the body, or part of it, keeps growing throughout life. The arm tip is a zone of the arm putatively representing a stem cells reservoir, due to its low differentiation rate, high number of proliferating cells, and fast regenerative process. Through *in silico* data-mining we identified in the arm tip a characteristic molecular fingerprint with differential expression of genes including transcription- and neurogenic-factors, cell fate and proliferation makers, RAGs and immune-related genes. Through RT-qPCR experiments we evaluated relative gene expression and found it to