Topic of interest

---------Coste, porti, mare------

TITLE OF THE PRESENTATION

Adswim: Adriatic sea protection, by biotech and managed use of wastewater

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- *Adswim project*, started from the statement that the quality of the Adriatic Sea on both the two coasts, Italian and Croatian, is mainly excellent or good, with, however, some fragile areas due to local pollution events but also featuring an imbalance in the distribution of nutrients: Dissolved oxygen, Chlorophyll "a", Total phosphorus and Dissolved inorganic nitrogen are four indicative parameters of the main components affecting the primary production of marine ecosystems (nutrients and phytoplankton biomass). The presence of these nutrients and their balance determine the quality and productivity of coastal marine waters. Vice versa, if the ecosystem is unbalanced in particular due to a lack of PHOSPHORUS also in relation to the content of NITROGEN, the water body may become not only unsuitable for recreational uses or even dangerous (toxic algae blooms) but may not offer, the proper feed support, for trophic chains. These elements origin from natural sources but are also consequent to the anthropic and social activities that lead to their discharge, through urban and industrial wastewater into the marine environment. It has been reported that in some areas, there is a lack of balance between nutrients (of phosphorus with respect to nitrogen availability), phosphorus is generally in low amount (oligotrophic areas). A modified distribution of nutrients can result in species alteration in marine biological communities with potential loss of ecosystem integrity and endangers environmental viability and resistance to the spread of unwanted species. The aim of Adswim project is assess whether treated urban waste water (UWWT), within regulatory limits, could offer a controlled point

of nutrients supply, in particular phosphorus, for the receiving sea water. This requires several actions to preserve the receiving sea water some of them are addressed by the 12 PP's involved in this project, - network among Dp's to share knowledge and harmonise the plants management approaches – survey and compare as the EU legislation has been adopted cross-border by local government – transfer of knowledge and raise the awareness of citizens (including children) about the contribution they can make to protecting the environment by using resources correctly and the role that the DPs can play in this safeguarding activity -minimise or possibly eliminate risks for the hygienic quality of the sea optimising new treatments of UWWT, - search pathogens and new emerging pathogens in UWWT and test their eventual persistence in close proximity of the discharging point at the sea water, - develop sensors/biosensors to test water biotoxicity and measure phosphate contents.

- *P is essential to all life* forms and often oligotrophic condition in our sea can be measured.

  We are going to collect samples of treated waste water before discharging and close to discharging point in the sea with the cooperation with DPs, cross border involved.

  We will confirm the amount of nutrients applying standard and official methods and we are optimizing an electrochemical approach to measure P with a stand-alone plastic electrode, possibly in field.

  The electrode optimized is based on an Octamolybdate derivative, purposely synthetized to prepare this non-conventional electrode; a POM reactive microstructure was obtained that behaved very satisfactorily in the preparation and optimization of an electrochemical platform to detect phosphate. This sensor showed advantageous characteristics, is easy and cheap to prepare and it works disposably, but more important, it allowed the detection of phosphate in high salinity samples with a sensitivity of nM and a wide linear range. Comparing with literature data, as far as we have been able to verify, the electrochemical sensor that we are proposing improves by at least 3 times the determinations now possible through the use of sensors but the range of concertation typically expected for oligotrophic sea are in the range of sensitivity of our device.

  Concrete reef balls are positioned near the discharge lines on a sandy seabed: the aim is to help stabilize the seabed and encourage the local repopulation of both plant and fish species that find refuge and foothold in the cement structures. this should encourage the attraction of other species and the redevelopment of the surrounding marine environment.

  Does modulating and controlling the amount of P discharged through treated and safe wastewater help the repopulation process?