



## BIOTECHNOLOGY RESEARCH FOR A COMPLEX WORLD

20th anniversary of the EC-US Task Force on Biotechnology Research

2 June 2010



### MARINE BIOTECHNOLOGY IN THE 21<sup>ST</sup> CENTURY

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The potential of marine biotechnology that was predicted in the last decade of the 20th century has been realized in the first decade of the 21st century. Two new, marine-derived drugs are now clinically available: an analgesic (Prialt®) from a fish-eating snail and a cancer drug (Yondelis®) from a mangrove tunicate. Enzymes from hydrothermal vent microbes are routinely used in PCR reactions, and marine-derived molecular probes are helping us understand the molecular basis of disease processes. Advances in aquaculture biotechnology have resulted in more efficient production of finfish and shellfish for human consumption, and polyunsaturated fatty acids from marine microalgae are used as nutritional supplements for adults and infants. Rapid diagnostic tools have been developed to monitor toxins in the environment and in seafood, and genetic fingerprinting techniques are helping to control illegal trade of threatened marine species. There are both significant challenges and opportunities in marine biotechnology research and development in the coming decades. Among the challenges we face are threats to biodiverse ecosystems, such as coral reefs and mangroves, which will certainly result in the loss of marine organisms that are the source of chemicals with disease-fighting properties. Balancing competing uses of marine resources is a major goal of coastal and marine spatial planning efforts that are underway in both the U.S. and the E.U. But the challenges present many opportunities for marine biotechnology research and development, such as: the application of bioprocess engineering to develop sustainable production methods for marine-derived biochemicals; the development of novel marine models to study the molecular basis of poorly understood human disease processes; the development of biochemical sensors to monitor human and environmental health indicators in the marine environment; the application of marine biotechnology to restoration of endangered habitats and fisheries; and the use of marine-derived proteins to control the nanofabrication high-performance composites as semi-conductors and biosensors. Non-conventional collaborations and interdisciplinary approaches in marine biotechnology research and development are likely to result in innovative and transformative technologies in the next decade.