

Science for Environment Policy

Nature provides treasure trove of medical inspiration

A recent analysis highlights the potential of natural products as an indispensable source for drug discovery. Natural compounds can be used directly as potential medicines or can provide templates for the design of synthetic and semi-synthetic drugs. Furthermore, because of their ability to interact selectively with biological macromolecules, they also provide a tool to better understand biochemical processes and thus identify new potential targets for the treatment of human diseases.

Natural products are a very diverse group of molecules, often chemically distinct from synthetic compounds. Through the process of evolution, they have become biologically active, performing useful functions, such as regulating cell cycles or acting as chemical defences.

To identify new compounds researchers can look at plants, microbes or marine organisms that have not yet been investigated for biological activity. Technological advances are also making it possible to search for undiscovered molecules from existing, known sources. In the case of microorganisms, such as bacteria and fungi, genetic approaches are used to identify new compounds. It has been shown that microorganisms often have genes for many more natural chemicals than those they produce in standard laboratory conditions. Recent research is revealing how they can be persuaded to actually produce these substances. For example, interfering with certain enzymes has been found to influence the expression of genes in some fungi, which has enabled scientists to isolate a number of new compounds.

In another approach, a fragment of DNA is integrated into the genome of an organism to 'de-silence' a particular gene cluster that has been previously identified. This method has been applied to the fungus *Aspergillus nidulans*, and has also allowed the identification of new compounds. More efforts are needed to apply such approaches to a broader range of species.

In recent years significant technical improvements have also been made in isolation and purification methods, thus improving the prospects for discovering useful natural products. These include advanced chromatography methods that make it easier to isolate natural products from plant, animal and microbial extracts. This makes it quicker, cheaper and easier to identify novel structures.

Natural products are also helping researchers understand how drugs work and are suggesting new approaches to drug development. Approaches include screening large natural product libraries using chemical genetics and chemical proteomics (the study of proteins) procedures. These allow the proteins affected by the natural products to be identified and may suggest new avenues for drug discovery.

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