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Mother Nature's medicine cabinet

By Reese Halter

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The diversity of life on our planet is astounding. And given enough time and careful management of our natural resources, science will find cures for most of the ailments that afflict humankind.

Between 40 and 90 million North Americans suffer from pain. It's the most common reason that people visit physicians. The annual cost of medical bills and lost wages easily exceeds \$100 billion. Sales of morphine and morphine-derived products in the U.S. alone cost \$650 million per year. Morphine is addictive, constipating and causes respiratory distress; and over time more of it is needed to obtain relief.

Coral reefs are the largest non-human made organisms' on our planet, adding a whopping 200 tons of new growth a year. They are easily the equivalent in biological diversity to that of the Amazon rainforests.

Globally, there are about 500 species of exquisitely mottled tapering shells of cone snails. One species from the Philippines contains a toxin that is 100 times more potent than morphine. The drug Prialt derived from this cone snail is effectively treating pain, including phantom-limb pain; it's non addictive and the human body does not appear to develop a tolerance.

Currently, we know of about 1.5 million different species on our planet. The oceans likely contain 100 million forms of life yet to be discovered.

More than 100 different varieties of cancer exist. Soft corals from northwest Australia produce the most potent anticancer compounds ever found. One of these compounds, eleutherobin, is being trialed to combat both ovarian and breast cancers. It may become an efficacious tool to treat patients who suffer from taxol-resistant cancers. (Taxol comes from the Pacific yew tree.)

Ocean derived pharmaceuticals are so important that Merck, Lilly, Pfizer, Hoffman-Roche and Bristol Myers Squibb have all established marine biology divisions.

Caribbean sea squirts produce ecteinascidin offering promise for those diagnosed with melanoma and breast cancers.

Sponges from the Florida Keys contain cytosine arabinoside, which has been improving treatments for Leukemia since 1969.

Sponges are very efficient at fighting off viruses. The compound adenine arabinoside vidarabine is effective against herpes and shingles. Research from sponges lead scientists to develop the blockbuster AIDS drug AZT.

Australian sponges yield potent chemicals for treatment of falciparum malaria — one of the most lethal and drug-resistant forms. Another sponge has compounds known as topsentins or anti-inflammatories that can be employed in treatments of sunburn and even arthritis.

A deep water Caribbean sponge has compounds 1000 times stronger than cyclosporin an effective immunosuppressant.

Coral, incidentally, is the most effective treatment in re-growing human bones and it requires no immunosuppressants.

Australian scientists are developing new sunscreens from the Great Barrier Reef that will be used in cosmetics and tanning lotions.

Tropical rainforests too should be thought of as nature's treasure trove of medicines. Venom from the Brazilian viper lead to a blockbuster drug called Capoten, which successfully lowers blood pressure and is worth \$1.75 billion in sales annually. The iridescent poison dart frogs from northwest Columbia produce epibatidine which is being tested as a non-sedating, non-addictive, non-opioid painkiller.

Plant medicine also reduces the risk of cancers, heart disease, liver disease and respiratory disease. And they are helping to combat drug resistant diseases like TB and malaria.

Five of the world's top 30 drugs are derived from fungi — Penicillin being the most noteworthy. Fungi are the least studied and most promising groups of therapeutic organisms. Merck's blockbuster drug Lovastatin comes from a soil fungus and it's used to lower cholesterol. The Swiss pharmaceutical Sandoz discovered the immunosuppressant cyclosporin from the insect-killing Cordyceps fungus and changed human-organ transplant surgery. Thousands of species of fungi are known and likely another million are awaiting discovery.

Of all the 1.5 million or so species classified on Earth, more than half are insects. The insect world is a veritable drugstore of pharmacodynamic agents.

The defense glands of many aquatic beetles brim with steroids, a group of chemicals used in a variety of medicines from birth control pills to anti-inflammatory agents. One beetle, *Colymbetes fuscus*, produces chemicals that lower blood pressure in mammals.

Bug-drugs are able to bind to bacterial cell walls and punch holes in them, killing bacteria. Penicillin, on the other hand, interferes with the ability of bacteria to build cell walls and reproduce.

The more we look in the natural world, the more we find.

Technology can't replace nature, but it can help us modify and improve natural products for medicine, industry and agriculture.

The race is on to better manage our relationship with all species on Earth — invariably it will ensure a better life for our children's future.

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