

HEAD WORD GAP FILL

Saving bugs to find new drugs

A More drugs than you might think are _____ (derive) from, or inspired by, _____ (compound) _____ (founded) in living things. Looking to nature for the soothing and curing of our ailments is nothing new – we have been doing it for tens of thousands of years. You only have to look at other primates – such as the capuchin monkeys who rub themselves with toxin-oozing millipedes to deter mosquitoes, or the chimpanzees who use noxious forest plants to rid themselves of intestinal parasites – to realise that our ancient ancestors too probably had a basic grasp of medicine.

B Pharmaceutical science and chemistry built on these ancient _____ (foundation) and perfected the _____ (extract), characterisation, _____ (modify) and testing of these natural products. Then, for a while, modern pharmaceutical science moved its _____ (focusing) away from nature and into the laboratory, _____ (design) _____ (chemically) _____ (compound) from scratch. The main cause of this _____ (shifts) is that although there are plenty of promising _____ (chemically) _____ (compound) in nature, finding them is far from easy. _____ (secure) _____ (sufficiency) numbers of the organism in question, _____ (isolate) and characterising the _____ (compound) of interest, and producing large quantities of these _____ (compound) are all _____ (signifies) hurdles.

C Laboratory-based drug discovery has _____ (achieve) _____ (vary) levels of success, something which has now prompted the development of new _____ (approach) _____ (focus) once again on natural products. With the ability to mine genomes for useful _____ (compound), it is now _____ (evidential) that we have barely scratched the surface of nature's molecular _____ (diverse). This realisation, together with several looming health crises, such as antibiotic resistance, has put bioprospecting – the search for useful _____ (compound) in nature – firmly back on the map.

D Insects are the undisputed masters of the terrestrial _____ (domains), where they _____ (occupied) every possible niche. _____ (consequent), they have a bewildering array of _____ (interact) with other organisms, something which has driven the _____ (evolve) of an _____ (enormity) _____ (ranged) of very interesting _____ (compound) for defensive and offensive purposes. Their remarkable _____ (diverse) _____ (exceed) that of every other group of animals on the planet combined. Yet even though insects are far and away the most _____ (diversity) animals in existence, their _____ (potentially) as _____ (source) of therapeutic _____ (compound) is yet to be realised.

E From the tiny _____ (proportional) of insects that have been _____ (investigate), several promising _____ (compound) have been _____ (identify). For example, alloferon, an antimicrobial _____ (compounds) produced by blow fly larvae, is used as an antiviral and antitumor agent in South Korea and Russia. The larvae of a few other insect species are being _____ (investigate) for the potent antimicrobial _____ (compound) they produce. Meanwhile, a _____ (compounds) from the venom of the wasp *Polybia paulista* has _____ (potentially) in cancer treatment.

F Why is it that insects have received relatively little attention in bioprospecting? Firstly, there are so many insects that, without some manner of _____ (target) _____ (approaches), _____ (investigate) this huge variety of species is a daunting _____ (tasks). Secondly, insects are generally very small, and the glands inside them that secrete _____ (potential) useful _____ (compound) are smaller still. This can make it difficult to _____ (obtains) _____ (sufficiency) quantities of the _____ (compounds) for _____ (subsequently) testing. Thirdly, although we consider insects to be everywhere, the reality of this ubiquity is vast numbers of a few extremely common

HEAD WORD GAP FILL

species. Many insect species are infrequently _____ (encounter) and very difficult to rear in captivity, which, again, can leave us with _____ (sufficient) material to work with.

G My _____ (colleague) and I at Aberystwyth University in the UK have developed an _____ (approaches) in which we use our knowledge of ecology as a guide to _____ (targets) our efforts. The creatures that particularly interest us are the many insects that secrete powerful poison for subduing prey and keeping it fresh for future _____ (consume). There are even more insects that are masters of _____ (exploit) filthy habitats, such as faeces and carcasses, where they are regularly _____ (challenge) by thousands of micro-organisms. These insects have many antimicrobial _____ (compound) for dealing with pathogenic bacteria and fungi, suggesting that there is certainly _____ (potentially) to find many _____ (compound) that can serve as or inspire new antibiotics.

H Although natural history knowledge points us in the right direction, it doesn't solve the problems associated with _____ (obtain) useful _____ (compound) from insects. Fortunately, it is now possible to snip out the stretches of the insect's DNA that carry the _____ (code) for the interesting _____ (compound) and _____ (inserted) them into cell lines that allow larger quantities to be produced. And although the road from _____ (isolate) and characterising _____ (compound) with desirable qualities to developing a commercial product is very long and full of pitfalls, the variety of successful animal-_____ (derive) pharmaceuticals on the market _____ (demonstrate) there is a _____ (precede) here that is worth exploring.

I With every bit of wilderness that disappears, we deprive ourselves of _____ (potentially) medicines. As much as I'd love to help develop a groundbreaking insect-_____ (derive) medicine, my main _____ (motive) for looking at insects in this way is conservation. I sincerely believe that all species, however small and seemingly _____ (significant), have a right to exist for their own sake. If we can shine a light on the darker recesses of nature's medicine cabinet, exploring the useful chemistry of the most _____ (diversity) animals on the planet, I believe we can make people think differently about the value of nature.