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

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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 DNAthat 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.