

## 小論文2 (英語の課題)

以下の文章を読んで、(1) その内容を100語程度の英語で要約し、(2) その内容についてのあなたの意見を100語程度の英語で述べなさい。全て英語で解答すること。

注 : empirical: 実証的な / purifying: (分離) 精製する / antibiotic resistance: 抗生物質耐性 / abscesses: 膿瘍 / poplar: ポプラ (樹木の総称) / deter: 抑止する / caesarean section: 帝王切開 / backslide: 逆戻りする

### 本文

While humans evolved over a period of approximately 6 million years, breakthroughs in modern medicine as we know it today began only in the 19th and 20th centuries. So how did humans successfully survive through millions of years of diseases and illnesses without modern drugs and treatments?

With the outbreak of COVID-19 pandemic, the requirements for **empirical** evidence and formal safety testing before the use of a treatment, have been set aside by many biomedical scientists. They have been searching for potential therapies from any sources, be it scientific or folklore. They were ready to try any experimental or traditional medicine and even wondered if there was a molecule in the traditional medicines that could be isolated to treat COVID-19.

Scientists have been looking for new drugs for various diseases by **purifying** existing compounds in nature instead of synthesizing completely new ones in the lab. From COVID-19 to **antibiotic resistance**, past successes, and new technologies point to the tremendous potential of developing new drugs from natural products.

Humans have coevolved with the rest of nature over time, and obtaining medicine is perhaps one of the most important interactions people continue to have with the natural world. DNA analyses have shown that early humans may have treated dental **abscesses** with **poplar**, containing the active ingredient of aspirin, and Penicillium mold, containing the antibiotic penicillin. Researchers call the molecules like the ones that give poplar and Penicillium their biological effects, natural products because they are produced by living organisms such as microbes, fungi, corals, and plants. These natural products have evolved to structurally serve biological functions, primarily to **deter** predators or gain a survival advantage in a particular environment and over other competitors.

Because natural products are already made to function in living creatures, this makes them especially attractive as a source for drug discovery. While proteins may look different in different organisms, many have similar structural features and functions across species. This can help ease the search for related proteins that work in people.

Natural products derived from microbes and plants are the biggest resource for drug discovery for modern medicine. For example, the discovery of the antibiotic penicillin in 1940 from Penicillium mold allowed doctors to treat previously fatal infections and started the era of antibiotics.

As of September 2019, over 50% of currently available FDA-approved drugs are either directly or indirectly derived from natural products. One of the best-selling drugs of the past two

decades is an anti-cholesterol drug, derived from the fungus *Penicillium citrinum*. Other examples of drugs derived from natural products used today include those made from the soil bacteria *Streptomyces nodosus*, those derived from the bark of the Pacific yew tree, and others from the fungus *Tolypocladium inflatum*. Undiscovered treatments for a wide range of diseases can still be found in natural products. Recently, researchers have been looking into natural products as a potential way to prevent or treat COVID-19.

Researchers are increasingly able to use new screening technologies and methods to isolate previously unidentified natural products. Screening for natural products typically involves looking through a large library of extracts from natural sources. However, discovering natural product-based drugs is challenging. Since the 1980s, natural products have fallen out of favor because of several challenges. These include difficulty accessing expensive screening methods, and limitations in technology that can't fully analyze the complexity of natural products. There are also ecological and legal considerations, such as accessing samples sustainably and maintaining biodiversity. Pharmaceutical companies have reduced their natural product-based drug discovery programs, and federal funding is also in short supply due to limited profitability.

New drugs are often necessary for unprecedented health emergencies like COVID-19. They are also needed for a health emergency that began long before the pandemic – antibiotic resistance. A September 2017 report from the World Health Organization reaffirmed that antibiotic resistance is a global health emergency that will seriously jeopardize progress in modern medicine. If current antibiotics lose their effectiveness, common medical interventions such as **caesarean sections** and cancer treatments may become incredibly dangerous. Transplantation could become virtually impossible. Antibiotic-resistant microbes were the direct cause of roughly 1.27million deaths in 2019.

The COVID-19 pandemic has reversed prior progress addressing this issue, with a 15% increase in antimicrobial-resistant infections from 2019 to 2020. Among the likely causes of this **backslide** were increases in antibiotic use, difficulty following infection control guidelines and longer hospital stays.

As of recent estimates, roughly 75% of approved antibiotics are derived from natural products. There are thousands of microorganisms both in the ocean and on land left to explore as potential sources of drug candidates. In the search for new drugs to combat antibiotic resistance and the pandemic, natural products may still be the way to go.

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