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Nobel Prize 2015 in medicine shared by three bioscientists

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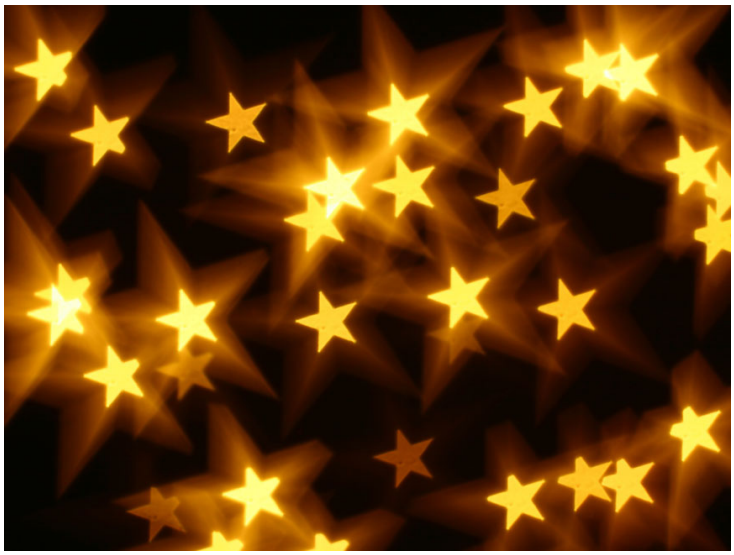

This year's Nobel Laureates have developed therapies that have revolutionized the treatment of some of the most devastating parasitic diseases. Dr William C. Campbell and Dr Satoshi ÅŒmura discovered a new drug, Avermectin, the derivatives of which have radically lowered the incidence of River Blindness and Lymphatic Filariasis, as well as showing efficacy against an expanding number of other parasitic diseases.

At the same time, Dr Youyou Tu discovered Artemisinin, a drug that has significantly reduced the mortality rates for patients suffering from Malaria. These two discoveries have provided humankind with powerful new means to combat these debilitating diseases that affect hundreds of millions of people annually. The consequences in terms of improved human health and reduced suffering are immeasurable.

The discoveries of Avermectin and Artemisinin have revolutionized therapy for patients suffering from devastating parasitic diseases. Therefore, it is beyond any doubt that Dr Campbell, Dr ÅŒmura and Dr Tu have transformed the treatment of parasitic diseases. Rightly so, the Nobel Prize 2015 jury decided to honor them with the Nobel Prize 2015 in physiology or medicine for doing amazing work that will have tremendous benefits for millions.

After decades of limited progress in developing durable therapies for parasitic diseases, the discoveries by this year's Laureates radically changed the situation. Satoshi ÅŒmura, a Japanese microbiologist and expert in isolating natural products, focused on a group of bacteria, Streptomyces, which lives in the soil and was known to produce a plethora of agents with antibacterial activities (including Streptomycin discovered by Selman Waksman, Nobel Prize 1952).

Equipped with extraordinary skills in developing unique methods for large-scale culturing and characterization of these bacteria, ÅŒmura isolated new strains of Streptomyces from soil samples and successfully cultured them in the laboratory. From many thousand different cultures, he selected about 50 of the most promising, with the intent that they would be further

analyzed for their activity against harmful microorganisms.

William C. Campbell, an expert in parasite biology working in the USA, acquired ÅŒmura's Streptomyces cultures and explored their efficacy. Campbell showed that a component from one of the cultures was remarkably efficient against parasites in domestic and farm animals.

The bioactive agent was purified and named Avermectin, which was subsequently chemically modified to a more effective compound called Ivermectin. Ivermectin was later tested in humans with parasitic infections and effectively killed parasite larvae (microfilaria). Collectively, ÅŒmura and Campbell's contributions led to the discovery of a new class of drugs with extraordinary efficacy against parasitic diseases.

Malaria was traditionally treated by chloroquine or quinine, but with declining success. By the late 1960s, efforts to eradicate Malaria had failed and the disease was on the rise. At that time, Youyou Tu in China turned to traditional herbal medicine to tackle the challenge of developing novel Malaria therapies. From a large-scale screen of herbal remedies in Malaria-infected animals, an extract from the plant Artemisia annua emerged as an interesting candidate.

However, the results were inconsistent, so Tu revisited the ancient literature and discovered clues that guided her in her quest to successfully extract the active component from Artemisia annua. Tu was the first to show that this component, later called Artemisinin, was highly effective against the Malaria parasite, both in infected animals and in humans. Artemisinin represents a new class of antimalarial agents that rapidly kill the Malaria parasites at an early stage of their development, which explains its unprecedented potency in the treatment of severe Malaria.

Diseases caused by parasites have plagued humankind for millennia and constitute a major global health problem. In particular, parasitic diseases affect the world's poorest populations and represent a huge barrier to improving human health and wellbeing.

The discoveries of Avermectin and Artemisinin have fundamentally changed the treatment of parasitic diseases. Today the Avermectin-derivative Ivermectin is used in all parts of the world that are plagued by parasitic diseases. Ivermectin is highly effective against a range of parasites, has limited side effects and is freely available across the globe.

The importance of Ivermectin for improving the health and wellbeing of millions of individuals with River Blindness and Lymphatic Filariasis, primarily in the poorest regions of the world, is immeasurable. Treatment is so successful that these diseases are on the verge of eradication, which would be a major feat in the medical history of humankind.

Malaria infects close to 200 million individuals yearly. Artemisinin is used in all Malaria-ridden parts of the world. When used in combination therapy, it is estimated to reduce mortality from Malaria by more than 20 percen overall and by more than 30 percent in children. For Africa alone, this means that more than 100 000 lives are saved each year.