Pioneers in Parasitology

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Sir Ronald Ross
13 May 1857 - 16 Sept 1932

Ross was an Indian-born British medical doctor. His discovery of the malarial parasite in the gastrointestinal tract of mosquito led to the realization that malaria was transmitted by mosquitoes, and laid the foundation for combating the disease.

In May 1895 he observed the early stages of malarial parasite inside a mosquito stomach. Then he was deployed to Bangalore, which was not endemic for malaria. However in April he had a chance to visit Sigur Ghat, where he noticed a mosquito on the wall in peculiar posture; he called it the “dappled-winged” mosquito. In July 1897, he managed to culture 20 adult “brown” mosquitoes from collected larvae. He successfully infected the mosquitoes from a patient named Husein Khan for a price of 8 annas. After blood-feeding, he dissected the mosquito and found an “almost perfectly circular” cell from the gut. On 20 August, 1887 he confirmed the presence of the malarial parasite inside the gut of mosquito, which was later identified as a species of the genus Anopheles.

In September 1897, Ross was transferred to Bombay and then to Rajputana (now Rajasthan). Frustrated due to lack of work he threatened to resign from service. It was only on the representation of Patrick Manson, the government arranged for his continued service in Calcutta on a “special duty”. He immediately resumed research in malaria and kala azar. He had no success with malarial patients because they were almost always immediately given medication. Manson persuaded Ross to use birds. By March he began to see results on bird parasites closely related to the human malarial parasites. Thus using the more convenient model of birds, he established the importance of mosquitoes as intermediate hosts in avian malaria. He discovered that the salivary gland was the storage site of malarial parasites in the mosquito and the parasites are released from it during biting. He later demonstrated the transmission of malarial parasite from mosquitoes (in this case Culex species) to healthy birds from an infected one, thus, establishing the complete life cycle of the malarial parasite.

Giovanni Battista Grassi
27 Mar 1854 - 4 May 1925

Grassi was an Italian physician and zoologist, most known for his pioneering works on parasitology, especially on malariology. He was the first to describe and establish the life cycle of the human malarial parasite, Plasmodium falciparum, and discovered that only female anopheles mosquitoes were capable of transmitting the disease. In a classic experiment, he dispatched volunteers to the Capaccio plains, a malaria-endemic area. In what was a controlled trial he compared disease rates in 112 volunteers who were protected against mosquito bites with 415 unprotected volunteers. Only five of 112 protected volunteers contracted malaria as against 100% of the unprotected volunteers. In 1898 he was able to produce the final proof of mosquito transmission of malaria when he fed local mosquitoes (A. claviger) on infected patients and found that uninfected individuals developed malaria through the mosquito bite. “Grassi’s Law”: infected man + anopheles mosquitoes = malaria. Although the equation is straightforwardly correct, the reverse implication is not so. In many areas, he noted that while

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anopheline vectors were abundant, malaria was infrequent and sometimes absent and concluded that there existed races of _Anopheles_ that did not play a role as vectors. This was proved in 1925, by his pupil Falleroni. Grassi was the first to demonstrate the life cycle of human dwarf tapeworm _Taenia nana_, as well as the fact that this tapeworm does not require an intermediate host. He was the first to demonstrate the direct life cycle of the roundworm _Ascaris lumbricoides_ by self-experimentation. He invented the genus of _Strongyloides_.

**William Boog Leishman**  
6 Nov 1865 - 2 Jun 1926

Leishman was a Scottish pathologist and British Army medical officer. He served in India, where he did research on enteric fever and kala-azar. He described a method of staining blood for malaria and other parasites—a modification and simplification of the existing Romanowsky method which became known as Leishman’s stain. In 1901, while examining pathologic specimens of a spleen from an English soldier stationed in West Bengal, and died of kala azar (now called _visceral leishmaniasis_), he observed oval bodies. But he mistook the parasite to be degenerate trypanosomes. In May 1903 Leishman published his discovery in the *British Medical Journal*, titled “On the possibility of the occurrence of trypanosomiasis in India.” On 17 June 1903 Donovan found the parasites (by then known as “Leishman bodies”) from the spleen tissue and in the blood of an infected young boy. Donovan identified the Leishman bodies as the causative agents of _kala-azar_. Donovan sent some of his slides to Ronald Ross and to Alphonse Laveran. Laveran identified the protozoan (and yet wrongly) to be members of _Piroplasmida_, and gave the scientific name _Piroplasma donovani_. It was Ross who resolved the conflict of priority in the discovery and correctly identified the species as member of the novel genus _Leishmania_. He gave the popular name “Leishman-Donovan bodies”, and subsequently the valid binomial _Leishmania donovani_, thereby equally crediting the two rivals.

**Patrick Manson**  
3 Oct 1844 - 9 Apr 1922

Manson was a Scottish physician who made important discoveries in parasitology. He is recognized as the “Father of Tropical Medicine”. Manson focused on searching for filarial parasites in blood taken from his patients. He thus began to reconstruct the life cycle of filarial parasites; and through painstaking observation discovered that the parasites were only present in the blood during the night and were absent during the day. “Manson observed that filaria only developed as far as an embryo within the human blood and that the mosquito must have a role in the life cycle. He conducted experiments on his gardener, Hin Lo, who was infected with filaria. He would get mosquitoes to feed on Hin Lo while he slept, then dissect these mosquitoes and finally express the blood contained in the stomach. Placing this under the microscope, he found that, the digestive juices of the mosquito had stimulated the parasites to fresh activity. Through these early experiments he started to hypothesise about the role of mosquitoes and the spread of disease. The discovery that the mosquito (Culex fatigans, now _Culex quinquefasciatus_) was the intermediate host of the filarial parasite ( _Wuchereria bancrofti_) was a medical breakthrough in 1877. Under the constant supervision of Manson, Sir Ronald Ross described the full life cycle of the malarial parasite (of birds) inside the female mosquito. Manson also demonstrated a new species of _Schistosoma_ (Bilharzia) known as _Schistosoma mansoni_. In 1882, he discovered sparganosis, a parasitic infection caused by the tapeworm _Spirometra_.

**References**