

Paul de Kruif, American science writer on malaria: a case study

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Abstract

From 1926 onward, science writer Paul de Kruif has popularized the history of great discoveries in the science of diseases, malaria among them. During the thirties he focused on abuses and neglects of medical care and pointed to new developments, *e.g.*, the treatment of syphilis with heat, rather than with malaria therapy. He conveyed his messages in popular magazines, using a romantic style and explicit language that was unheard of. He promoted new drugs, like Atabrine for endemic malaria and for the military engaged in (sub-) tropical war zones. Medical authorities were unhappy that his message about Atabrine was so dramatic, raising unwarranted hope of eradication. By the end of the Second World War, however, the usefulness of Atabrine was recognized.

In my research I consulted original sources: letters, articles and books of De Kruif, as well as contemporary scientific publications; recent books on malaria history helped to design the historiography. Paul de Kruif's dealing with various malaria topics is presented as a case study of science writing. Modern malaria research requires skilled journalists: they can excite public interest about problems in distant parts of the tropical world and work to raise funds. Journalists should also push for the translation of (bio-) medical progress to applicable tools in malaria control.

1 Introduction

In 1847 a group of Dutch pioneers struggled in the forests along the eastern shore of Lake Michigan to create the Holland Colony. Hundreds of people came from the Netherlands to enjoy religious freedom and economic possibilities. But that summer, within weeks of arrival, one after another fell ill with fever. They shivered and sweated, often in a pattern of one day on and one day off. The next summer with a growing population of two thousand settlers, mass illness started anew with this so-called Michigan ague, from which nobody was spared [1].

Among these colonists were the Dutch grandparents of Paul de Kruif. With the development of the town, the incidence of this tertian malaria (as it became known at the turn of the century) had dropped considerably and was no longer of public health significance. De Kruif, a twentieth-century champion of public health and a journalist, was well aware of the scourge of the Michigan fevers from which his predecessors had suffered [2].

De Kruif (1890-1971) in his lifetime, researched malaria extensively. He was trained as a microbiologist and did exploratory research, first at the University of Michigan, then as a US medical corps officer during the First World War in France; thereafter, he conducted research at the famous Rockefeller Institute for Medical Research in New York. He chose, however, to become a science writer. He wanted to teach the public about the great discoveries that improved

the state of health of the people. His book, *Microbe Hunters* (1926), became an overwhelming success and was translated into some twenty languages. It recounted the ways in which medical researchers and doctors like Pasteur and Koch had done their crucial experiments; it showed their endurance and sacrifices, as well as their breakthroughs. It was a new type of instructive entertainment for the reading public. In the thirties, he became a defender of the poor who could not afford or reach medical care. He launched and managed big rallies against tuberculosis, syphilis and polio. Public health meant for him that the poor had the right to professional care, and he trumpeted that idea around in various popular magazines, often in a rather challenging tone and wording. Time and again, he found the influential medical hierarchy on his heels, as we will see below.

The primary purpose of this article is to call attention to the value of popularization of science, and in this case of malaria research. Secondly, this article shows how well the problems of research, competition, jealousy, misunderstanding, publication, and priority can be illustrated by the history of malaria. This study also makes clear that a science writer should know his topics well, as physicians can be extremely sensitive when a journalist without a medical background treads on their domain, even though they themselves are not the journalist's target audience.

De Kruif dealt with malaria at three different levels. The first was the discovery of the transmission of the disease agent, recounted in *Microbe Hunters*. The second was the



Figure 1. Paul de Kruif, around 1932. Photo Doris Ulmann, courtesy Library University of Oregon, Special Collections, album 75.

use of the fever-causing malaria parasite as a means to alleviate the suffering of dementia paralytica among syphilis patients (neuroloues), and his subsequent dealings with the development of a fever machine. The third was his plea for the new drug Atabrine. Researching these stories convinced me of the influence Paul de Kruif has had on understanding medical history, on medical topicality and innovations, and on care for public health of the masses. Recounting these fragments of a popularizer's drive may help save him from disappearance out of the collective (American) memory.

2 Materials and Methods

The sources for this essay are the books and publications of Paul de Kruif, covering the years 1926-1960. I also turned to several collections of papers of his correspondents, as found in US libraries and archives. I read several contemporary scientific publications, and for the necessary historiographic touch, I consulted modern books on the history of malaria.

3 Results

3.1 An itching struggle

Chapter X in *Microbe Hunters* tells the story of the discovery of the transmission of malaria parasites that live in red blood cells. It was Ronald Ross, who found the clue in British India: the female mosquito which, after taking blood of a malaria patient, could deposit the parasite again

into other hosts. In 1897 Ross described the development of the parasite inside the body of the mosquito. Unfortunately, he had no patients to give the final proof and thus, he used birds and certain mosquitoes as models. The discovery was heralded as a great triumph for England. At the same time, however, an Italian researcher, Giovanni Battista Grassi demonstrated that human malaria could only be transmitted by mosquitoes of one particular genus, *Anopheles*. And Grassi claimed the final proof. It caused a bitter controversy that was further intensified by the fact that Ross alone was awarded the Nobel Prize in 1902; it haunted both men until their deaths.

De Kruif's British friend, the protozoologist Clifford Dobell, who knew both Ross and Grassi, recommended De Kruif read Ross' *Memoirs* (1923), with the remark "all lies." He was very critical of Ross "a very dirty dog" but somewhat less so of Grassi, "dirty, but not a dirty dog. He is a great zoologist, cut savage or almost rabid when roused. I believe he is honest..." The quarrel had never before been recounted by a neutral outsider, and realizing this, De Kruif conducted a thorough and careful research for this chapter. He wrote: "...unhappily for the Dignity of Science[they] were in each other's hair on the question of who did how much. It was deplorable. To listen to these two, you would think each would rather this noble discovery had remained buried, than have the other get a mite of credit for it. Indeed, the only consolation to be got from this scientific brawl-aside from the saving of human lives-is the knowledge that microbe hunters are men like the rest of us... Like two quarrelsome small boys they sat there."

De Kruif described medical history for a broad public-not as a contribution to academic history. He put words in the mouths of certain of his microbe hunters that they never spoke. For the lay readers this made his personalities real and the stories so fascinating. But for various referees this was intolerable, and none of the more recent historians, writing on the discovery of the transmission of malaria and its aftermath refer to this chapter. After reading *Microbe Hunters*, Dobell wrote: "It is an extraordinary achievement in popularization... I don't agree with all you say about Ross I know Ross better than you do, and far more about his work. You, it seems to me, have taken his 'Memoirs' too seriously. Many statements in them are downright lies"[4]. De Kruif had tried to be neutral in describing the quarrel. Yet, the outspoken views of his friend were rather penetrating, and he put Grassi in a light which was more sympathetic than Ross could stand.

When *Microbe Hunters* was to appear in Great Britain, Ross became outraged (as always when it came to Grassi) and wrote a protest article, entitled "Simian journalism" [5]. He joined some other offended colleagues in a disclaimer [6]. They threatened with a libel suit in Britain, and the London publisher, Jonathan Cape, had to leave out the chapter.

The American parasitologist Eli Chernin described this affair in some detail [7]. De Kruif wrote a response to some medical journals in which he revealed his sources in a restrained but decisive manner. For him that was the end of the affair, but he was the first to bring the highlights and all-time low points at the start of modern malaria to a lay public [8].

3.2 Malaria for syphilitics

After the success of *Microbe Hunters*, De Kruif went on visiting and interviewing doctors and researchers that had changed the world with their discoveries. His second dealing with malaria is described in his book *Men against Death* [9]. When on a trip through Europe in 1930, he took the chance of visiting old Professor Julius Wagner-Jauregg in Vienna. This psychiatrist had been watching over asylums with its patients suffering from general paralysis of the insane. It was the end stage of infection with a spirochete that causes syphilis. Even salvarsan, the "magic bullet" drug against syphilis of Ehrlich (chapter XII of *Microbe Hunters*) could not get the bodies of those doomed ones rid of the corkscrew microbe. Wagner-Jauregg had long been fascinated by the discovery that fever could save such people from their madness. Finally in 1917, he took blood from a soldier with tertian malaria (*Plasmodium vivax*), and injected some of his soon-to-die patients with it. After a period of high fevers, he then wiped out the malaria parasites with quinine, and some patients completely recovered from their state of dementia! He went on, now trying to give the "malaria fire" to patients in a less advanced stage of syphilis. Most of them went into remission, particularly after combining their treatment with salvarsan. He was rewarded with the Nobel Prize in 1927 for this discovery.

De Kruif listened with captivation to the retired alienist, because he knew well that by then, the "malaria therapy" had already found its way into hospitals throughout his home country. This method had several complicating factors: (1) the tertian parasite failed to give high fevers after repeated blood inoculations; (2) ethical considerations against injecting blood from one parietic to the other forced the institutions to start rearing and infecting mosquitoes for the transmission of the malaria parasite to patients, a rather specialistic job; (3) blacks responded poorly to *P. vivax* and for them the much more risky *P. falciparum* had to be used; and (4) salvarsan could not be used along with the malaria infection because it also killed these parasites, but only as a follow-up treatment.

De Kruif called the encounter with Wagner-Jauregg a turning point in his working life. It was because he knew about a parallel development in America, where physicist Willis Whitney was experimenting with induced fever, using a high frequency oscillator, the "radiotherm." Subse-

quently, Charles Carpenter found that animals developed fever with this machine, and if infected with spirochetes, the microbes would get killed [10]. In this model, when applied to human patients, the coup de grace for the heat-affected spirochetes was then given by the administration of salvarsan [11]. De Kruif told Wagner-Jauregg about it: "*In America there's the beginning of development of a new kind of fever-safe-that might replace malaria.*" The old Nobelist replied: "*You must tell me about it. It would be wonderful, ausserordentlich!*" It stirred De Kruif to hope to help further and improve that technique.

3.3 Heat treatment

And that hope came true when De Kruif visited Walt Simpson, a pathologist in Dayton, Ohio. Though the following episode no longer deals with malaria per se, it is a logical follow-up of the visit to Wagner-Jauregg. De Kruif vividly recounted the story in chapter twelve of his book *The Fight for Life* (1938). Dr. Simpson got interested in artificial fever in combination with chemical treatment. The research director of General Motors, Charles ('Boss') Kettering was consulted; he volunteered to have his people adapt the highly uncomfortable radiotherm so it would blow hot air over the body lying inside the cabinet, to let the sweat evaporate. De Kruif regularly took part in the experiments to refine the system. "*I was the first guinea pig, having the hell burned out of myself in the first crude air-conditioned GM radiotherm.*" Just by accident it was discovered that the short waves were not necessary, and moist hot air brought the body temperature up by itself. The Kettering Institute for Medical Research in Dayton delivered the first "hypertherm," and Simpson, Kendall and Rose had it developed into a safe and comfortable device that brought the body temperature to a steady 106°F (41° C). In 1937 General Motors constructed 100 machines, leased to hospitals without profit [12]. Some years later, Simpson and his co-workers were confident in stating that the heat-arsenic-bismuth treatment had a healing score at least as good as the malaria-plus-chemo approach [13].

In his book *Life among the Doctors* (1949), De Kruif told the success story of the wide scale application of a "one-day-cure" in Chicago during the Second World War. After syphilis-awareness rallies in 1942, army and navy men, and especially prostitutes could get a cure for free in the Intensive Treatment Hospital, for which De Kruif had helped raise funds. The campaign aimed at healthy but infected people, thereby preventing the spread of this feared disease. And De Kruif heralded the one-day cure in *The Reader's Digest* for a combined fever-arsenic-bismuth treatment [14]. The Kettering hypertherm was a great step forward, compared with the painful eighteen-month chemical treatment alone. Some medical voices ridiculed the system, but by the

end of 1943, nearly a thousand infectious men and women had received this intensive treatment on a voluntary basis. Then came penicillin which prevented the multiplication of the microbe and a four-barreled fever-arsenic-bismuth-penicillin treatment was launched. Chicago's syphilis rate of 7 percent in 1938 was brought down to 3.9 percent in 1947. The fever machine had saved thousands of lives and had prevented the spread of syphilis from which infected people would have otherwise languished away in a miserable state of body and mind. In the end penicillin completely took over both the malaria therapy and the hypertherm.

3.4 Atabrine

During the Great Depression, malaria made a strong comeback in the southern United States. Quinine was a terrific anti-malaria drug, but because it could not wipe out all parasites, malaria tended to come back, both in the individual and at population scale. One of the new drugs was "Atabrine", a German discovery, and like wildfire, beginning 1932, the little yellow pills spread over the tropical world [15]. In 1933, a trial was set up in Calhoun County, Georgia where 80 percent of rural schoolchildren had malaria parasites in their blood. Those without Atabrine suffered six times more malaria than those who took it. Additional trials were done by health commissioner Dr. M. E. Winchester in Glenn County that led to the decision to give a full course of treatment to all members of every family with any member malarious (1935-1936). Critical discussions about the activities of Winchester triggered the interest of science reporter De Kruif. He joined Winchester in McIntosh County, Georgia, where they questioned a black farmer about the effects of Atabrine: "*Now I feel like working. For the first time I want to work.*" He probably had had the parasite his whole life [16].

Malaria declined and some experts began to think that if mosquitoes could not be wiped out, they should try to break the chain by preventing parasites from infecting mosquitoes, "and malaria should disappear in a few years." De Kruif was advised, however, by his friend, Surgeon General for Public Health, Tom Parran, to "*make some additional checks before going overboard too enthusiastically about it*" [17]. De Kruif reassured Parran: "*My whole early life was spent in experimental science; if my stories were not founded upon an exhaustive examination of the facts obtained from their original sources, I would long ago have been discredited. I do want all the facts, Tom.*" Parran asked for a professional comment by the senior malariologist Dr. Louis L. Williams, and De Kruif received from him a lengthy letter on 19 March 1938. The point was that though Winchester had published that Atabrine prevented clinical malaria, the impression was made that he had con-

trolled malaria with the drug. Moreover, he had disqualified quinine as a prophylactic agent and suggested that the new drug was a very good alternative. Williams went a long way explaining that drug trials executed in the down slope of an epidemic or season may give too favorable an impression when comparing only two successive seasons. De Kruif informed Parran that his article would appear in June: "*Please remember that I do not advocate drug control to the exclusion of drainage and other anti-mosquito measures... I only tell of what Atabrine can do in those areas where mosquito control is impossible or not economically feasible I assure you that I have made a thorough study of the malaria question, and am prepared to defend the story before any group of malariologists.*" The full article and its shortened version did not cause further discussions [15].

Meanwhile, De Kruif was aware of the fact that Parran, in a wave of providence had asked the Winthrop Chemical Company to produce more than five million of these little yellow Atabrine pills [18]. After the US became engaged in the Second World War, De Kruif enthusiastically wrote "Enter Atabrine - exit Malaria." [19] American troops in the Pacific suffered badly because of lack of quinine, the source of which had been cut by the Japanese following their invasion of Java in 1942, from which at that time 90 percent of the world's quinine supply originated. Malaria brought about more hospitalization than all other causes combined, and Atabrine was a logical alternative. The article met, however, with immediate and severe criticism from medical authorities: one anonymous but obviously well-informed respondent, opposed the wording of eradicating the disease in malarious areas of the world by this drug [20]. This was carried further by Time Magazine in its issue of 1 Feb., 1943 [20]. Notably Dr. Lewis Weed, chairman of the Division of Medical Science of the National Research Council (NRC) protested to the editor of Reader's Digest, DeWitt Wallace, that the article was "*entirely erroneous*" and "*dispersed misinformation which is potentially quite dangerous to civilian health and the War Effort*" [21]. De Kruif responded with a carefully documented counter attack and sent this to all members of the NRC. DeWitt Wallace remained imperturbable through the attempts to murder the story, as De Kruif recalled later, particularly after seeing all the documentation that made him so sure of his case: an impressive amount of scientific evidence. De Kruif, in his written defence, signaled that some NRC members had alleged that Atabrine contained toxic substances. It was a hornet's nest and Dr. R.E. Dyer, director of the National Institute of Health, advised Parran to acknowledge only the receipt and not get involved in the controversy.

This wave of professional protests forced the Army to engage in a whole new screening program for Atabrine, thus redoing what other researchers all over the world had done before. Its report [22] gave De Kruif quite some satisfac-

tion, and he scribbled to Parran, "Tom! This winds up an interesting passage-at-arms with Weed!" Meanwhile, military doctors continued or resumed treating the soldiers with Atabrine, and also used it as a preventive drug against the debilitating and killing disease at the Asian and Mediterranean fronts. Rumors among healthy men about the drug lowering sexual vigor had to be dealt with, but in the end, the US Army Surgeon General stated that Atabrine was the greatest single contribution to the war effort. In its August 1944 issue, the *JAMA* published the NRC's revision of its former standpoint and declared that Atabrine was not dangerous and was in fact superior to quinine. The suspicious attitudes of the bureaucrats had cost time, lives, and money for the nation at war. But now, Atabrine was fully vindicated and implicitly (not explicitly!), so was De Kruif [23].

4 Discussion

These three episodes demonstrate that De Kruif extensively screened the scientific literature before he wrote on malaria. Of course, this is what one would expect of a serious science writer. Though he wrote for the general public, he was challenged, attacked, and criticized by health professionals on many occasions. Another criticism was his use of plain language and his urge to fight the conservative medical establishment. Thus, his adversaries were easily provoked to protest the medical writings of one who was not even a doctor (merely a PhD), and who often used implausible headings, like wiping out or stamping out a disease. But that was exactly how he could attract the interest of his people ("Malaria, scourge of mankind CAN be licked"). Since the Ross-Grassi quarrels, priority conflicts have haunted medical science (on polio vaccines, Salk versus Sabin), and particularly when the Nobel Prize was involved (on HIV-AIDS, Gallo versus Montagnier). Such controversies should not be covered up, but brought into the open by science writers.

Writing about medical history or actuality did not make De Kruif a source that historians consider worthy. Apart from Chernin, himself an amateur historian, De Kruif is not quoted in the American literature about malaria [24]. He is quoted neither on the Ross-Grassi controversy (of which he was the first layperson who published about it in detail [25]), nor on the subject of Wagner-Jauregg (from whom he received first-hand information on malaria therapy for paretics [26]), or on his stimulating role in the development and application of artificial fever for patients. Heat treatment for killing spirochetes is now obsolete, and neurosyphilis is no longer a public health problem, thanks to penicillin and public awareness. His pleas for Atabrine to protect military personnel at the various fronts in malarious areas also did not make it to the official records of medical history. Notably, Leo Slater, who in his recent book *War and*

disease, deals extensively with Atabrine, does not mention De Kruif and the stir he provoked among American malarialogists and medics [27]. His adversaries were right that eradication of malaria with a single drug was not possible. But he parried these attacks by focusing on Atabrine as a useful drug for the prevention and cure of military personnel in combat.

Meanwhile, Atabrine has been replaced by other drugs and malaria has disappeared from the western world (not thanks to drugs!). Yet, De Kruif's concern with people suffering from malaria (and syphilis) or risking infection, did have an impact on medical policy makers in the United States. Paul de Kruif, part of medical history himself, qualifies as a spokesman of medical history, public health, and the breaking of medical news for a broad public—a calling that he pursued until 1960.

5 Conclusion

Science journalism is an indispensable means to make research progress understandable for the public at large. It stimulates the political and public discourse. It helps make the connection between discoveries and their applications and facilitates raising funds. Science writing is no prime business of researchers, and often it causes clashes with tacit or prudent scientists, because the messages are considered premature, imperfect or too promising. De Kruif was a unique phenomenon as popularizer of medical matters. He recounted heroic stories in a romantic, plain, and appealing style. He suggested innovative research activities and applied the results in rallies to control diseases. He felt the necessity to inform the reading public about new medications. Through him, the American public became more self-confident in their relations with doctors. Yet, he made mistakes and his writings may have been focused too much on "hope". Careful science writing is a profession in its own right and more professionals are needed for malaria—to clarify the complexity of the disease, explain the possibilities for control, and amplify the requirements for elimination. Paul de Kruif is history as well. What remains are the lessons, taught by the study of history.

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