

PHARMACEUTICS

Artemisia, Malaria, and the Red Queen

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The Chinese medicinal plant *Artemisia annua* has been a popular choice for relief of fever for centuries, and the

World Health Organization (WHO) recommends artemisinin-based combination therapies (ACTs) for the treatment of uncomplicated malaria caused by *Plasmodium falciparum* (2). A shortage in the availability of artemisinin in late 2004 (3) led the U.S. Agency for International Development (USAID) to support *Artemisia* cultivation in Africa. It was in that context that agricultural economist Dana Dalrymple prepared a USAID briefing paper that has subsequently grown through frequent revisions into the e-book *Artemisia annua, Artemisinin, ACTs and Malaria Control in Africa*. As with its predecessors, Dalrymple has released the work without copyright and made it freely available online. In its most recent version, the book incorporates selected updates through to March 2013.

At present, about 90% of the deaths due to malaria occur in WHO's African region (4). So it is appropriate that the book, in an informal style, provides an accessible introduction to malaria control from the African perspective. Although he focuses on Africa, Dalrymple notes that *Artemisia* has long been a traditional remedy for a range of ills (including malaria) and that during the 1970s Chinese researchers demonstrated the qualities of the purified extract artemisinin. He rightly acknowledges the act of "global public good of the first order" the Chinese performed in sharing their knowledge with the world.

Dalrymple combines an overview of the scientific literature with a repository of per-

sonal communications and contributions from members of the *Artemisia* community. He provides readers with a broad history that

spans the discovery of artemisinin, efforts to encourage *Artemisia* cultivation in Africa, and initiatives to increase the availability of ACTs in countries where malaria is endemic. His account sometimes reads like the collective memoirs of a community, and in places it feels like a working document awaiting updates. Yet this approach offers a fascinating insight into how this particular subject has unfolded.

The author cites over 1400 references and relates some of the key developments from research between 2006 and 2012—notably semi-synthetic artemisinin and the

Artemisia annua, Artemisinin, ACTs and Malaria Control in Africa:

Tradition, Science and Public Policy

by Dana G. Dalrymple

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Original source. *Artemisia annua*.

commercial availability of high-yield hybrid *Artemisia* seed. He does not, however, set out to provide a definitive review of specialist scientific publications in the field. As one might expect given his background, Dalrymple focuses not on the specifics of scientific advancement per se but rather on the sometimes complicated interplay among public policy, economics, and social science in using these advancements to improve public health. He stresses the importance of placing research results within a holistic approach to malaria prevention and cure. Acknowledging the complexities therein, he calls for "individuals with, or representing, a more comprehensive view of malaria control" to address the "epidemiological, medicinal, and macroeconomic issues" he has identified.

The book raises conundrums in the use of *Artemisia* and artemisinin for readers to ponder. Dalrymple does not provide answers; rather he notes that "[i]n this sense, this paper ends up not far from where it started." *Artemisia* was originally a Chinese medicinal herb, harvested from the wild and administered as a tea by local communities. Dalrymple suggests that its necessary transition to a regulated, commercial product (ACT) raises complexities in intellectual-property management of "impure public goods, ones that incorporate both public and private dimensions." Furthermore, he quotes scientists who question a reliance on plant products in 21st-century society while acknowledging both the importance of *Artemisia* agriculture in Africa and the opportunities presented by natural products and their derivatives in addressing health care needs. Dalrymple provides readers with sufficient insight to become frustrated by the many challenges associated with achieving effective malaria control and stabilizing the ACT supply chain, but he often leaves them to form their own conclusions about the possible solutions.

Artemisia annua, Artemisinin, ACTs and Malaria Control in Africa has far outgrown its humble origins and perhaps is now best considered as an *Artemisia* community record, albeit one that continues to rely on Dalrymple to provide coordination,

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perspective, and expert comment. The book also provides a thorough introduction to the challenges of malaria control—which Dalrymple likens to the advice the Red Queen gives Alice in Lewis Carroll's *Through the Looking-Glass*: “Now, here, you see, it takes all the running you can do, to keep in the same place.” If the book encourages readers (especially specialists) to consider new, multidisciplinary approaches to tackling malaria, Dalrymple will consider his continued efforts a success.

References and Notes

1. Available at www.mmv.org/newsroom/publications/artemisia-annua-artemisinin-acts-malaria-control-in-africa.
2. www.who.int/malaria/publications/world_malaria_report_2012/en/.
3. www.who.int/mediacentre/news/releases/2004/pr77/en/.
4. www.who.int/malaria/world_malaria_report_2011/en/.

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HEALTH CARE

Behind What Doesn't Make Sense

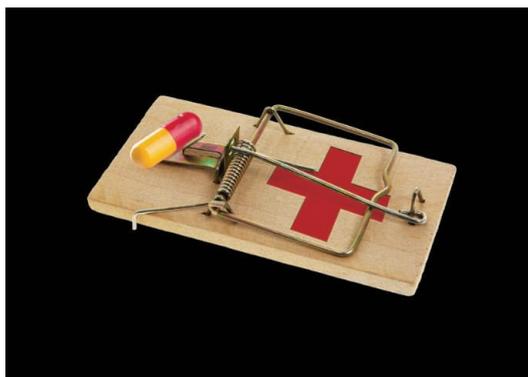
Richard S. Mathis

I often tell my children to be careful when they interact with the health care system, because it is not always rational. Tests may be ordered that aren't necessary, procedures recommended that are harmful, and mistakes made that could have been prevented.

You would think that health care in the United States would be very different. Isn't it delivered by highly trained, intelligent professionals who have years of education and sizable resources at their disposal? Yet we Americans can hardly call our health care system a model of efficiency and rationality. Although 18% of our gross domestic product is spent on health care, our health outcomes do not compare favorably with those of other developed countries. We are typically close to the bottom of the list on measures related to mortality and morbidity.

It is tempting to attribute the shortcomings of our system to a single villain. Private insurance companies, the government, and pharmaceutical manufacturers have all had

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their turns. But what if the problem goes a little deeper? What if it involves such factors as the way individuals make decisions? Douglas Hough's *Irrationality in Health Care* provides an interesting perspective on the topic. Hough (an economist at Johns Hopkins University) uses the tools of behavioral economics to understand why certain areas of irrationality exist. This fairly new school of economics differs from the mainstream, neoclassical approach, which assumes that people are rational and act in their own best interests. Behavioral economics draws on contemporary psychology and acknowledges that people are often not rational. People don't always try to maximize their happiness through a utility function that enables them to choose wisely among available goods and services.

Irrationality in Health Care
What Behavioral Economics Reveals About What We Do and Why

by Douglas E. Hough
Stanford University Press,
Stanford, CA, 2013. 311 pp.
\$39.95. ISBN 9780804777971.

Instead, their decisions are often made based on trial and error and a current situation that acts as reference point. Purchasers buy differently, for example, if they are “shown a more expensive house before a less expensive house, a fully equipped car before a stripped-down model, a fifty-two-inch LCD [liquid crystal display] television before a more modest set.”

Hough constructs his consideration around a list of 23 anomalies in health care that are not rational and, therefore, cannot be explained by neoclassical economics. Some of these anomalies cover issues that people in health care frequently wonder about—such as why the public supports specific aspects of health care reform but not the Patient Protection and Affordable Care Act containing those provisions, why patients insist on getting a prescription when they visit a physician, and why doctors can take a long time to adopt new treatment regimens and checklists. Other anomalies spotlight some of the most controversial issues

in medicine, such as why there was an uproar in November 2009 when the U.S. Preventive Services Task Force recommendations for screening mammography were released.

Behind such anomalies are quirks in the way that people tend to think and feel. For example, people tend to fear loss more than they appreciate gain and to overreact to the prospect of getting something for nothing. Thus, although they may support such Affordable Care Act provisions as prohibiting

insurance companies from denying coverage due to preexisting conditions or setting lifetime limits on the total amount paid out for an individual's health care, they fear that the law will reduce coverage and take away services they perceive to be free. These factors tend to trump those driving support. The same is true of establishing guidelines that appear to limit a woman's receiving mammography screening below 50 years of age. Even though the guidelines clearly state the rationale for the recommendation, the public outcry was deafening.

Other tendencies that can influence decision-making include action bias, poor decision-making when faced with too many choices, and overoptimism when remembering compliance with rules and recommendations. Such inclinations contribute to patients insisting on prescriptions, consumers finding it difficult to reach a decision when provided with several health insurance options, and physicians misremembering how many times they washed their hands throughout the day.

Hough carefully avoids using behavioral economics as an explanation of all things rational and irrational in U.S. health care. He is also realistic about the current status of behavioral economics as a “young and imperfect science.” Recognizing the limitations of the advancing field, he does an excellent job of applying it to well-known conundrums. The book could have been improved had the author listed all of the factors that contribute to irrationality in one place. That would have been a better use of space than including in the book the text of his interviews with physicians and economists. Although meant to shore up his points, those prove somewhat distracting. My minor criticisms, however, should not dissuade either health care practitioners or members of the public from reading *Irrationality in Health Care*. Both will find the book well worthwhile.

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