Chapter 2

Naturally Occurring Antineoplastic and Cytotoxic Agents

“Instead of assuming that the mediaeval pharmacist was a benighted fool, we might wonder whether there was not sometimes a justification for his strange procedure.”

G. Sarton

The earliest applications in cancer treatment of materials derived from natural products probably began with the development of man’s reasoning abilities. The general use of medicinal plants has been known for at least 60,000 years. Remains of a human body and plants placed in an Iraqi cave at that time have recently been found. Seven of the eight pollens discovered were identified as from medicinal plants. The Egyptian medical papyri, particularly the Ebers Papyrus of approximately 1550 B.C., describe the use of plant materials for afflictions assumed to be cancer. Such recorded references begin with the Chinese Shen-Nung of the period 2838–2698 B.C., but these materials were probably well known much earlier. Indeed some of this information still forms an integral part of traditional Chinese medical treatment, and a variety of plant extracts are currently in use as supportive measures for contemporary cancer treatment. In this regard, modern development in China of medicinal agents from plants is greatly influenced by Mao’s view that “Chinese medicine and pharmacology are a great treasure

G. R. Pettit, Biosynthetic Products for Cancer Chemotherapy
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house and must be explored and raised to a higher level.” While a member of the U.S. Academy of Sciences medical and pharmacology delegation to the People’s Republic of China in 1974, this writer was pleased to see that quotation prominently displayed in the Peking Institute of Materia Medica, where new cancer chemotherapeutic agents are being developed.

From the valuable and comprehensive survey of plants employed in primitive cancer treatment begun by Hartwell in the 1950’s and completed in 1971, we know that 17 medical works containing plant extract treatments for cancer were written prior to the year 50 B.C. In the same timeframe Hippocrates (460–349 B.C.) may have been the first to use the word carcinoma. And the use of an arsenic paste for the treatment of cancer had already been described in the Ebers Papyrus. From the second century A.D., 18 works have been preserved describing the use of plants in cancer treatment. Another 45 summaries of plants for cancer treatment are known for the period to about A.D. 1000, 50 to about A.D. 1300 and 95 more proceeding on into the 19th century. Fortunately, because of the remarkable preservation and location of these valuable accounts of primitive medicine and more recent collections, we can estimate that more than 3,000 different plant species have found use in the primitive treatment of cancer. Many additional plant species are mentioned in letters written to the National Cancer Institute. These include some 600 letters received at the time of former Secretary of State John Foster Dulles’s fatal struggle with cancer.

Other early approaches to cancer treatment include the caustic pastes and cautery of Hippocrates and the first cancer surgery (including mastectomies), performed by Celsus in the first century A.D. One of the first recorded attempts to use a single substance for cancer chemotherapy is attributed to Lissauer. In 1865, he reported remissions in chronic leukemias resulting from the use of potassium arsenite (Fowler’s solution). Unfortunately this first step in modern cancer chemotherapy does not seem to have received much attention, but such advances probably did move Gurin (in Kiev) in 1908 to write,