FIGURE 1-3: Mass-production of medication, 1944.
(From the Library of Congress Prints and Photographs Division, Washington, D.C.)

TABLE 1.1 U.S. Casualties in Major Wars

War	Number Serving	Battle Deaths	Disease and Accidents
Civil War	2,213,363	140,414	224,097
Spanish-American War	306,760	385	2,061
World War I	4,743,826	53,513	63,195
World War II	16,353,659	292,131	115,185

Source: U.S. Department of Justice

in the U.S. Army was 18% during World War I, decreasing to 1% during World War II. Death from combat injuries complicated by infections also decreased.

With the discoveries of new drugs like penicillin that could save millions of lives, the belief grew that new drugs must be better than old standard herbs and treatments, especially if created or refined in a scientific manner. Pharmacology therefore advanced rapidly in the second half of the 20th century as many new drugs were either discovered or developed. In an effort to discover possible new drugs, researchers studied plants, marine animals, and micro-organisms in soil, water, and air. Partially or totally synthesized medications were produced by combining two or more compounds or elements. Partially synthesized medications were made by adding a pure chemical to a natural substance. Totally synthesized medications were created by combing two or more pure chemicals to produce a new substance that could be used as a medication. One major breakthrough was the discovery of ways to create large amounts of viable drugs from a small amount of natural resources using genetic engineering. For example, human insulin can be mass-produced by adding the human insulin gene to a nonpathogenic strain of *Escherichia coli*.

Pharmacology in the 21st Century

In the 21st century science is booming. One of the most promising advances in the field of medications is that of pharmacogenetics, which is the "study of individual candidate genes as powerful tools to explain interindividual variability in drug response." In other words, the patient's genetic material is analyzed, and then in the case of cancer, the tumor's genetics are analyzed to figure out the best drug and what dosage will work best to combat the disease. Currently there are certain medications and doses used to treat conditions for every adult patient with that condition. Through these advances in pharmacogenetics, the ability to individualize drugs and their dosage is happening in the treatment of HIV and rheumatoid arthritis. In addition, the hope is that in the future we can specifically tailor drugs and dosages for opioids and antihypertensives among other medications.

SOURCES OF DRUGS

Although most drugs are now manufactured in laboratories, many agents are still derived from natural substances such as plants, animals, minerals, and toxins. Some are utilized by extracting active ingredients from animals or plants and using these ingredients to manufacture a medication. Other times