Table 2. Interactions Between Smoking and Drugs Presumably Based on Alterations in Drug Metabolism.

Analgesics
Propoxyphene—higher rates of "ineffective" responses
Antipyrene—increased hepatic metabolism
Phenacetin—lower plasma levels
Pentazocine—higher maintenance dose needed

Tricyclic Antidepressants
Imipramine—increased clearance rate

Xanthines
Theophylline—significantly accelerated metabolism

Tranquilizers
Diazepam—CNS depression less frequent (probably due to increased rate of metabolism)
Chlorpromazine—reduced drowsiness

Diagnostic Tests

A number of studies have established the importance of considering a patient's smoking status in interpreting reports of diagnostic tests. There are clear differences between smokers and nonsmokers in "normal" blood levels of several factors. Most of these differences relate directly to the amount of smoking and disappear after the person stops smoking. Interpreting test results without taking into account the patient's smoking history in some cases could lead to incorrect diagnoses or inappropriate therapy.

A dramatic example of differences between smokers and nonsmokers involves carcinoembryonic antigen (CEA), which in nonsmokers can be an important aid in the diagnosis of colon cancer.[9] Clinicians need to use particular care when interpreting assay results on smokers, however, because CEA levels in smokers may reach the same high levels observed in patients with proven colon cancer.[10]

A number of studies have found higher concentrations of circulating white blood cells in smokers than in nonsmokers, although all the subjects were healthy and completely free of any symptoms of infection or other disease conditions that tend to raise white blood cell counts. These differences between what is normal for smokers and nonsmokers holds true for all ages from 15 to 79, in both sexes, and in all races.[11]

In all groups studied, it also was clear that the heavier the smoking, the higher the white cell count. The quantity smoked, inhalation practices, and duration of smoking history all relate directly to the leukocyte count.[11] Smokers who inhale also have a greater average number of leukocytes than those who do not, regardless of the amount they smoke. The count also is higher in light smokers who inhale than in heavy smokers who do not.[12]

Other significant altered diagnostic values in smokers are increases in hemoglobin concentration, hematocrit, and mean corpuscular volume.[13] The high levels of carbon monoxide in cigarette smoke reduce the oxygen-carrying capacity of the blood, so that smokers apparently adapt by increasing the red cell mass and hemoglobin concentration. As with the changes smokers experience in their normal white blood cell level, the degree of increase in hemoglobin concentration in smokers is not sufficient by itself to lead to a false diagnosis that a healthy person is ill. But cigarette smoking should be appreciated as a factor in producing incremental differences in these diagnostic tests.

The scientific literature includes reports of several other tendencies for different normal values on clinical tests in smokers and nonsmokers, but there are inconsistencies in research results. For healthy, smoking individuals, these findings probably may not be significant, but physicians may find the data helpful in handling certain illnesses. For example, several studies suggest that smoking reduces clotting time by potentiating platelet aggregation. The coagulation time of smokers' whole blood during a nonsmoking period was significantly shorter than that of nonsmokers.[14] Although this effect may have little importance for most patients, it could provide significant incentive to stop smoking for a patient who already has had a thrombosis or other clotting problems.

Treating and Preventing Nutritional Deficiencies

Interactions between macro- and micronutrients and tobacco are significant for pregnant patients because of the fetal malnutrition associated with smoking. Studies in both the United States[15] and Britain[16] demonstrate that babies born to smoking mothers are smaller and have greater risk of perinatal mortality. Partially responsible for their babies' low birth weight may be the impairment of mothers' protein metabolism, as well as lower levels in maternal blood of amino acids, vitamins B_{12} and C, glucose, and fatty acids. In addition, it is postulated that the smoking mothers' higher levels of carboxyhemoglobin and nicotine may decrease to some extent oxygenation of the fetus.

Scientists have known since 1939 that smoking causes changes in blood levels of certain nutrients, which may help to explain certain adverse effects of smoking on health. Since there has not yet been research to identify clearly such cause and effect relationships, the Surgeon General's Report considered only those nutrients for which there is a clearly understood interaction with smoking.

On the macronutrient level, investigators have found alterations in both carbohydrate and protein metabolism frequently associated with smoking. Both epidemiological and clinical nutrition studies established the smoking-carbohydrate interaction: Smoking raised blood levels of somatotropic hormone and plasma catecholamine—changes with significant implications for carbohydrate metabolism.[17] Smoking also appears to impair protein metabolism, reducing smokers' efficiency in retaining nitrogen.[18]

Smokers may also have increased needs for micronutrients compared to nonsmokers, which include: vitamin C, vitamin B_{12}, vitamin B_6, and bone minerals. Decreased plasma levels in vitamin C due to smoking are well-established,[19] although the exact mechanism has not