

Characteristic points of an electrocardiogram are the P wave, reflecting atrial depolarization; the QRS-complex, representing the ventricular muscle depolarization; and the T-wave, reflecting ventricular muscle repolarization. In the normal electrocardiogram, the ST segment is isoelectric, resting at the same potential as the interval between the T wave and the next P wave. Horizontal depression or a downsloping ST segment merging into the T wave occurs as a result of ischemia, ventricular strain, changes in the pattern of ventricular depolarization or drug effects. In chronic ischemic heart disease, there may be moderate degrees of horizontal ST-segment depression or a downward sloping ST segment, flattening or inversion of T waves and prominent U waves. It is difficult to define an abnormal ST-segment depression in precise quantitative terms. However, a myocardial ischemia has to be considered if the beginning of the ST segment is more than 0.5 mm (corresponding to 0.05 mV) below the isoelectric line, and there is an associated T-wave abnormality (Wilson et al. 1991).

Allred et al. (1989a,b; 1991) conducted a multicenter study of effects of low COHb on 63 individuals with coronary artery disease. Male subjects aged 41-75 (mean = 62.1 years) with stable exertional angina pectoris (diagnosis established for more than 3 months; no at-rest symptoms) and a positive stress test (measured by a greater than 1-mm change in the ST segment of the electrocardiogram and occurrence of angina symptoms) were studied in three test centers using standardized test protocols. Only patients showing reproducible effects before and after a test stay in the exposure chamber on the qualifying visit were included. On the subsequent exposure days, the stress test was repeated before the exposure and, if the result was not reproducible compared with the qualifying visit, the visit was repeated on another date; at the second failure in the pretest, the subject was dropped from the study. Further evidence that these subjects had coronary artery disease was provided by the presence of at least one of the following criteria: angiographic evidence of narrowing (~70%) of at least one coronary artery, documented prior myocardial infarction, or a positive stress thallium test demonstrating an unequivocal perfusion defect.

All patients were tested three times on separate days in a double-blind fashion. On each of the 3 exposure days, the subject performed a symptom-limited exercise test on a treadmill (pretest) and was exposed for 50-70 min randomly to air and to CO. (Subjects were exposed to CO concentrations that were experimentally determined to produce an end-exposure COHb of 2.2% or 4.4%; these COHb values were 10% higher than the targeted concentrations to compensate for the CO loss during exercise). Afterward, the subject performed a second symptom-limited exercise test. The mean exposure levels and ranges for the test environment were clean air (0 ppm), 117 ppm (range 42-202 ppm) for a COHb of 2%, and 253 ppm (range 143-357 ppm) for a COHb of 4%. Gas chromatographic measurements of COHb were performed 1 min after the pretest, after 30 and 40 min into exposure, at the end of exposure, and 1 min after the