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Variations in the affinity of hemoglobin for carbon monoxide in health and disease.

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It is known that the affinity of hemoglobin for carbon monoxide varies slightly in different individuals and even more in the blood of various species. But the possibility of variations in human blood under conditions of health and disease has not received special consideration.

Bloods from normal individuals and selected hospital cases in whom the percentage of hemoglobin varied from 38 to 110 per cent. were examined.

In each case the blood was equilibrated in vitro at 20° C. with known concentrations of carbon monoxide in atmospheric air and the carbon monoxide-hemoglobin dissociation curve of the blood determined.

From the curves the oxygen-carbon monoxide affinity ratio was computed by the following formula:

$$\text{Affinity CO} = \frac{TO_2 \times \text{CO per cent.} \times \text{affinity } O_2}{(100 - \text{CO per cent.}) \times TCO}$$

when TO_2 = the tension of O_2 (2,100 when expressed in parts per 10,000 of air).

TCO = the tension of CO (expressed in parts of carbon monoxide in 10,000 of air) at any given point in the carbon monoxide dissociation curve of the blood.

CO per cent. = percentage saturation of the blood at a given tension of CO.

Affinity O_2 and affinity CO = the relative affinity of O_2 and CO for the blood when affinity for O_2 = 1.

The results obtained are shown in the following table. It will be noted that (1) the carbon monoxide variations in the oxygen-

carbon monoxide affinity ratio of all bloods examined fall between 1 : 254 and 1 : 378, and (2) these variations bear no relation to the hemoglobin percentage of the blood nor to the age and condition of the subject.

Subject.	Age.	Sex.	Condition.	Hemoglobin.	Affinity at 20° C.
				Per cent.	
H. S.	59	Male	Pernicious anemia	38	1 : 310
M. G.	27	Female	Pernicious anemia, recent transfusion	60	1 : 323
W. F.	38	Male	Diabetes mellitus	60	1 : 310
J. B.	28	"	Pulmonary tuberculosis	80	1 : 286
M. H.	3	Female	Broncho pneumonia	80	1 : 298
H. C.	31	Male	Chronic endocarditis	85	1 : 323
E. K.	12	"	Lobar pneumonia	85	1 : 254
M. M.	14	Female	Diphtheria (convalescent)	85	1 : 275
M. B.	48	"	Tumor of spinal cord	85	1 : 364
F. B.	53	"	Mucous colitis	85	1 : 323
S. C.	8	"	Tuberculosis of hip joint	90	1 : 275
E. G.	30	Male	Diabetes mellitus	100	1 : 323
F. W.	20	"	Normal	100	1 : 286
M. G. T.	30	"	"	100	1 : 378
R. M. W.	23	Female	"	100	1 : 378
A. L. P.	36	Male	"	105	1 : 364
Y. H.	46	"	"	110	1 : 275
H. W. H.	28	"	"	110	1 : 323

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The elimination of carbon monoxide and a method of acceleration.

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Carbon monoxide combines with hemoglobin with an affinity about 300 times as great as that of oxygen for hemoglobin. Blood is deprived of its oxygen-carrying power by combining with CO and the organism suffers from a corresponding degree of anoxemia. The severity of the damage done to the victim is dependent upon the degree of anoxemia and especially upon the duration. Evidently the rate of elimination is extremely important.

A study has been made of the normal rate of elimination in dogs gassed to 60 to 80 per cent. saturation of the hemoglobin with