LETTERS TO THE EDITOR

AN EXAMINATION OF NITROGLYCOL POISONING IN AN EXPLOSIVES PLANT

OXIDATION RATE OF OXYHAEMOGLOBIN BY SODIUM NITRITE

In the previous papers,^{1,2)} the oxidation of oxyhaemoglobin by sodium nitrite was investigated and its process was found to be consisted of two phases, the lag and the methaemoglobin forming phase. Some intramolecular modification of haemoglobin molecule caused by various medicaments and poisonous substances showed a considerable effect on the lag phase or on both the lag and the methaemoglobin forming phase.³⁾

In the presence of nitroglycol, rabbit oxyhaemoglobin showed the increase of the oxidation rate in the lag phase, although the rate in the methaemoglobin forming phase did not change. From this fact an intramolecular modification of haemoglobin caused by nitroglycol was supposed.³⁾ In fact, in the examination of the workers exposed to nitroglycol in a dynamite plant⁴⁾ and in an experimental study of nitroglycol poisoning in rabbit, a considerable increase of oxygen affinity of haemoglobin, which might be resulted by the intramolecular modification of haemoglobin, was observed.⁵⁾ These facts suggest that the haemoglobin of the workers who exposed to nitroglycol may show some abnormality in the oxidation of oxyhaemoglobin by sodium nitrite.

The oxidation rate of oxyhaemoglobin of the workers in a dynamite plant was measured at the conditions of 0.05 mM oxyhaemoglobin, 2.0 mM sodium nitrite, pH 7.23 and 25°C according to the method described previously.^{1,2)} The results were shown in Table 1. The subjects of No. 1-24 are now employing in nitroglycol works and those of No. 25-32 are in non-nitroglycol works, who were removed from nitroglycol works being supposed to be suffered with nitroglycol poisoning one or more years ago. The mean value of the normal was obtained from ten healthy men of our institute.

As seen from the table, the value of τ , the time length of the lag phase, of dynamite workers was considerably small comparing with the normal, while the value of v , the methaemoglobin forming phase, was nearly the same with the normal. These results coincided well with those obtained by the experiments *in vitro*.³⁾

On the other hand, neither τ nor v value of No. 25-32 were different from the normal. In regard to haemoglobin, therefore, it may be probably

OXIDATION RATE OF OXYHAEMOGLOBIN

Table 1. The oxidation rate of oxyhaemoglobin of the workers in a dynamite plant.

Subject No.	τ (Seconds)	v (μ M/Second)
1	31.6	1.69
2	45.0	1.52
3	46.2	1.49
4	33.5	1.71
5	28.4	1.75
6	31.3	1.64
7	42.1	1.46
8	30.1	1.69
9	39.7	1.48
10	20.4	2.12
11	31.1	1.58
12	34.8	1.50
13	33.6	1.68
14	34.5	1.67
15	22.7	1.98
16	28.5	1.78
17	37.1	1.64
18	26.5	1.81
19	42.3	1.55
20	25.4	1.89
21	36.1	1.60
22	35.8	1.59
23	46.2	1.49
24	46.2	1.77
25	39.6	1.58
26	40.2	1.84
27	41.4	1.56
28	43.2	1.49
29	42.6	1.52
30	44.4	1.42
31	42.6	1.52
32	48.0	1.39

Mean values

Subject No.	τ (Seconds)	v (μ M/Second)
1-24	34.5	1.67
25-32	42.7	1.54
Normal value	42.0 ± 1.48	1.60 ± 0.071

Oxyhaemoglobin of workers was prepared as follows : 1 ml of heparinized blood was washed enough with 0.9% sodium chloride solution and haemolyzed with 2 ml of deionized water. Clear haemoglobin solution obtained by centrifugation was purified through a G-25 Sephadex column of 1cm² × 20cm. The rate of oxidation was measured at the conditions of 0.05 mM oxyhaemoglobin, 2.0 mM sodium nitrite, pH 7.23 and 25°C.

No. 1-24: Workers in nitroglycol works.

No.25-32: Workers removed from nitroglycol works to non-nitroglycol works one or more years ago.

The normal values were obtained by examining 10 healthy laboratory workers in our institute.

recognized that they have recovered to the normal by keeping off from nitroglycol.

Thus, this method described above may be useful for the early detection of abnormal haemoglobin caused by various poisons.

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