10944

Comparison of the Influence of Anoxia and Asphyxia on Blood Sugar.*

E. GELLHORN AND A. PACKER.

From the Departments of Physiology and Psychiatry, University of Illinois College of Medicine.

In a preceding investigation, Gellhorn and Lambert[1] showed that the effect of a mixture of low oxygen and excess carbon dioxide is more effective in raising the blood pressure than would be expected from an algebraic summation of the effects of the 2 gases when studied separately. It was observed that this potentiating effect was present not only in the normal animal but also in dogs deprived of their buffer nerves. It seemed to us of interest to investigate whether a similar synergism could be observed with regard to the blood sugar effect. The investigations of Kellaway[2] have shown that in the unanesthetized cat low oxygen increased the blood sugar considerably, whereas the inhalation of carbon dioxide alone has no such effect. The mixture of the 2 gases was, however, not tested.

Eighteen experiments were carried out on 9 unanesthetized rabbits. Each experiment consisted of 3 observations obtained at one week intervals in which the effect of the inhalation of 7% O_2, 5.4% CO_2, and 7% O_2 plus 5.4% CO_2 respectively was studied for a period of 90 minutes. It was found invariably that the inhalation of 5.4% CO_2 had no significant effect on the blood sugar of rabbits. As Table I shows, the effects of 7% O_2 are slight and vary widely in different experiments. It was found, however, almost without exception, that when the low oxygen mixture was inhaled together with excess carbon dioxide, the blood sugar rose considerably higher than was observed in the same animal when subjected to low oxygen alone. The average rise in the blood sugar was 8.1% after the inhalation of 7% O_2 but 29.4% after the inhalation of 7% O_2 + 5.4% CO_2. An example of the individual records may be found in Fig. 1. It will be noted that the gas mixture low in O_2 and rich in CO_2 not only increased the blood sugar considerably more than the algebraic summation of the effects of the 2 factors alone but also that the

* This work has been aided by a grant from the John and Mary Markle Foundation.

1 Gellhorn, E., and Lambert, E. H., *The Vasomotor System in Anoxia and Asphyxia*, The University of Illinois Press, Urbana, 1939.

2 Kellaway, C. H., *J. Phys.*, 1919, **53**, 211.

TABLE I.
Percentage Rise of Blood Sugar After 1.5 Hours.

A 7% O	B 7% O + 5.4% CO_2
+10	+64
+26	+28
+12	+64
— 2	+41
+ 4	+30
+ 3	+ 4
+ 2	+19
+ 1	+ 6
± 0	+43
— 7	+ 1
+28	+39
+ 7	+38
+16	+17
+17	+35
+ 9	+25
— 3	+22
+21	+42
+ 2	+11
—	—
Avg + 8.1	Avg +29.4

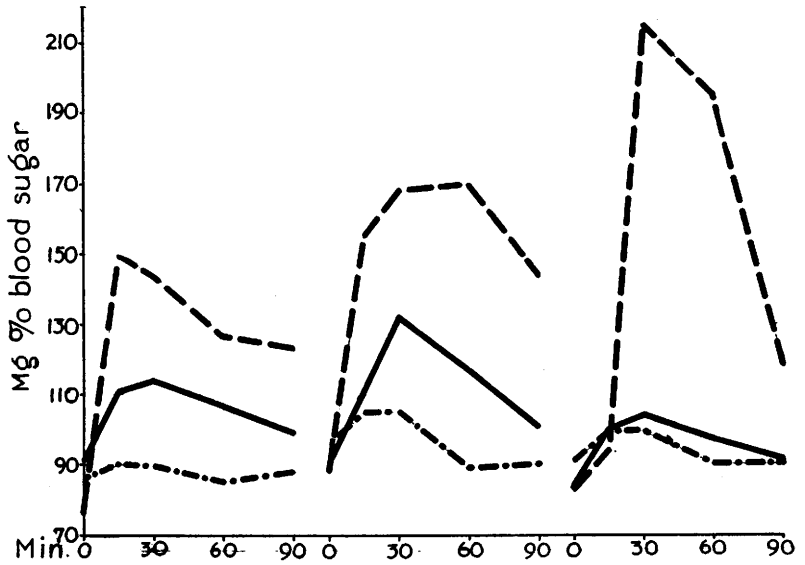

FIG. 1.

The influence of CO_2 and oxygen lack on the blood sugar of rabbits. The gases were administered from Douglas bags for 90 minutes.

Abscissa: Time in minutes.

Ordinate: Blood sugar in mg%.

———— During inhalation of 7% O_2.

—.—.—.—. " " "5.4% CO_2.

— — — — " " "7% O_2 + 5.4% CO_2.

effect of the combination of gases is more prolonged than is observed in experiments in which each of the gases alone was used.

Summary. Experiments on unanesthetized rabbits show that although the inhalation of 5.4% CO_2 has practically no effect on the blood sugar when used alone, it greatly increases the effect of the inhalation of 7% O_2 on the blood sugar.

10945

Effect of Season (Temperature) on Blood Lipids.*

O. B. HOUCHIN AND C. W. TURNER.

From the Department of Dairy Husbandry, University of Missouri, Columbia, Mo.

In a previous paper[1] it was shown that an AP extract injected into New Zealand White female rabbits caused a significant depression of the plasma fat as determined by the Allen[2] method. Both the normal animals and the normal preinjection samples of blood from experimental animals showed rather large variations in plasma fat. Casual observations indicated that the lipid changes might be due to temperature changes accompanying the various seasons of the year. Further examination of our data indicated a rather definite drop in the plasma fat values during the increasingly cool weather in the fall, whereas the highest values appeared to be obtained during the hottest weather of the summer. On the other hand, previous studies on the seasonal variation in the blood lipids of the cow[2] and rabbit[3] did not indicate significant trends. The animals included in these studies were probably under fairly uniform temperature control in northern summer climate and housed during winter time. Recent study with the guinea pig[4] indicates an increased use of fat for maintenance under cold environment which condition might be expected to reduce the level of the blood lipids. Yet in the presence of an increased demand for fat, it would be possible for the blood lipids to remain high if the underlying mechanism regulating lipid metabolism was effective.

* This study has been aided in part by grants from the Committee on Research in Endocrinology of the National Research Council. Contribution from the Missouri Agricultural Experiment Station, Journal Series, No. 630.

1 Houchin, O. B., and Turner, C. W., *Endocrinology*, 1939, **24**, 638.

2 Allen, B. N., *Minn. Agr. Exp. Sta. Bul.*, No. 130, 1938.

3 Boyd, E. M., *Can. J. Res.*, 1938, **16**, 31.

4 Kayser, C., *Compt. Rend. Soc. de biol.*, 1939, **126**, 701.