

VARIATION OF BLOOD GLUCOSE IN MAN AT SIMULATED  
ALTITUDES BETWEEN 10,000 FT AND 30,000 FT IN  
DECOMPRESSION CHAMBER

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It is well known that flying at high altitude causes both mental and physical exhaustion. Cumulative effect of subacute Hypoxia was suggested as the cause by some workers, but repeated blood gas analysis and estimation of percentage of oxygen saturation by photo-electric method failed to present any evidence to that effect (Armstrong 1952). Similarity between the syndrome of anoxia and that of hypoglycemia, as far as C.N.S. is concerned has been proved (Earnest Gellhorn 1938). It has also been shown by the same author that hypoglycemia sensitizes the C.N.S. to anoxia. Because of the significance of hypoglycemia in the etiology of fatigue, investigation of lowered blood sugar level at lowered barometric pressure seemed indicated. Result of previous investigations carried out (Angelo and Forbes) failed to show any change of blood sugar when subjects were exposed to moderately low altitude (8,000 to 10,000 ft) for a long duration.

**Object.**

The object of this investigation was to assess the influence of reduced barometric pressure on blood glucose level and to correlate the variations of blood glucose level, if any, with the onset of flying fatigue at altitude between 10,000 ft and 30,000 ft.

**Method.**

Subjects of different trades were selected from the local Air Force Station. They were of 20-28 years of age. No dietary restrictions were imposed on the previous day of the experiment. It was not possible to control the thermal condition of the chamber, but it was adequately ventilated during the run.

Group of four subjects reported after breakfast at 09.30 hours and blood was collected every half an hour for two and half hours on the ground level for blood sugar estimation. Further observation on blood sugar level was made at various simulated altitudes upto 15,000 ft according to a definite programme. (Table 1).

TABLE - I—BLOOD GLUCOSE LEVEL IN MG. PERCENT OF SUBJECTS

Altitude	Subject No. 1		Subject No. 2		Subject No. 3		Subject No. 4	
	Cham-ber	Ground	Cham-ber	Ground	Cham-ber	Ground	Cham-ber	Ground
Base before exposure	54	84	84	90	78	76	110	64
5,000	74	114	70	104	92	64	80	80
10,000	54	74	84	100	74	56	80	72
15,000	60	74	90	80	92	60	110	50
Base on arrival	54	88	96	120	84	60	100	80
Base after $\frac{1}{2}$ hr.	52	100	90	80	80	56	104	68

The blood sugar levels at various barometric pressures on subjects resting in Decompression Chamber. All subjects had taken normal breakfast. Figures under head 'ground' represent their true blood sugar levels on the previous day at the corresponding hours.

Twelve subjects were exposed to different simulated altitude from 15,000 ft to 30,000 ft. Blood was collected before exposure, immediately on arrival to pre-determined altitude, then three half hourly samples for  $1\frac{1}{2}$  hrs. during their stay to that particular altitude and again on their arrival to ground level within five minutes. (Table II)

Glucose tolerance test was done on six subjects at the ground level and compared with blood sugar level at 20,000 ft and 25,000 ft on the subsequent day under identical experimental conditions. Estimation of blood glucose level was carried out by Folin & WU method (King). (Table III)

TABLE - II

(True blood sugar levels at different barometric pressure with oxygen. Subjects had normal breakfast, engaged in light standardised activity during exposure in Decompression chamber)

Altitude	Subjects	Before exposure	On arrival	$\frac{1}{2}$ hr.	1 hr.	$1\frac{1}{2}$ hr.	Base
15,000	1	74	96	102	102	108	108
	2	110	104	114	104	104	90
20,000	1	80	90	108	100	86	86
	2	92	120	112	104	90	70
25,000	1	70	72	68	70	78	80
	2	74	78	92	86	86	90
30,000	1	60	72	68	72	64	72
	2	68	64	64	62	70	66
	3	100	110	80	90	86	92
	4	90	104	98	98	92	96
	5	90	84	106	100	98	102
	6	86	62	70	64	62	62

TABLE - III

(Glucose tolerance tests on ground and at 20,000 and 25,000 ft. simulated height in the Decompression chamber for 2½ hours)

Subjects	Fasting	½ hr.	1 hr.	1½ hr.	2 hr.	2½ hr.	
1	66	102	118	114	120	90	Ground
	85	145	118	120	114	104	20,000 ft
2	94	162	138	106	70	84	Ground
	70	152	76	84	80	74	20,000 ft
1	96	100	94	92	92	79	Ground
	78	118	100	102	98	104	25,000 ft
2	76	110	100	92	72	70	Ground
	74	104	112	94	70	70	25,000 ft
3	75	88	112	88	88	82	Ground
	80	98	100	100	80	74	25,000 ft
4	88	116	140	88	95	82	Ground
	90	120	100	—	—	—	25,000 ft

### Discussion

The analysis of the result shows that there is a wide variation of blood sugar level from person to person, but in no individual the sugar level showed any evidence of Hypo or hyperglycemia. Comparison of tolerance curves indicate that return of the blood sugar level to the preingestion value occurred, approximately at the same time, both on the ground and at simulated altitudes.

### Conclusion

No significant change from the ground level condition occurred in the blood sugar level of resting human subjects maintained at simulated altitude between 10,000 ft to 30,000 ft if oxygen was used.

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