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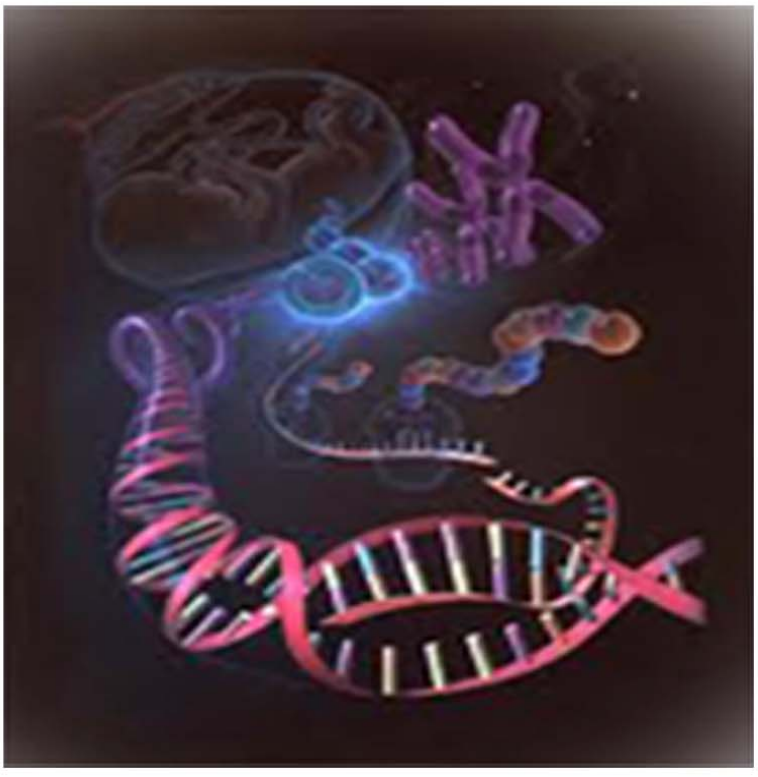

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Research Paper

EFFECT OF INTERMITTENT GLUCOSE SUPPLEMENTATION ON ENDURANCE PERFORMANCE DURING PROLONGED ACTIVITY OF BODY MUSCLES

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From this study, it is revealed that blood glucose level get decreased due to extensive work for 1.5 hours (90 minutes) in place-bo condition. In the place-bo study, the mean blood glucose before the commencement of work was 90.2 ± 4.684 mg / dl. (Mean ± SD, n=20) and after the work it was found to be 82.05 ± 1.04 mg/dl. In the next day, glucose solution (6mg/500ml/Kg body weight) was given, 30 minutes after the commencement of the work. In this case, increase was seen of about 16.05 ± 1.79 (Mean ± SD, n=20). In the further study, glucose supplement was given twice (at the interval of 30 minutes and 50 minutes). In this case, the increase of blood glucose in this case was reported to be 18.95 ± 2.53 mg/dl. It was reported to be higher than the previous case. In the last study, glucose supplementation was made thrice (30, 50 and 70 minutes) In this case, the increase was reported to be 19.06 ± 1.53 mg/dl. (Mean ± SD, n=20). From the above results, it was found that highest increasement of blood glucose was observed when glucose supplements were given at three times (30 min, 50 min and 70 minutes after the commencement of the work) during the extensive work.

Keywords: Intermittent glucose supplementation, Place-bo study, Blood glucose level

INTRODUCTION

Today, sports have become inseparable phenomenon of our social life. It has made its own place at the apex of human civilization because of its trial, competitive event and improving nature. The acquisition of new knowledge for betterment of performance of human organism in relation to physical, motor and physiological qualities is in process of saturation. The million dollar question is one such area that plays a critical role in process of continuous sports performance-improvement. Physiological

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aspects of exercise in sports are gaining much attention among sports administrators.

Physical Education is the process by which changes in the individual are brought about through his movement experiences. Over the decades, the society in general has realized the need for keeping fit and healthy through organized physical activity programmes. Considering the importance of endurance in athletics and every day life, it was thought desirable to conduct a study regarding the improvement of work efficiency during prolonged performance by supplementation of glucose in different times of the work.

METHODOLOGY

20 "Cross Country" runners who had represented West Bengal state for national "Cross Country" Championship, age ranging between 23-26 years had been selected as subject randomly. In Place bo trial supplementation of single dose (saccharine mixed water) was given to the individuals after at 30th minutes of run. Supplementation of a single dose (glucose mixed water) was administrated at 30th minutes of run. Supplementation of double doses of glucose mixed with water was administrated at 30th and 50th minutes of run. Supplementation of triple glucose mixed water was given at 30th, 50th and 70th minutes of run. In previous three cases, the dose of the given glucose was 6mg in 500 ml / Kg body weight. Blood glucose, was tested by latest scientific Autoanalyzers. Those instruments were available in clinical centers MEDILAB, 23 Raja S.C. Mallick Road, Garia, Kolkata-84 and SERUM, Bidhan Sarani, Shyambazar, Kolkata-6.

To ensure that the investigator was well versed with the technique of conducting the tests, the investigator had a number of practice session in testing procedure, under the guidance of experts from Doctors Diagnostic and Research Centre, Kolkata Tester reliability was established by test – retest process where by consistencies of result were obtained by product moment correlation method. Estimation of blood glucose was done following the method (glucose oxidase-peroxidase method) of Barham and Trinder (1972), and Henry (1963).

The tests were conducted in the early morning (6.30 am) all those days. Subjects were well informed about the day and time of tests. They were also advised to have a comfortable life style during entire study period.

In all the four days of the testes the subjects were suppose to run for 90 minutes continuously at a pace of 400 meters (one lap of the standard track). They are advised to run the distance within two and half minutes.

The first day of the test was the Placebo trial. In that day, subjects were run in a notion that they were supplied with glucose mixed water but virtually only saccharine water (without any amount of glucose) were supplied at 30th minutes of run.

On the second day of the test, subjects were supplemented glucose mixed water (6 mg in 500ml / Kg body weight, at 30th minute of the run.

On the third day of the test the subjects were supplemented to glucose mixed water at 30th and 50th minute of run. The glucose was supplemented to the subjects in a proportion of 6mg in 500ml / Kg body weight. During this time same 500ml was given twice during the endurance performance.

On the fourth day of the test the subjects were supplemented glucose mixed water at 30th, 50th and 70th minutes of run. The glucose will be supplemented to the subjects in a proportion of 6mg in 500ml / Kg body weight. During this time same 500ml was given thrice during the endurance performance. The data thus collected were subjected to statistical analysis for the conclusion.

RESULTS

From this study, it is revealed that blood glucose level get decreased due to extensive work for 1.5 hours (90 minutes) in place-bo condition. In this condition, a mild dose of saccharine was given to the objects so as to minimize the psychological effect. They thought that they are provided with glucose, before the work. It is essential because psychological condition may affect the work performance and blood glucose level.

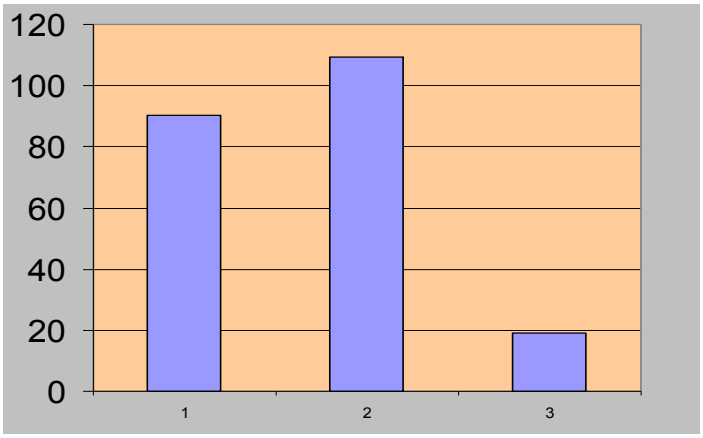
In the place-bo study, the mean blood glucose before the commencement of work was 90.2 ± 4.684 mg / dl. (mean ± SD, n=20) and after the work it was found to be 82.05 ± 1.04 mg/dl. The difference was 13.25 ± 1.63 mg/dl.

In the next day, glucose solution (6mg/500ml/ Kg body weight) was given, 30 minutes after the commencement of the work. The blood sugar content was measured before and after the extensive work. It was found that blood glucose level before the commencement of the work was 90.3 ±1.08 mg/dl and after the work it is 106.00 ± 3.94 mg/dl. So, increase was seen of about 16.05 ± 1.79 (Mean ± SD, n=20), (Table 1).

In the further study, glucose supplement was given twice during the extensive work. It was at the interval of 30 minutes and 50 minutes after the commencement of the work.

In this case, glucose solution was given at the rate of 0.3 gm/500ml/Kg body Wt. after 30 minutes and 50 minutes. The amount of blood glucose level was measured before and after the commencement of the work. It was found that level of blood glucose before and after the experiment was 90.26± 1.46 mg/dl (mean ± SD, n=20) and 109.21 ± 2.03 mg/dl (mean ± SD, n=20), respectively. Therefore, the increase of blood glucose in this case was reported to be 18.95 ± 2.53 mg/dl (Figure 1). It was reported to be higher than the previous case (Table 1).

Figure 1: Increase of Blood Glucose Level During Double Dose of Glucose



Note: 1 = Before Work; 2 = After Work; 3 = Change.

Table 1: Change of Blood Glucose Level During the Study Period

Experiments	Blood glucose level before the commencement of the work (mean ± SD, n=20)	Blood glucose level after commencement of the work (mean ± SD, n=20)	Difference (mean ± SD, n=20)
Place-bo condition	90.26 ± 4.68 mg / dl.	82.05 ± 1.04 mg/dl.	(-) 13.25 ± 1.63 mg/dl.
Gucose supplement single time	90.3 ±1.08 mg/dl	106.00 ± 3.94 mg/dl.	(+) 16.05 ± 1.79 mg/dl.
Glucose supplement twice	90.26± 1.46 mg/dl	109.21 ± 2.03 mg/dl	(+) 18.95 ± 2.53 mg/dl.
Glucose supplement thrice	91.36± 1.47 mg/dl	110.42 ± 0.39 mg/dl	(+) 19.06 ± 1.53 mg/dl.

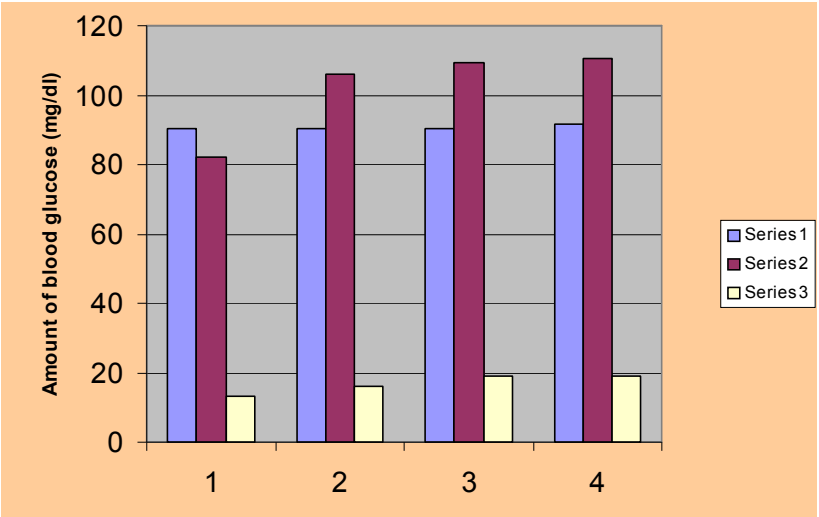
Note: (+) = Increase, (-)= Decrease.

In the last study, glucose supplementation was made thrice during the extensive work. First supplement was given after 30 minutes, second one was given after 50 minutes and third supplement was given after 70 minutes from the commencement of the work. In this case, glucose supplementation was given at the rate of 2mg / 500ml/kg body wt. at the interval of 30, 50 and 70 minutes from the commencement of the work.

The amount of blood glucose was measured before and after the commencement of the work. It was found that the level of blood glucose before and after the extensive work was 91.36± 1.47 mg/dl and 110.42 ± 0.39 mg/dl respectively. The increase was reported to be 19.06 ± 1.53 mg/dl. (mean ± SD, n=20) (Figure 2 and Table 1).

So, from the above results, it was cleared that gradual increase was seen during the experiments. It was found that, highest increase was observed when glucose supplements were given at three times (30 min, 50 min and 70 minutes after the commencement of the work) during the extensive work (Table 2).

Figure 2: Changes in the Blood Glucose Level During the Entire Study



Note: 1 = Place-bo; 2 = Single Dose; 3 = Double Dose; 4 = Triple Dose; and Series 1 = Before Work; Series 2 = After Work; Series 3 = Difference.

Table 2 : Increase or Decrease of Blood Glucose Level During Prolonged Work

No. of individuals	Age (Year)	Weight (Kg)	Difference Before-After Work (Place-bo)	Difference Before-After Work (Single dose)	Difference Before-After work (Double dose)	Difference Before-After work (Triple dose)
1	26	59	-12	(+)19	(+)19	(+)14
2	24	56	-11	(+)17	(+)14	(+)11
3	25	52	-15	(+)16	(+)16	(+)14
4	25	59	-13	(+)14	(+)10	(+)15
5	25	59	-10	(+)15	(+)18	(+)13
6	26	58	-11	(+)18	(+)16	(+)16
7	26	52	-14	(+)19	(+)17	(+)17
8	26	55	-15	(+)16	(+)19	(+)14
9	24	55	-12	(+)17	(+)11	(+)13
10	25	56	-16	(+)15	(+)12	(+)16
11	25	51	-13	(+)13	(+)17	(+)17
12	25	58	-14	(+)14	(+)13	(+)18
13	25	59	-16	(+)17	(+)18	(+)13
14	24	53	-12	(+)18	(+)16	(+)14
15	25	54	-14	(+)19	(+)19	(+)16
16	24	62	-13	(+)15	(+)12	(+)15
17	25	58	-15	(+)16	(+)19	(+)14
18	24	56	-14	(+)14	(+)17	(+)19
19	24	52	-13	(+)17	(+)16	(+)17
20	23	55	-12	(+)18	(+)10	(+)14

Note: (+) = Increase, (-)= Decrease.

ANOVA analysis of the given data shows that μ_o (Hypothesis) = μ_1 = μ_2 = μ_3. It means that intermittent glucose supplement has no definite effect on the increase of blood glucose level and work efficiency. Three observations are independent.

Sources of variables	df	Tr.S.S (Treatment sum of square)	M.S.S. = SS/df	F
Treatment	4–1=3	9524.738	3174.912	$\frac{3174.912}{167.341}$
Error	76	12717.988	167.341	
Total	80–1=79	–	–	F = 18.972

Correction factor (Cf) = (G^2/N) = 1540.012

Treatment sum of square (Tr.S.S) = 9524.738

Total sum of square (T.S.S) = 12717.988

Error SS (ESS) = T.S.S–Tr.S.S = 3193.25

So, Critical value of F, in α=0.05 and 0.01 level of significance is 2.01 and 2.67 respectively (df = 79). Our calculated F value is 18.972. It clearly indicates that the μ_0 is rejected. Therefore, we can say that intermittent glucose supplement has definite effect on the increase of blood glucose level and work efficiency.

't'-test was performed to known the variables are independent or not. When it was performed in between place-bo data and 'single dose' data, the result was t = 10.25, it is well beyond the critical value (At 5% level of significance, Critical value = 2.093, df = 19). It showed that level of blood glucose is dependent on glucose supplementation. 't' test was performed between double dose and place bo results. The result was t = 9.36. It was well beyond the critical value (At 5% level of significance, Critical value = 2.093, df =19). Therefore, the two variables are dependent to each other. 't' test was performed between place-bo and triple supplementary glucose dose. It was found that t=10.23. It was well beyond the critical value (At 5% level of significance, Critical value = 2.093).

Therefore increase of blood glucose level is directly dependent on the glucose supplementation.

DISCUSSION

Lancaster, *et. al.* (2003) reported that prolonged strenuous exercise is immuno suppressive and this may account for the increase incidence of upper infection following endurance.

Jeukendrup and Jenetjens (2000) reported that carbohydrate feeding during exercise improves endurance performance. They also reported that not all carbohydrates are oxidized at similar rates and they may not be equally effective. Fructose, galactose and amylase have been shown to be oxidized at 25-50% lower rates. While, glucose was reported to be more effective regarding this matter. Therefore, out present observation is similar with the previous observations.

Coggan and Coylee (1991) reported that during first hour of exercise, most of the energy is derived from muscle glycogen. They also reported that the contribution of muscle glycogen decreases over time as muscle glycogen stores become depleted and that blood glucose uptake and oxidation increase progressively to maintain –CHP oxidation. During prolonged performance, blood can potentially provide all of the–CHO energy needed to support the exercise. In our present study, It is also revealed that intermittent glucose supplementation can increase blood glucose level during prolonged extensive activity. Therefore, the present result confirms the previous observations.

Febbraio and Stewart (1996) reported that intermediate glucose supplementation increases the power of endurance performance. Therefore our present findings confirms the previous observations.

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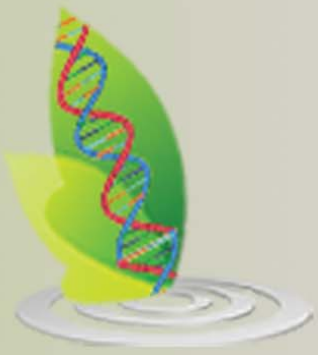

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