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Effect of acute exercise on electrolyte response among trained and untrained men

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Abstract
The study was undertaken to analysis the acute effect of aerobic exercise an electrolyte response among trained and untrained men. To achieve the purpose fifteen All Indian Inter University place holders from football, kabaddi and netball teams were selected as trained group and fifteen then students were selected from Department of Education, English and Political Science, Annamalai University, who did not participated any sports activity as untrained group. Their age ranged between 20 to 24 years. The blood sample of 5 ml from each subjects, were collected before exercise and immediately after the exercise. The subjects were performed 15 minutes running on treadmill. The samples were analysed by ion sensitive techniques (serum) with the help of AUL 983 electrolyte analyzer. To assess exercise induced changes paired 't' test was used before and after exercise and ANOVA was employed to findout significant variations on exercise induced rise in electrolytes for trained and untrained groups. The level of confidence was fixed at 0.05. Acute effect of aerobic exercise significantly reduce the electrolyte level in the muscles and internal fluids for bath trained and untrained man loss of electrolytes can result in heat cramps or muscle cramps.

Keywords: acute exercise, electrolyte response, trained, untrained men

Introduction
The minerals sodium, potassium and chlorine are collectively termed electrolytes because they are dissolved in the body as electrically charged particles called ions. Sodium and chlorine are the chief minerals in blood plasma and extra - cellular fluid. Potassium is the chief intracellular mineral. The most important function of the mineral electrolytes sodium and potassium is their role in establishing the proper electrical gradients across cell membranes. This electrical difference between the interior and exterior of the cell is required for the transmission of nerve impulses, for the stimulation and contraction of muscle and for the proper functioning of glands. The electrolytes are also important in maintaining the permeability of the cell membranes and controlling the balance between the acid and base qualities of the body fluids, especially the blood.

The sweat composition not only varies among individuals, but it can also vary within the same individual depending on the rate of sweating, the level of fitness and the state of head acclimation [1]. In cool conditions, sweet losses may be high when the exercise intensity is high or the duration long [2]. In warmer environment, sweat losses can be substantially greater, causing a reduction of as much as 8% in body mass during a marathon [3]. There are, however, some puzzling aspects; where the sweat rate is sufficient to keep the skin wet, further increases in the sweat rate will increase the amount of water that drips from the skin without evaporation but will not further increase the rate of evaporation heat loss [4].

In spite of the variations that do occur, the major electrolytes in sweat, as in the extra cellular fluid, are sodium and chloride, although the sweet concentrations of these ions are invariably lower than those in plasma [5]. Contrary to what might be expected, an increased concentration of sodium and chloride in sweat content with increased flow; this was attributed to a reduced opportunity for reabsorption in the sweat duck because of the more rapid transit through the duct [6].

A proper balance of electrolytes between the intra cellular and extra cellular fluids not only ensures normal nerve conduction, but also ensures neuromuscular irritability to stimuli, muscle

contractility, energy metabolism, cardiac conduction of impulses, bone growth, regulation of blood volume, and normal kidney functions [7]. Maintenance of plasma calcium level within the normal range is of vital importance because, certain fundamental process like membrane permeability, neuromuscular excitability and coagulation are dependent on the plasma calcium level [8].

The homeostasis of Na^+, K^+ and Cl^- are also interrelated. Chloride is important in the formation of hydrochloric acid in gastric juice. Chloride ions are also involved in chloride shift. Excretion of Cl^- through urine is parallel to Na^+ renal threshold. A major function of these electrolytes is to modulate fluid exchange within the body's various fluid compartments [9].

Electrolytes and athletic performance is an area of special interest among sports scientists. Research in this area will evolve to develop apt techniques to minimize the negative aspects of electrolyte loss, thereby enhancing the efficiency of the human machine especially in the field of sports where peak level performance is the ultimate aim. The purpose of the present investigation was to compare the effect of acute exercise on selected electrolytes response among trained and untrained men.

Methodology

The purpose of the study was to find out the effect of acute exercise on electrolytes (sodium, potassium and chloride) response among trained and untrained men. To achieve the purpose fifteen All Indian Inter University place holders from football, kabaddi and netball teams were selected as trained group and fifteen then students were selected from Department of Education, English and Political Science, Annamalai University, who did not participated any sports activity as untrained group. Their age ranged between 20 to 24 years. The blood sample of 5 ml from each subjects, were collected before exercise and immediately after the exercise. The subjects were performed 15 minutes running on treadmill. The inclination of treadmill was set at 5 per cent and speed was gradually increased to 10 km/hr. The samples were analysed by ion sensitive techniques (serum) with the help of AUL 983 electrolyte analyzer, present at RMMCH, Annamalai University. To assess exercise induced changes paired 't' test was used before and after exercise and ANOVA was employed to findout significant variations on exercise induced rise in electrolytes for trained and untrained groups. The level of confidence was fixed at 0.05.

Results

Table 1: Analysis of changes on electrolytes as a result of acute exercise between trained and untrained men

Variables		Trained group		Untrained group		SOV	S.S.	df	M.S.	F
		Before exercise	After exercise	Before exercise	After exercise					
Sodium (M Eq/L)	$\bar{x}$	140.55	142.39	139.17	141.86	B	0.51	1	0.51	0.266
	Mean gain	1.85		2.69		W	53.28	28	1.90	
	't'	5.80*		6.72*						
Potassium (M Eq/L)	$\bar{x}$	4.35	4.63	4.47	4.81	B	0.155	1	0.155	0.841
	Mean gain	0.28		0.34		W	3.84	28	0.135	
	't'	2.29*		2.72*						
Chloride (M Eq/L)	$\bar{x}$	101.63	102.78	102.43	104.01	B	1.32	1	1.32	2.89
	Mean gain	1.15		1.57		W	14.77	28	0.53	
	't'	7.60*		7.24*						

T.V. = ('t' = 2.14) (F = 4.20)

The table I shows the level of electrolytes (sodium, potassium and chloride) of trained and untrained men before and after the aerobic exercise. From the results it is clear that all the three electrolytes are significantly increased in blood serum due to acute effect of aerobic exercise. However the ANOVA value fund to be insignificant. Hence, it is inferred that, serum, electrolyte level is increased due to aerobic exercise.

Discussion

Alteration in the electrolyte composition of the extra cellular fluids will have direct effect on neural function. Fluctuation in sodium or potassium ion concentration due to dehydration, may facilitate or depress neural activities. Inadequate or excessive concentrations of calcium ions will affect sympatric function directly by reducing or exaggerating the amount of neurotransmitter released at the presynaptic membranes.

Sodium, potassium and chloride are distributed throughout all body fluids and cells. Sodium and chloride are primarily found in the body fluid outside cells as in plasma, but potassium is located mainly inside the cells. Minerals enable neural impulses to control muscle activity. In addition they are responsible for maintaining the water balance and distribution, normal osmotic equilibrium, acid base balance and normal cardiac rhythm.

Increase in sodium concentration in plasma is associated with increase in concentration of plasma lacate which contributed to large part of hyper-osmolality observed during high intensity exercise [10]. The volume of sweat increases, reabsorption from the kidnies reaches its peak; the concentration of sodium in the sweat increase progressively [11].

Acute effect of aerobic exercise increase potassium level [12]. The intensity of exercise is related to the peak post exercise potassium concentration. The elimination of potassium to that of sodium and potassium pump that exist in the cellular metabolism. The extra cellular potassium is directly linked to the pump stimulus and the rate of re-uptake is proportional in the extra cellular accumulation [13]. The concentration of extra and intra cellular potassium in skeletal muscle cell function are also important determination of cardiovascular and respiratory function. Exercise results in a release of K^+ ions from contracting muscle which produce a decrease in intra cellular K^+ concentration and an increase in plasma concentration [14].

The concentration of chloride is lower in sweat than in plasma because of passive reabsorption of chloride ions along with active reabsorption of sodium ions. At rest, excessive electrolytes are excreted in the urine by the kidneys. But urine

production declines tremendously during exercise, due to active reabsorption of fluids and electrolytes. Dehydration cause the hormone aldosterone to promote renal retention of sodium and chloride ions, rising their concentration in the blood [11]. Therefore it may be revealed from the study that significant rise in the sodium, potassium and chloride (electrolyte) as the result of acute exercise among trained and untrained men.

Conclusion

Acute effect of aerobic exercise significantly reduce the electrolyte level in the muscles and internal fluids for bath trained and untrained man loss of electrolytes can result in heat cramps or muscle cramps.

Implication

Electrolyte supplementation along with fluid replacement can maintain pre-exercise serum electrolyte level among athletes.

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