INFLUENCE OF METHYLAMPHETAMINE ON BLOOD LACTIC ACID FOLLOWING EXERCISE

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It has been shown by Weiss and Laties that amphetamines, besides being central stimulants, not only improve physical performance but also a motivation to perform the work better, and more so when fatigue is setting in. Prolonged exercise with the concomitant relative muscular anoxia causes accumulation of lactic acid in blood and tissues because its uptake by liver is slower than its rate of production by the muscle. Since amphetamines delayed fatigue, it looked desirable to study the effect of methylamphetamine on the

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level of lactic acid in blood after regulated but prolonged exercise.

Male albino rats, weighing between 200 to 250 g, were divided into seven groups of 7 or more animals each. Animals were exercised on a treadmill moving at a speed of 1.25 miles per hour for a period of 50 minutes. Animals were put in a holder so that their front legs only were made to work. Division of animals and the treatment given to them are shown below:

- Group I — without drug and without exercise
- Group II — without drug but with exercise
- Group III — injected with 0.3 mg/kg drug followed by exercise for 50 minutes
- Group IV — injected with 1.0 mg/kg drug followed by exercise for 50 minutes
- Group V — injected with 2.0 mg/kg drug followed by exercise for 50 minutes
- Group VI — injected with 3.0 mg/kg drug followed by exercise for 50 minutes
- Group VII — injected with 5.0 mg/kg drug followed by exercise for 50 minutes

Methylamphetamine hydrochloride was given intraperitoneally half an hour prior to exercise. Immediately on termination of the exercise, animals were anaesthetized with ether and blood was taken by a cardiac puncture and put into a bottle containing sodium fluoride. This series of operations from termination of exercise to collection of blood by cardiac puncture took approximately 5 minutes. Blood lactic acid was determined according to method of Barker and Summerson (2). Results obtained, after statistical analysis, are presented in Table I and show that:

1. Exercise per se increases blood lactic acid significantly (P<0.01 for Group I versus II).
2. Methylamphetamine at 0.3 mg/kg body weight had no significant effect on blood lactic acid (Group III versus II).
3. Blood lactic acid levels in groups IV, V and VI were significantly lower than in group II animals (P<0.01 for groups IV & V versus group II; P<0.05 group VI versus II).
4. Levels of lactic acid in blood after exercise with drug (Groups IV, V, VI) did not differ significantly from that of Group I where neither exercise nor drug was given.
5. While intergroup differences between Groups IV, V and VI were not significant, blood lactic acid concentration after 5.0 mg/kg body weight of drug (Group VII) was higher than at 3.0 mg/kg dosage (Group VI), indicating that further increase in drug dosage began to reverse its effect.

Data presented above give sufficient evidence to indicate that methylamphetamine (1.0 mg to 3.0 mg per kg body weight) prevented rise in lactic acid concentration of blood following exercise. Respiratory centre is stimulated by amphetamines in laboratory animals and there is an increase in rate and depth of respiration (3). It appears that lactic acid produced by muscular contraction has been better utilized under the effect...
of the drug and kept low by increased oxygen availability. In this connection it is noteworthy that methylamphetamine even at dosage of 10 mg per kg body weight failed to alter blood lactic acid levels in unexercised mice (4). In the light of observations of Hardinge and Peterson (5) that amphetamine toxicity in mice was increased after exercise, it is likely that 5 mg per kg dose of methylamphetamine used in our study reached toxic levels. Reversal of certain psychomotor responses with higher doses of methylamphetamine has been recorded by Maffii (6) and Kameyama (7). A similar reversal of effect on lactic acid level has been observed here.

Even though it has not been possible to elucidate the exact mechanism by which the drug helped in keeping blood lactic acid concentration low, the study does indicate that optimal doses of methylamphetamine improve physical work efficiency by preventing a rise in blood lactic acid levels after exercise.

REFERENCES