D-ribose Supplementation in Caucasian Males

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Mutations that occur within the AMPD1 gene are one of the most common defects detected in the Caucasian population with a likelihood of having the mutations as 1-2%. Several studies indicate that certain variants can cause fatigue, muscle weakness and muscular cramps, however some even with these variants remain asymptomatic. Some studies have shown that oral dosages of ribose can alleviate symptoms and can improve exercise performance in those with AMPD1 deficiency, ribose may provide a direct source of energy for cells. The aim of this preliminary study was to see if oral supplementary ribose can improve the performance of a 3 minute press-up test that is aimed to test muscle stamina and muscle fatigue in healthy Caucasian males against a control of healthy Caucasian males. The results show that having a T in rs17602729 may affect press-up performance in a 3 minute test and that supplemental ribose may improve performance, however the following results need to be correlated with current literature in the area and the conclusions are still debatable.

Keywords: AMPD1 ; Muhdo ; DNA ; ribose ; D-ribose ; nutrition ; genetics ; exercise performance

1. Introduction

Adenosine monophosphate deaminase 1 (AMPD1) plays a vital role in the purine nucleotide cycle, the gene encodes an enzyme of the same name. The enzyme coverts adenosine monophosphate to inosine monophosphate which frees an ammonia molecule during the process. Mutations that occur within the AMPD1 gene are one of the most common defects detected in the Caucasian population with a likelihood of having the mutations as 1-2%[1]. Several studies indicate that certain variants can cause fatigue, muscle weakness and muscular cramps [2] [3], however some even with these variants remain asymptomatic.

The disorder caused by mutations is known as adenosine monophosphate deaminase deficiency type 1 (AMPD1 deficiency) or myoadenylate deaminase deficiency (MADD). The most common symptoms of AMPD1 deficiency are:

1. Exercise intolerance – symptoms of fatigue and fast onset weakness on the commencement of exertion or prolonged exertion.
2. Fatigue – general fatigue is poorly understood and may have multiple pathways, however a surplus of adenosine reduces alertness [4].
3. Muscle cramping – this is may be due to an increased lactate [5].

Those who have AMPD1 deficiency should maintain fitness levels for general health but also maintain the strength of muscles to keep proper function. Some studies have shown that oral dosages of ribose can alleviate symptoms and can improve exercise performance in those with AMPD1 deficiency, ribose may provide a direct source of energy for cells [6].

*This is a preliminary search for correlations to allow for further study.

2. Aim & Methods

The aim of this preliminary study was to see if oral supplementary ribose can improve the performance of a 3 minute press-up test that is aimed to test muscle stamina and muscle fatigue in healthy Caucasian males (*n*= 55, 28-35y/o) against a control of healthy Caucasian males (*n*=14, 28-35y/o) whilst analysing the variants in rs17602729 (AMPD1). Two press-up tests done a week apart were conducted with participants taking 10g of oral ribose daily split into 2 5g doses, before the second press-up test 10g as the single dosage of that day was taken 30minutes prior to the test. The control group participants had no supplementary nutrition.

The results show that 24 in the non-control group and 4 in the control group had CC (fwd/fwd) in rs17602729, 15 in the non-control group and 5 in the control group had CT (fwd/fwd) in rs17602729, 15 in the non-control group and 5 in the control group had TT (fwd/fwd) in rs17602729. The pre-test press-up and post-test press-up results are in the tables

below:

rs17602729 fwd/fwd D-Ribose group	Press-up max in 3 minutes pre	Press-up max in 3 minutes post 7 day rest + D-ribose
CC	72	73
CC	91	91
CC	88	86
CC	75	78
CC	79	82
CC	101	99
CC	88	92
CC	110	108
CC	92	83
CC	94	96
CC	96	98
CC	88	90
CC	73	75
CC	80	79
CC	91	89
CC	87	90
CC	94	100
CC	99	101
CC	101	105
CC	110	101
CC	62	72

CC	73	75
CC	90	88
CC	91	93
CT	100	101
CT	98	105
CT	88	92
CT	85	91
CT	93	96
CT	95	95
CT	92	101
CT	100	103
CT	75	78
CT	62	71
CT	90	93
CT	82	84
CT	68	72
CT	72	78
CT	69	78
TT	89	98
TT	71	89
TT	65	75
TT	58	69
TT	71	79
TT	69	72

TT	70	70
TT	81	92
TT	83	92
TT	71	84
TT	74	80
TT	72	75
TT	79	88
TT	68	75
TT	63	79

Table 1. Non-control group results.

rs17602729 fwd/fwd control	Press-up max in 3 minutes pre	Press-up max in 3 minutes post 7 day rest
CC	88	89
CC	89	88
CC	91	90
CC	74	74
CT	78	77
CT	88	86
CT	86	89
CT	84	85
CT	71	73

TT	68	70
TT	73	70
TT	82	81
TT	71	70
TT	67	66

Table 2. Control group results.

Average	pre	post
rs17602729 CC	88.5	89.3
rs17602729 CT	84.6	89.2
rs17602729 TT	72.2	81.1
rs17602729 CONTROL CC	85.5	85.25
rs17602729 CONTROL CT	81.4	82
rs17602729 CONTROL TT	72.4	71.4

Table 3. Average results.

From the results we can see that in all 3 outcome control groups there was no significant change in press-up results. Within the d-ribose group that had CC there was no significant difference is scores, within the CT group there was a difference of + 4 press-ups on average however the significance of this is debatable, for the TT group there was a difference of +9 reps which is a significant difference which is unlikely to come down to placebo affect alone.

Graph 1. Average results.

The results show that having a T in rs17602729 may affect press-up performance in a 3 minute test and that supplemental ribose may improve performance, however the following results need to be correlated with current literature in the area, with further analysis including larger subject numbers. Whilst there is a significant difference between groups the exact cause is debatable with other factors requiring consideration.

References

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