EFFECT OF CELL-RATE™ ON EXCECISE-INDUCED CARDIO-RESPIRATORY AND BLOOD PARAMETERS CHANGES IN THOROUGHBRED HORSES DURING TRAINING

The following trial was conducted by an Equine Sport Medicine Unit who were faculty members of the Veterinary Medicine department at a major university. University name and professors are in strict confidence due to the proprietary nature of the active ingredient and to also protect distributor and manufacturer. The following trial summary was presented at the Congress of Equine Medicine and Surgery Proceedings.

Trial Summary

Two groups of thoroughbred horses, randomly distributed, were compared during a 12-week period for their cardio-respiratory and metabolic adjustment to strenuous exercise. During the whole experimental period, the principal group (n=6; weight: 500.2 $\pm$15.5 Kg; age: 4.5 $\pm$0.7 years) received once a day CELL-RATE™ while the control group (n=5; weight: 500.2 $\pm$16.3 Kg; age: 4.0 $\pm$0.3 years) received a placebo. All other conditions were similar for both groups. The horses were trained following the same highly standard schedule. The effect of (a) 2 different types of training, i.e. aerobic and interval training, as well as (b) detraining on some cardio-respiratory parameters measured during a standardized exercise were regularly investigated. The eleven horses underwent 5 standardized treadmill exercise tests (SET); 1st SET, at the start of the experimental period; 2nd SET, after 3 weeks acclimatization; 3rd SET after 3 weeks of aerobic training, 4th SET after 3 weeks of anaerobic training and 5th SET after 3 weeks of detraining.

The SETs (consisting a 5 minute warm-up and 6 minute test; 1 min at 1.7m.sec^{-1}, 1 min at 4m.sec^{-1}, 1 min at 8m.sec^{-1}, 1 min at 9m.sec^{-1}, 1 min at 10m.sec^{-1} and 1 min at 11m.sec^{-1}) were carried out in an air-conditioned laboratory on a treadmill included at 6 degrees. Respiratory airflow, tidal volume, respiratory rate and expired minute volume were obtained using a face mask and 2 ultra-sonic pneumotachographs. The oxygen uptake (VO_2) and carbon dioxide production (VCO_2) were calculated on a breath-by-breath basis, using a mass spectrometer. Heart rate (HR) was continuously measured with a polar horse tester. Oxygen pulse (OP=VO_2/HR) and ventilatory equivalent (EV=expired minute volume/ VO_2) were calculated from the collected data. Lastly, venous blood was sampled before and after the test and analyzed for plasma lactate (LA), cortisol (COR), hematological evaluation, enzymatic activities in phosphocreatine kinase, lactate dehydrogenase and aspartate amino transferase, and ions.

The results show that, in both groups, training induced significant modifications of all the cardio-respiratory parameters, but HRpeak: VO_2 and VCO_2 were significantly increased; the cardiac and respiratory efficiencies were significantly improved as assessed by the increase of OP and the decrease of EV respectively. The anaerobic training period induced the most substantial improvement of the cardio-respiratory parameters. After the 3 weeks of detraining period most of the values were similar again to the pre-training (SET1 and/or SET 2) ones in both groups. The training-induced modifications in most of the blood parameters were not significant, except for LA and COR.

The training-induced improvements of the following parameters were proportionally more important in the treated group (TG) than in the control group (CG):

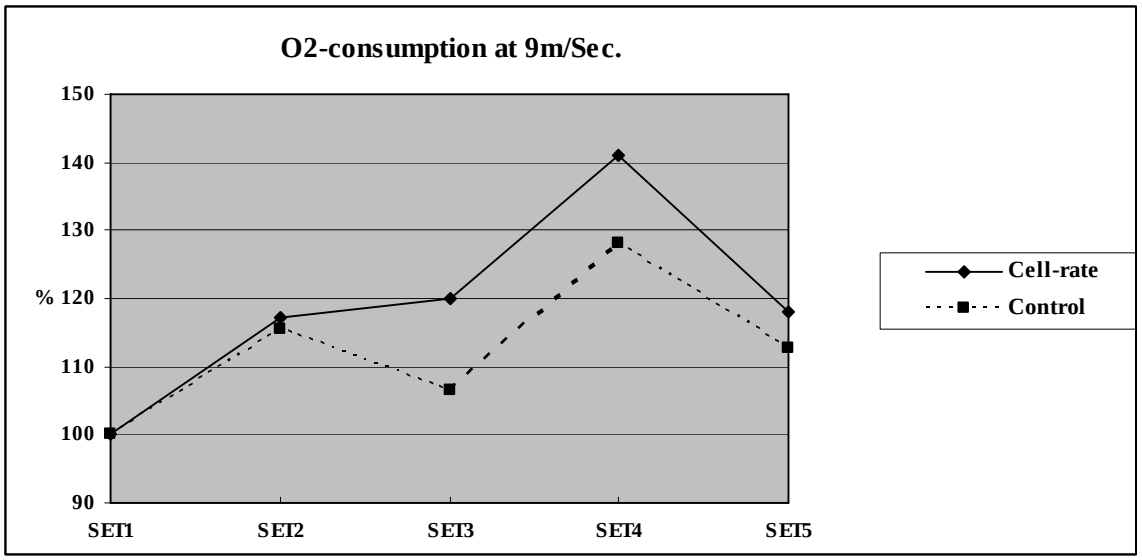
- VO_2 (+11% more in TG vs CG). VO_2 is a measurement of oxygen intake.
- VCO_2 (+19% more in TG vs CG). VCO_2 measures carbon dioxide production. The lower the carbon dioxide levels the less oxygen is

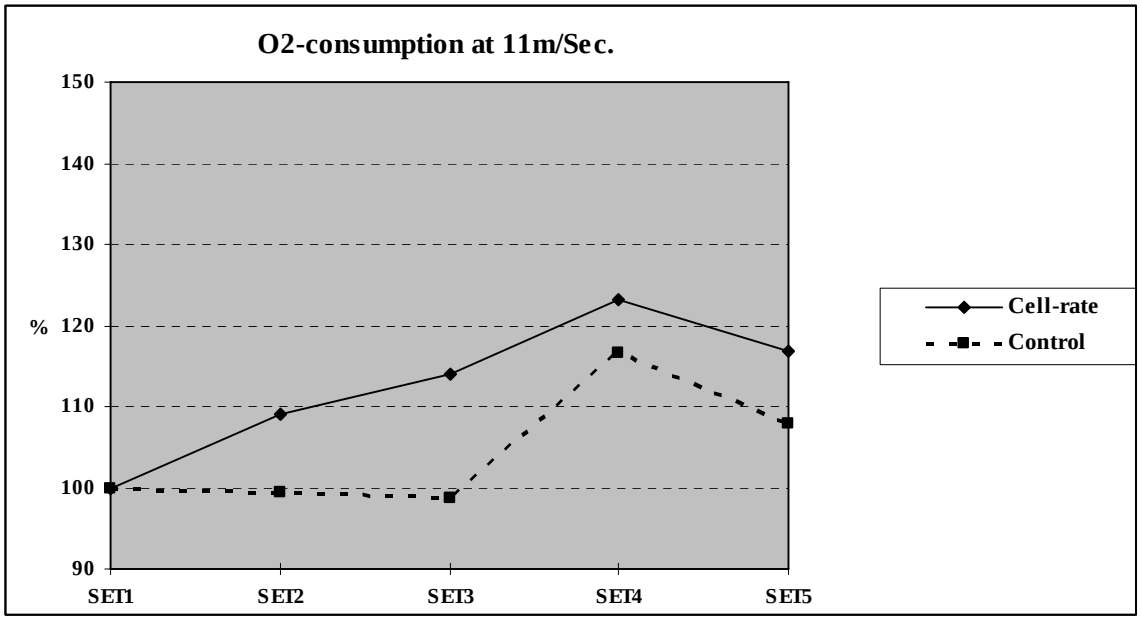
released to the tissues. Low carbon dioxide results in lack of oxygen for the cells. Muscle cells go into anaerobic respiration and produce lactic acid instead of carbon dioxide. Lactic acid is toxic and causes muscles to fatigue and further reduces carbon dioxide levels. The treated group had a 19% increase in carbon dioxide production which is significant.

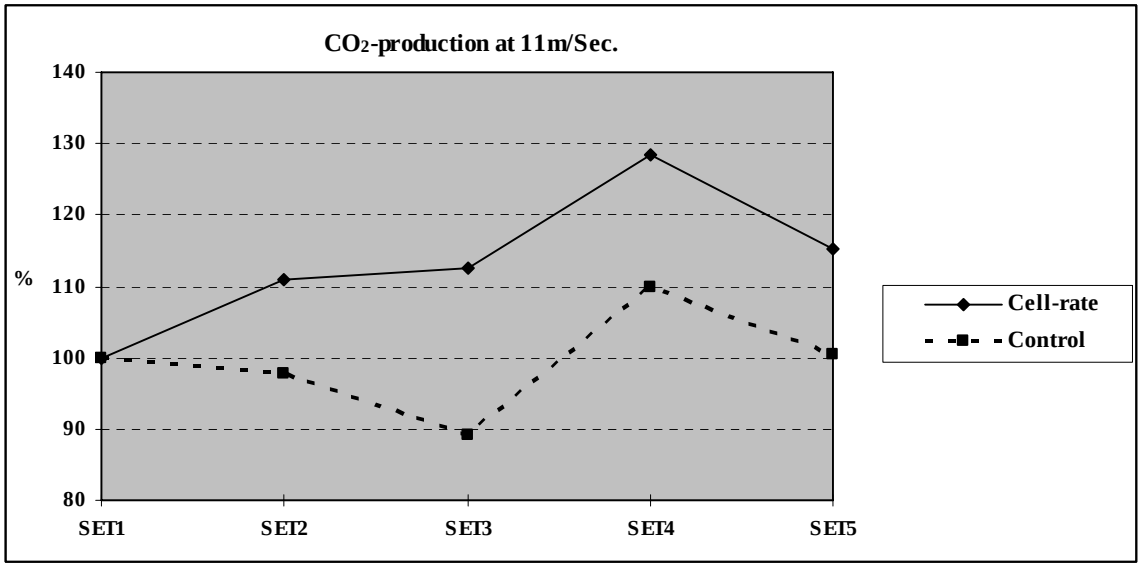
- EV (+14% more in TG vs CG). EV is the expired minute volume/ VO_2.
- OP (+19% more in TG vs CG). OP is oxygen pulse which is calculated taking VO_2/HR (heart rate).
- O_2 consumption was up substantially in TG. During 9m/sec measurements the TG had a 7.2% increase in O_2 consumption compared to CG. During 11m/sec measurements the TG had a 9.6% increase in O_2 consumption compared to CG.
- O_2 volume per heart beat was up substantially in TG. During 9m/sec measurements the TG had a 9.6% increase in O_2 volume per heart beat compared to CG. During 11m/sec measurements the TG had a 10.8% increase in O_2 volume per heart beat compared to CG.
- Lactate concentration in CG was 12.8% higher compared to TG.
- Enzyme levels of CPK concentration in the blood at rest was 39% higher in CG. CPK concentration in the blood after work was 72% higher in the CG. A rise in CPK level usually indicates there has been an injury or stress to the heart, the brain or muscle tissue. When muscle tissue is damaged, CPK leaks into the bloodstream. Similar results were found with SGOT and LDH concentrations in the blood.
- COR (Cortisol) concentration in the Trial Group was significantly lower than the Control Group. Cortisol concentration in the blood at rest was 12% lower in the Trial Group compared to the Control Group. Cortisol concentration in the blood after workout was 13% lower in the Trial Group compared to the Control Group. Cortisol is naturally released into the bloodstream in response to stress, pain or inflammation. For this reason, having a lower cortisol level is extremely important. Excess cortisol in the horses system causes a process called “catabolism”. This is the process of breaking down body tissue to meet energy requirements. This can lead to muscle wasting, weight loss and hypoproteinemia (abnormally low levels of protein in the blood). In the long term, catabolism weakens ALL the connective tissues in the body.

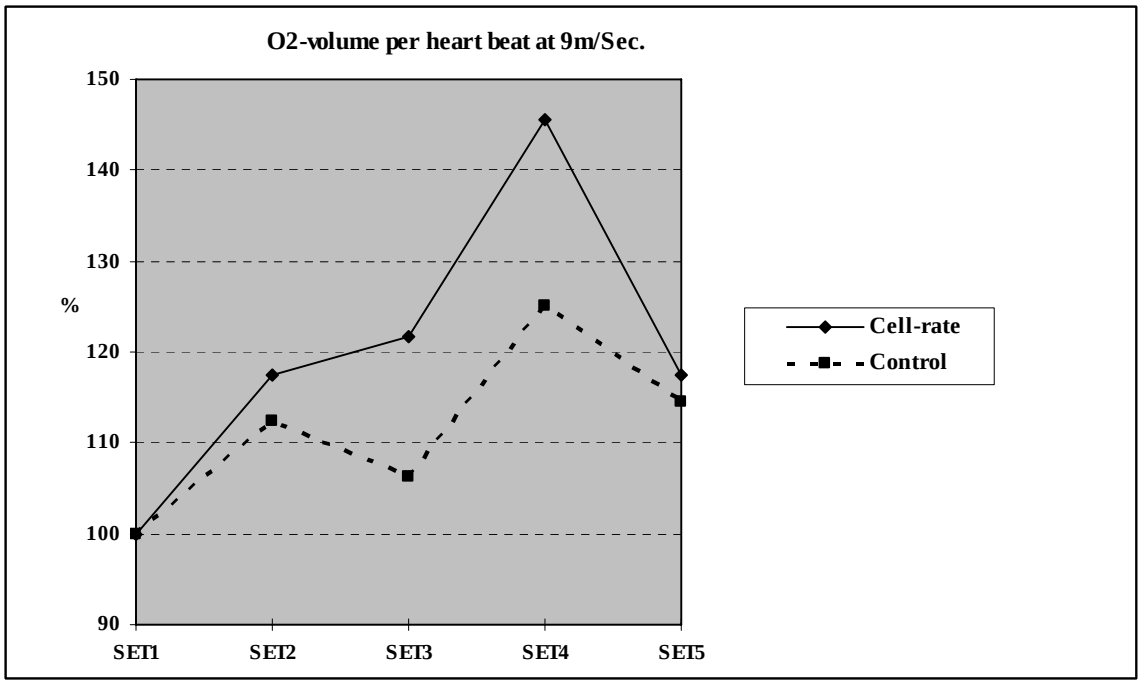
Other benefits of CELL-RATE™ from this trial are documented through graphs and data charts. The above results suggest that CELL-RATE™ used in the present experiment accelerates the effect of training by improving aerobic metabolic capacities.

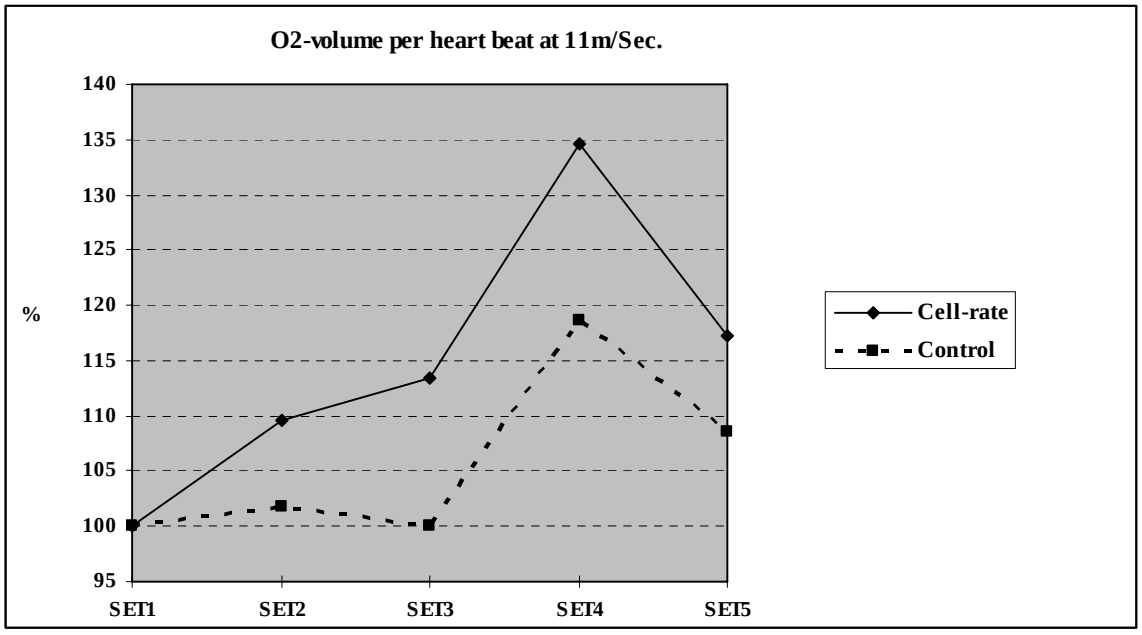
Trial study results

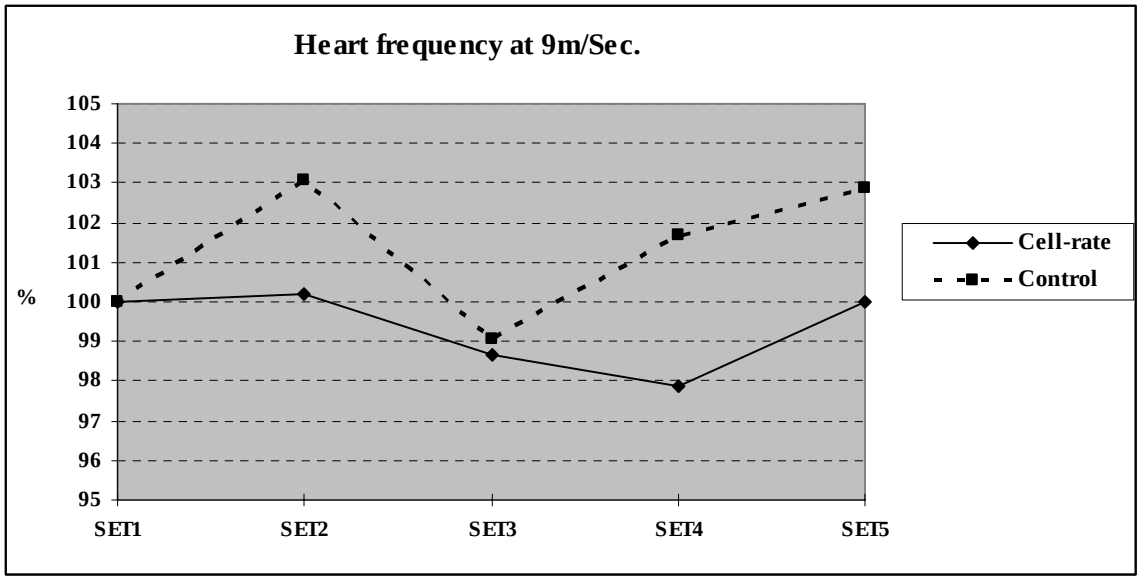

O2-consumption at 9m/Sec.
150
140
130
% 120
110
100
90
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control

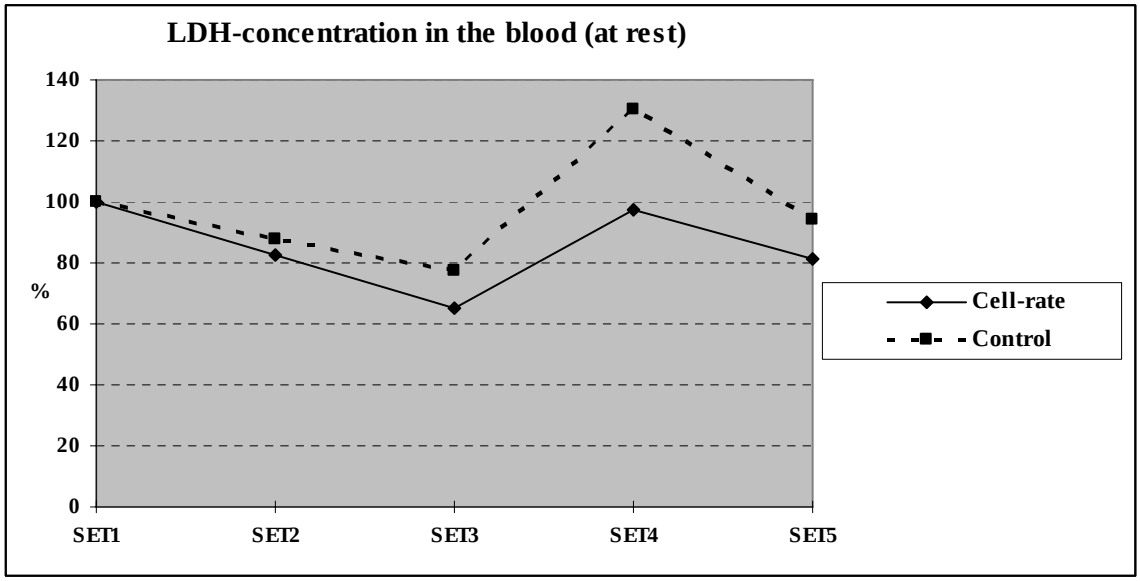

O2-consumption at 11m/Sec.
150
140
130
% 120
110
100
90
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control

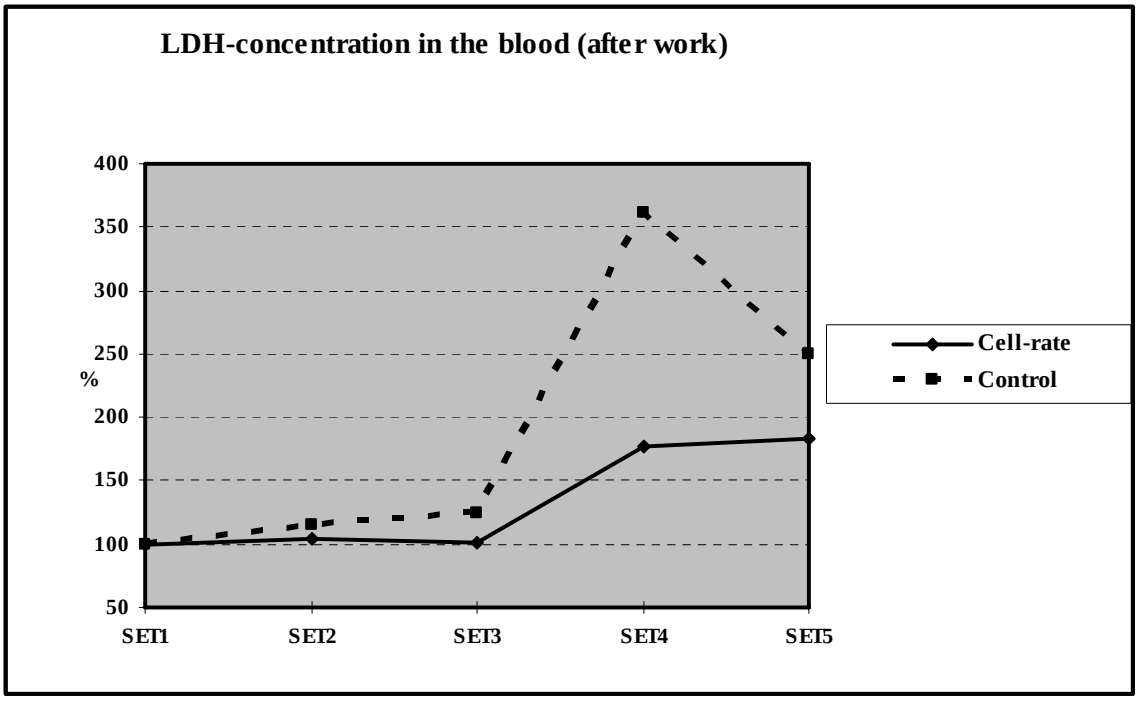

CO2-production at 11m/Sec.
140
130
120
%
110
100
90
80
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control

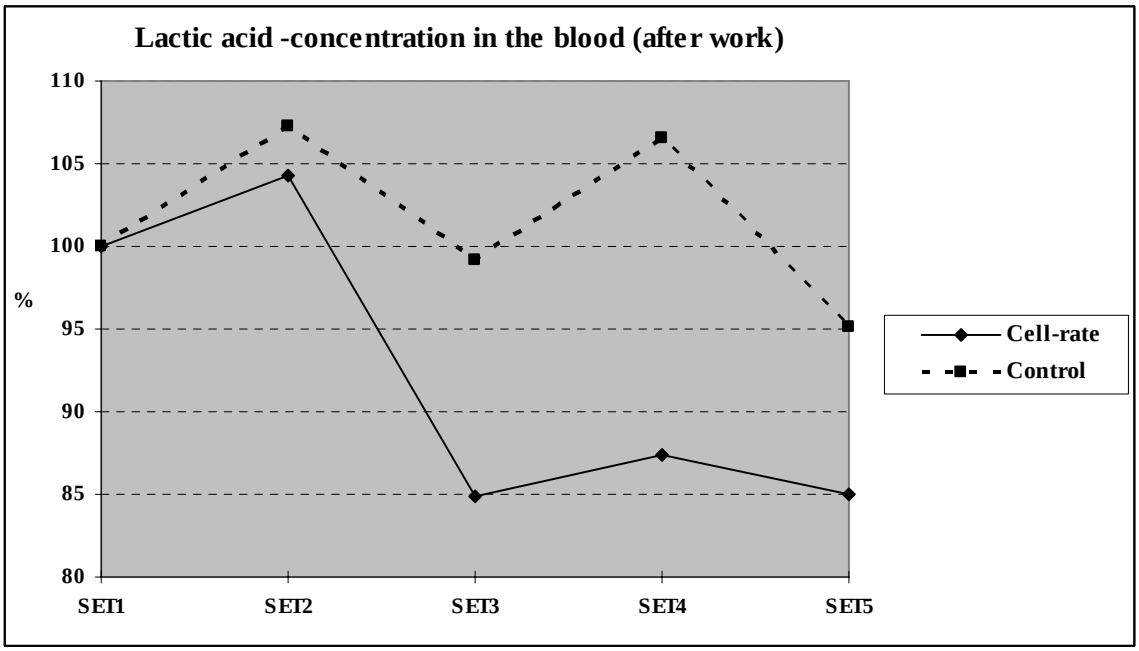

O2-volume per heart beat at 9m/Sec.
150
140
130
%
120
110
100
90
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control

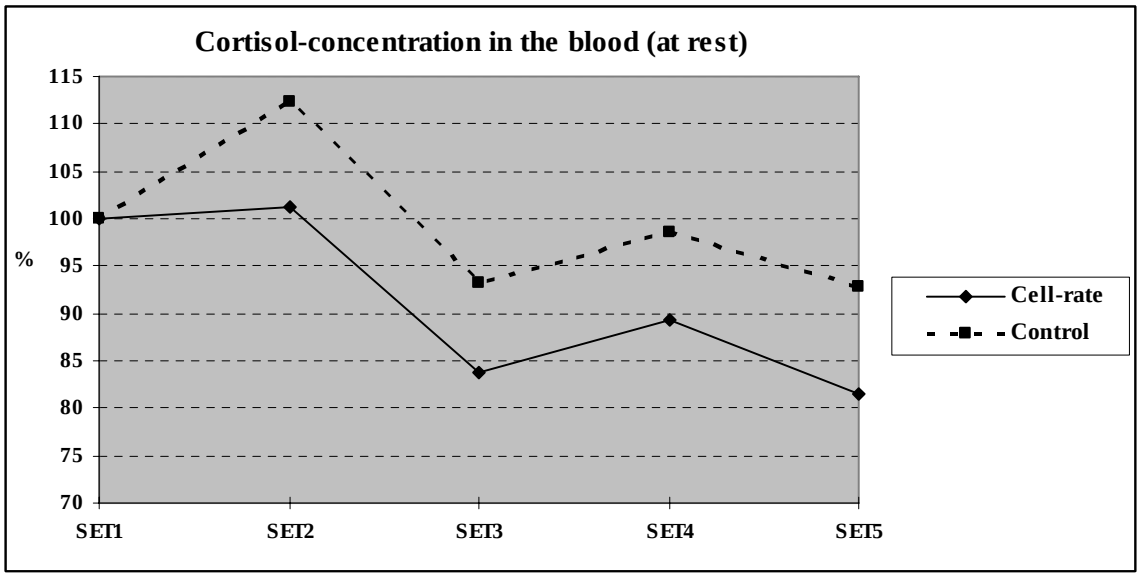

O2-volume per heart beat at 11m/Sec.
140
135
130
125
%
120
115
110
105
100
95
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control

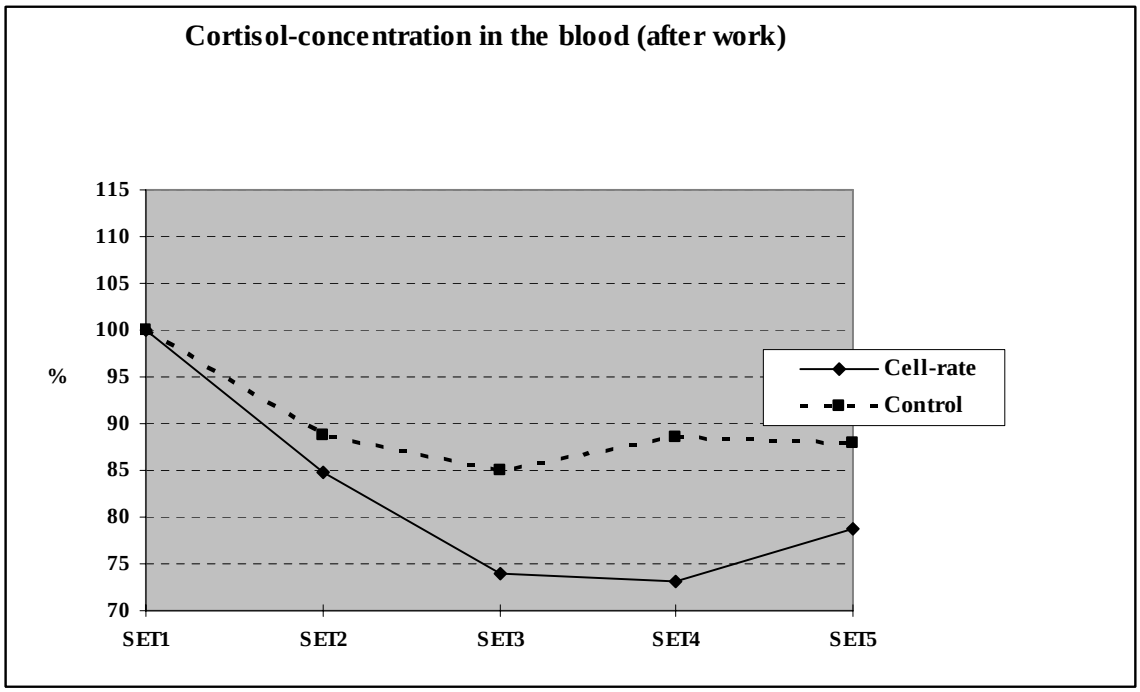

Heart frequency at 9m/Sec.
105
104
103
102
101
100
99
98
97
96
95
%
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control

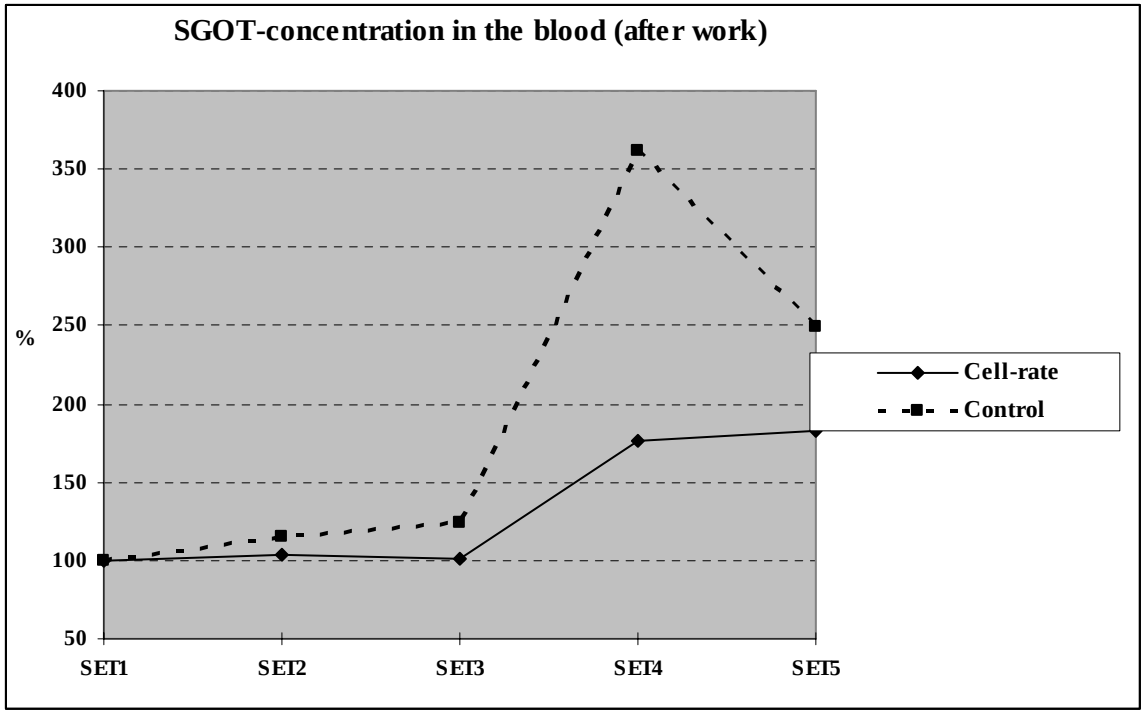

LDH-concentration in the blood (at rest)
140
120
100
80
60
40
20
0
%
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control

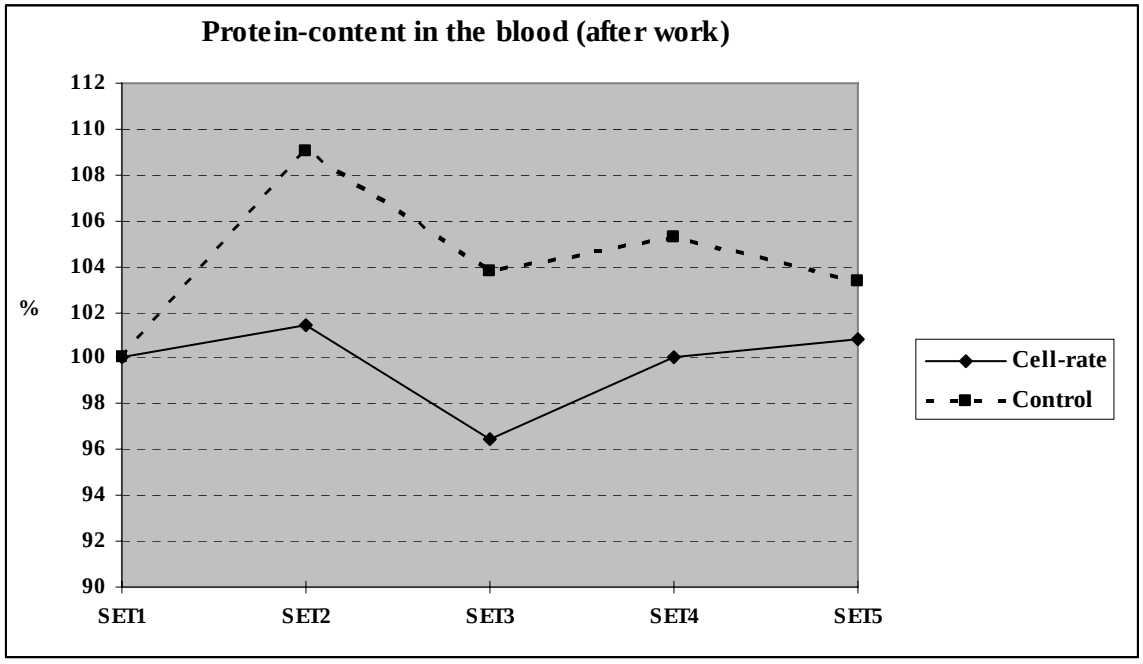

LDH-concentration in the blood (after work)
400
350
300
250
%
200
150
100
50
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control


Lactic acid -concentration in the blood (after work)
110
105
100
%
95
90
85
80
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control


Cortisol-concentration in the blood (at rest)
115
110
105
100
%
95
90
85
80
75
70
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control


Cortisol-concentration in the blood (after work)
115
110
105
100
%
95
90
85
80
75
70
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control


SGOT-concentration in the blood (after work)
400
350
300
250
200
150
100
50
%
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control


Protein-content in the blood (after work)
112
110
108
106
104
102
100
98
96
94
92
90
%
SET1
SET2
SET3
SET4
SET5
Cell-rate
Control