Physiological, Haematological and Performance Characteristics of Ultra Endurance Cyclists Competing in the Inaugural Race Around Ireland

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Abstract

Ultra-endurance events are a growing area within the sport of cycling. The Race Around Ireland (RAI) is a non-stop event where cyclists must complete the 2,170km route in under 96 hours. **Purpose**: The purpose of this study was to investigate the physiological, haematological and performance characteristics of members of a 4 man team before, during, and after the RAI. **Methods**: Four trained male cyclists were tested on 2 separate occasions within a 14 day period, with the second bout of testing performed within 7 days of the start of the race, to determine baseline values. Each cyclist completed a maximal incremental test on an electromagnetically braked cycle ergometer, commencing at 100W and increasing in intensity by 50W every 3 minutes until volitional exhaustion. Heart rate, VO_2, power output and blood lactate were measured during the test. Following a standardized recovery period, each cyclist then completed a 20 minute maximal performance test (MPT) designed to mimic the demands of the RAI. Baseline blood samples were taken prior to each testing session to facilitate a detailed haematological analysis. Blood samples were also taken before the start of the race, at set intervals during the race, as well as on the race completion. Subjects were also weighed and urine samples collected at the same time points in order to assess hydration status using urine specific gravity (Usg). Further testing was carried out 7 days (haematology), and 14 days (haematology and MPT) post race. **Results**: No significant differences were found between the MPT results pre and post race. Significant differences were found for white blood cells (WBC) and granulocyte count ($p<0.01$), haematocrit, haemoglobin, lymphocytes, and red blood cells ($p<0.05$). No significant difference was observed for changes in body mass or Usg. **Conclusions**: Variations in WBC and other immune function markers showed initial decrease followed by a gradual elevation during the race. However this did not seem have an impact on the post race MPT. Although there appears to be a significant change in immune function during ultra endurance cycling, this may not lead to a subsequent performance decrement. However, analysis may be complicated by the specific race tactics adopted by the team during the race and the time course of post race assessment.

Aim

Investigate the physiological, haematological and performance characteristics of members of a four man team before, during, and after an ultra-endurance cycle event.

Methods

- ❖Baseline testing
  - o 2 visits
  - o Separated by 7 days
- ❖Maximal incremental trial
  - o Heart rate (HR)
  - o VO_2
  - o Power output (PO)
  - o Blood lactate
- ❖20 minute maximal performance test (MPT)
  - o Heart rate
  - o Power output

❖ Baseline blood samples were taken prior to each testing session to facilitate a detailed haematological analysis.

❖ Subjects were also weighed and urine samples collected at the same time points in order to assess hydration status using urine specific gravity (Usg).

Results

Table 1. Subject Characteristics

Variable	Subjects
Age (yrs)	42.3 (6.5)
Mass (kg)	78.3 (3.45)
Height (m)	1.76 (0.07)
BMI (kg/m^2)	25.24 (1.95)
Body Fat (%)	13.86 (2.72)

Data presented as means (SD)

Table 2. Incremental Test Variables

Variable	Subjects
VO_{2peak} (ml/kg/min)	68.05 (7.29)
VO_{2peak} (L/min)	5.3 (0.69)
PO_{peak} (W)	394 (24)
PO @ 1mmol (W)	185 (98)
PO @ 1mmol (W/kg)	2.34 (1.18)
HR @ 1mmol (BPM)	117 (33)
PO @ 4mmol (W)	324 (27)
PO @ 4mmol (W/kg)	4.15 (0.28)
HR @ 4mmol (BPM)	158 (9)

Data presented as means (SD)

Table 3. Maximal Performance Test (MPT) Variables

Variable	Pre	Post
Distance (km)	10.68 (0.74)	10.55 (0.75)
PO_{mean} (W)	307 (44)	318 (41)
PO_{mean} (W/kg)	3.89 (0.5)	4.07 (0.44)
HR_{peak} (bpm)	171 (11)	171 (4)
HR_{mean} (bpm)	148 (16)	161 (4)

Data presented as means (SD)

No significant differences were found for Usg or subject mass.

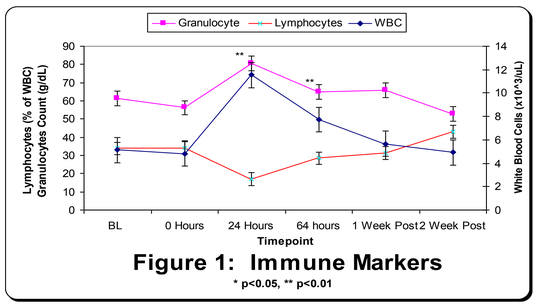

Figure 1: Immune Markers

* p<0.05, ** p<0.01

Significant differences were found for white blood cells (WBC) and granulocyte count during the RAI, yet returned to baseline values post event. ($p<0.01$)

Significant differences were found for haematocrit, hemoglobin, lymphocytes, and red blood cells 2 weeks post event ($p<0.05$)

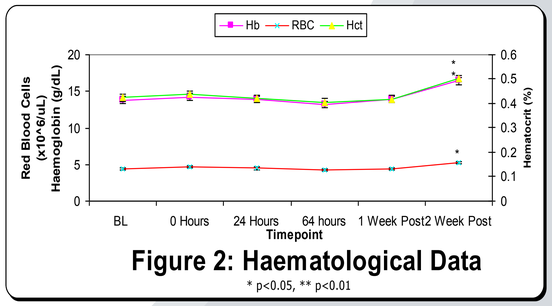

Figure 2: Haematological Data

* p<0.05, ** p<0.01

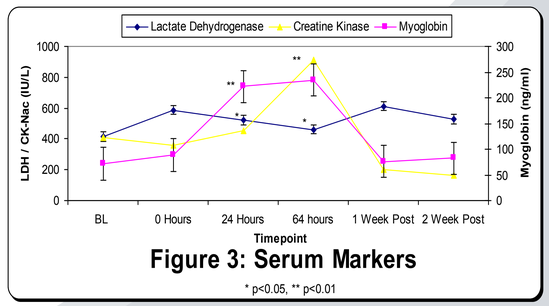

Figure 3: Serum Markers

* p<0.05, ** p<0.01

Significant differences were observed for CK, LDH, and myoglobin during the race

Discussion

❖Changes were observed for many haematological factors within the race

❖Small n value resulted in a large standard deviation

Conclusions

❖ Variations in immune function markers showed significant changes during the race followed by a gradual return to baseline post race. However this did not have an impact on the post race MPT.

❖ There appears to be a significant change in immune function during ultra endurance cycling, however this may not lead to a subsequent performance decrement.

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