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Non-alcoholic Beer Reduces Inflammation And The Incidence Of Upper Respiratory Tract Infections After A Marathon

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Abstract

Strenuous exercise significantly increases the incidence of upper respiratory tract infections (URTI) caused by transient immune dysfunction. Naturally occurring polyphenolic compounds present in food such as non-alcoholic beer (NAB) have strong anti-oxidant, anti-pathogenic, and anti-inflammatory properties.

PURPOSE To determine whether the ingestion of non-alcoholic beer polyphenols for three weeks prior to the Munich Marathon would attenuate post-race inflammation and decrease URTI incidence.

METHODS Healthy male runners (N=277, age 42±9 y) were randomly assigned to 1-1.5 L/day NAB or placebo (PL) beverage (double-blinded design) for three weeks before and two weeks after the Munich Marathon. Blood samples were collected 4- and 1-week pre-race, and immediately-, 24-h-, and 72-h-post-race, and analyzed for inflammation measures (IL-6 and total blood leukocyte counts). URTI rates, assessed by the Wisconsin Upper Respiratory Symptom Survey (WURSS-21), were compared between groups during the 2-week period following the race.

RESULTS Change in IL-6 was significantly reduced in NAB compared to PL immediately post-race [median (interquartile range): ng/L 23.9 (15.9 - 38.7) ng/L vs. 31.6 (18.5 - 53.3), p = 0.03]. Total blood leukocyte counts were also reduced in NAB versus PL by approximately 20% immediately- and 24-h-post-race (p=0.02). Incidence of URTI was 3.25-fold lower (95%-CI 1.38-7.66) (p=0.007) in NAB compared to PL during the 2-week post-marathon period.

CONCLUSION Consumption of 1-1.5 L/day non-alcoholic beer for three weeks before and two weeks after marathon competition reduces post-race inflammation and URTI incidence.

Purpose

In contrast to moderate physical activity, prolonged and intensive exercise has been linked in multiple animal and human studies to transient inflammation and immune dysfunction, and elevated incidence of upper respiratory tract illness (URTI).

Consumption of polyphenols – which can be found in fruits, vegetables, wine and also non-alcoholic beer (NAB) – has been linked to a decreased incidence of chronic disease such as cancer and cardiovascular disease which has been attributed to their strong anti-oxidant, anti-inflammatory, and anti-pathogenic properties.

We hypothesized that ingestion of non-alcoholic beer polyphenols for three weeks prior to a marathon would attenuate post-race inflammation and decrease URTI incidence.

Methods

277 healthy male participants of the Munich Marathon 2009 were in a double-blinded design randomly assigned to 1-1.5L/d NAB (verum) or placebo (PL) for 3 weeks prior and 2 weeks after the marathon.

Blood samples for analyses of inflammatory markers were taken 4- & 1-week pre-race, immediately-, 24h, and 72h-post-race.

Incidence of URTI was recorded with the Wisconsin Upper Respiratory Symptom Survey (WURSS-21) and NAB and PL group were compared during 2 weeks post-race.

For purpose of sensitivity analysis, statistical evaluations performed on the Full-Analysis-Set (FAS) and per protocol (PP) populations.

Results

Baseline characteristics are given in Tab. 1. Changes in IL-6 and leukocyte count from pre- to post-race were significantly reduced in the NAB group compared to the PL group (**IL-6**: 23.9 (15.9 - 38.7) ng/L vs. 31.6 (18.5 - 53.3) ng/L, p=0.03 respectively **leukocyte count**: reduction of app. 20%, p=0.02, see ***Figure 1 & 2***).

Incidence of URTI was 3.25-fold reduced in the PP (p=0.007) and 1.6-fold in the FAS group (p=0.115) (see ***Figure 3***).

Conclusions

In conclusion, consumption of 1-1.5 L/d non-alcoholic beer with polyphenols for three weeks prior to the Munich Marathon reduced post-race inflammation. Continued ingestion of the non-alcoholic beer during the 2-week period after the race reduced the incidence of clinically relevant URTI.

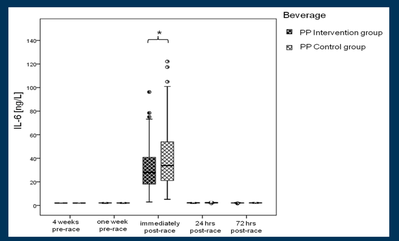

Figure 1. Interleukin 6 values for the intervention and control group at all visits.
* indicating p = 0.03.

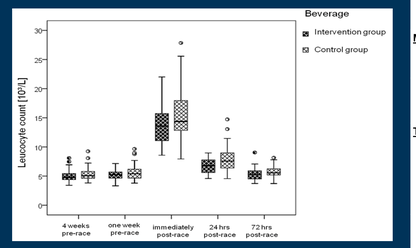

Figure 2. Leukocyte counts for the intervention and control group at all visits.
GEE analysis: difference in leukocyte levels at V3 (immediately post-race) and V4 (24-hrs post-race): overall comparison: mean difference ± SE = 1.2 ± 0.65 10^9/L, p = 0.02.

	All randomized subjects (n = 277)		Per protocol$_{IL-6}$ (n = 121)	
	Intervention (n = 142)	Control (n = 135)	Intervention (n = 58)	Control (n = 63)
Fluid intake				
Study beverage (L/day)	1.15 ± 0.24	1.23 ± 0.29	1.22 ± 0.16	1.28 ± 0.26
Other beverage (L/day)	1.44 ± 0.77	1.56 ± 0.83	1.49 ± 0.83	1.72 ± 0.93
Anthropometry				
Age (yrs) (median (IQR))	42 (35 – 49)	42 (36 – 49)	44 (36 – 51)	42 (35 – 49)
Body mass index (kg/m²)	23.4 ± 2.1	23.9 ± 2.1	23.4 ± 2.1	23.8 ± 2.1
Mean blood pressure systolic / diastolic (mmHg)	125 ± 12 / 81 ± 8	124 ± 12 / 81 ± 8	126 ± 11 / 82 ± 7	127 ± 12 / 83 ± 7
Marathon run				
Marathon time (h:mm:ss)	3:51:40 ± 0:30:22	3:51:39 ± 0:31:14	3:43:19 ± 0:24:20	3:49:18 ± 0:32:24
Mean heart rate during race (bpm)	156 ± 11	157 ± 10	156 ± 11	156 ± 11
Training history				
Training distance per week during the last 10 weeks before race (km)	52.0 ± 19.8	51.1 ± 21.9	49.7 ± 18.2	53.6 ± 22.4
Previous marathon races finished (median (IQR)	3 (1 – 7)	3 (1 – 6)	4 (1 – 7)	3 (1 – 7)

Table 1. Baseline characteristics of a) all randomized subjects and b) subjects of the per protocol population

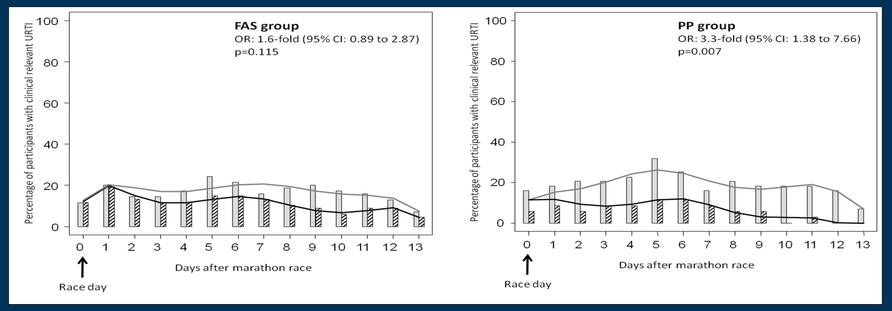

Figure 3. Incidence of clinical relevant URTI in the FAS & CC population after the marathon race in the intervention group (black striped) and control group (grey)

Acknowledgment

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