A SINGLE HIGH-INTENSITY EXERCISE SESSION REDUCES TUMOUR HYPOXIA IN MICE

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BACKGROUND
- Low blood perfusion and hypoxia are characteristic features of tumours and are factors of resistance to radiation and chemotherapy [1].
- A few rodent studies have shown that aerobic exercise, that has no severe side-effects, may improve perfusion and reduce hypoxia [2-4].
- We don’t know if there is an optimal exercise intensity and whether there is a dose response between exercise intensity and tumour response.

OBJECTIVES
- The aim of our study was to investigate the acute effect of a single exercise session of low, moderate, and high intensity aerobic treadmill running on tumour hypoxia.

METHODS
- Female CDF1 mice were injected with the C3H mammary carcinoma in the mammary fat pad.
- Mice were allocated to either a Control group (no exercise) or three groups performing low (6 m/min), moderate (12 m/min) or high intensity (18 m/min) treadmill running (Figure 1+2) for 30 minutes (n=11/group).
- Prior to running all mice were injected (i.p.) with Pimonidazole (60 mg/kg) and immediately after exercise they were injected (i.v.) with Hoechst 33342 (10 mg/kg) and sacrificed 1 minute later. Tumours were excised, and histological sections prepared.
- Hypoxia was determined from the degree of Pimonidazole binding, while analysis of the Hoechst 33342 staining enabled us to analyses perfused vessels in the tumour (latter analyses ongoing. Data not presented here).
- Mean hypoxic fraction after high-intensity running was statistically compared to the control, low intensity and moderate intensity groups using a Student’s T-test (p<0.05).
- Results are presented as mean values ± standard deviation.

RESULTS
- The hypoxic fraction was 9.0±5.2% for mice exposed to the high intensity running schedule (Fig. 3) - significantly lower compared with the hypoxic fraction in tumours from the control group (14.2±6.2%, p=0.046) and low intensity group (13.6±4.0%, p=0.034) but not the moderate intensity group (12.6±7.0%, p=0.19).

CONCLUSIONS
- Mice running at high intensity for 30 minutes elicit an acute reduction in the hypoxic fraction in the tumour when compared to sedentary mice or mice running at low intensities.
- Our future studies will focus on how long the reduction in hypoxia is maintained after running stops and how this exercise regime can be used to improve tumour treatment-response, especially to radiation.

REFERENCES

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