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Running session-conditioned human serum reduces cancer cell spheroid formation

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INTRODUCTION: Cancer remains a significant burden. Despite advances in diagnosis and treatment improving survival, recurrences are common. Observational studies suggest that physical activity (PA) is associated with lower cancer recurrence, but the linking biological mechanisms remain poorly understood. This study evaluated the effects of two acute running sessions (5 km and 10 km) on the modulation of spheroid formation capacity of triple-negative breast cancer (TNBC) cells.

METHODS: 14 healthy women (mean age 46.1 ± 8.6 years; body mass index 22.4 ± 2.2 kg/cm²) performed a 5 km- and a 10 km-long running session, interspersed by 2 weeks of wash-out time. The spheroid formation capacity of TNBC was evaluated in vitro using a 3D assay technique, stimulating cells with human sera collected before (PRE), after (POST), and 3 hours after exercise (POST-3h). After a 3-week incubation, spheroid formation was quantified through an automated imaging and analysis system for spheroid count.

RESULTS: In both running sessions, stimulation with POST and POST-3h sera resulted in a significant reduction in TNBC spheroid formation, compared with PRE sera, with the greatest effect observed with POST-3h sera. The latter collected after the 5 km run induced a >5% reduction in spheroid number in all participants (mean reduction $14.5 \pm 6.2\%$), compared with PRE sera. Comparable effects were observed after the 10 km run (>5% reduction in 13/14 sera; mean reduction $18.8 \pm 8.9\%$). No significant differences were found between the two runs.

CONCLUSIONS: These results align with our previous studies on prostate cancer cells exposed to running-conditioned sera, suggesting that acute exercise may reduce cancer tumorigenic potential, helping explain the link between PA and lower recurrence. Ongoing studies are expanding the cohort by enrolling additional female runners, and the collected sera are currently being tested on lung cancer cell models. These additional data will further clarify the systemic anticancer effects of acute exercise.

Keywords

Translational research, TNBC, Running sessions, 3D cell culture

Conflict of Interest & Ethical Approval

yes

Abstract submitters declaration

yes

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