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Acute Exercise Preferentially Increases B-Cell-Derived Cell-Free DNA In Adults with Chronic Lymphocytic Leukaemia

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Background. Elevated and impaired cell-free DNA (cfDNA) clearance are associated with increased tumour burden in chronic lymphocytic leukaemia (CLL). Although exercise has anti-tumour effects, the mechanisms underlying these effects are unclear. In healthy adults, acute exercise induces biphasic increases in cfDNA, followed by reductions upon completion. We aimed to understand the cfDNA response to acute exercise in patients with CLL.

Methods. Five treatment-naïve CLL (CLL: 65±11 years), five age- and sex-matched (OLD: 60±2 years) and seven young (YOUNG: 21±1 years) healthy adults completed a 30-minute high-intensity interval exercise session with blood taken before (PRE), immediately after (POST) and 30 minutes after (P30) exercise. We assessed complete blood counts (WBC, lymphocytes, monocytes, and neutrophils), while cfDNA in serum was assessed using RT-PCR for DNA fragments from neutrophils, lymphocytes, monocytes, and B-cells.

Results. As expected, immune cell Group x Time interactions were observed for counts of WBC ($F=9.8$, $p<0.001$, $\eta^2=.620$), lymphocytes ($F=6.6$, $p<0.001$, $\eta^2=.524$) and monocytes ($F=3.6$, $p=0.020$, $\eta^2=.373$). These were characterised by all groups increasing immune cell counts from PRE to POST and returning to PRE levels at P30. CLL had ~8-10 times more monocytes and lymphocytes at each timepoint (all $p<0.05$). Lymphocyte cfDNA increases were characterised by CLL having 38.2±12% higher B-cell specific cfDNA at POST compared to YOUNG ($p<0.001$) and OLD ($p<0.001$). A group x time interaction was observed for neutrophil cfDNA ($F=8.28$, $p<0.001$, $\eta^2=0.580$) with similar increases PRE-to-POST in CLL and OLD (mean group diff.=12±14%, $p=0.072$) but higher expression at POST in the YOUNG compared to CLL (mean group diff.=38±14%, $p=0.004$).

Conclusion. Exercise elicits an exaggerated transient B-cell-derived cfDNA response in CLL, suggesting that exercise damages CLL cells. These cfDNA dynamics could support immune modulation and disease management in CLL. Further investigation is warranted.

Keywords

Leukaemia cfDNA; acute exercise; CLL;

Conflict of Interest & Ethical Approval

yes

Abstract submitters declaration

yes

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