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Colon cancer cell differentiation by sodium butyrate modulates metabolic plasticity of Caco-2 cells via alteration of phosphotransfer network

PLOS ONE

Ljudmila Klepinina[1]*, Aleksandr Klepinin[1], Laura Truu[1], Vladimir Chekulayev[1], Heiki Vija[2], Kaisa Kuus[3], Indrek Teino[3], Martin Pook[3], Toivo Maimets[3], Tuuli Kaambre[1]

Effects of sodium butyrate on mitochondrial respiration

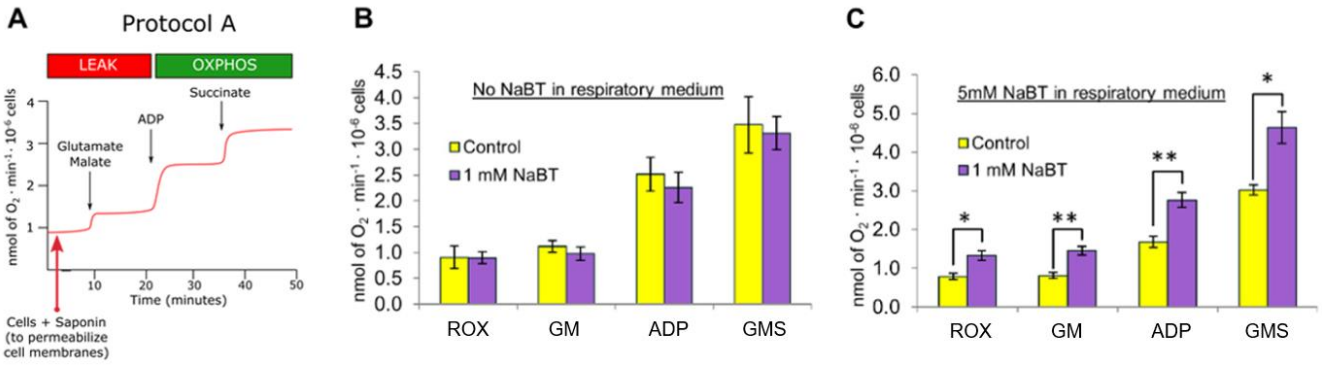

Figure 1. Upon 48-hour pre-treatment with sodium butyrate, colon adenocarcinoma (Caco-2) cells use butyrate as a substrate to a higher extant for oxidative metabolism compared to untreated cells. **(A)** Schematic of high-resolution respirometry protocol used. **(B)** Oxygen consumption rates in the absence of sodium butyrate in the respiratory medium. **(C)** Oxygen consumption rates in the presence of sodium butyrate in the respiratory medium. All data are presented as mean ± SEM (N = 3–5; * p < 0.05). ROX – residual oxygen consumption, GM – Glutamate & Malate, GMS – Glutamate & Malate & Succinate, NaBT – sodium butyrate.

O2k-brief communicated by T Komlodi and L Tindle-Solomon
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Effects of sodium butyrate on respiration using a coupling control protocol

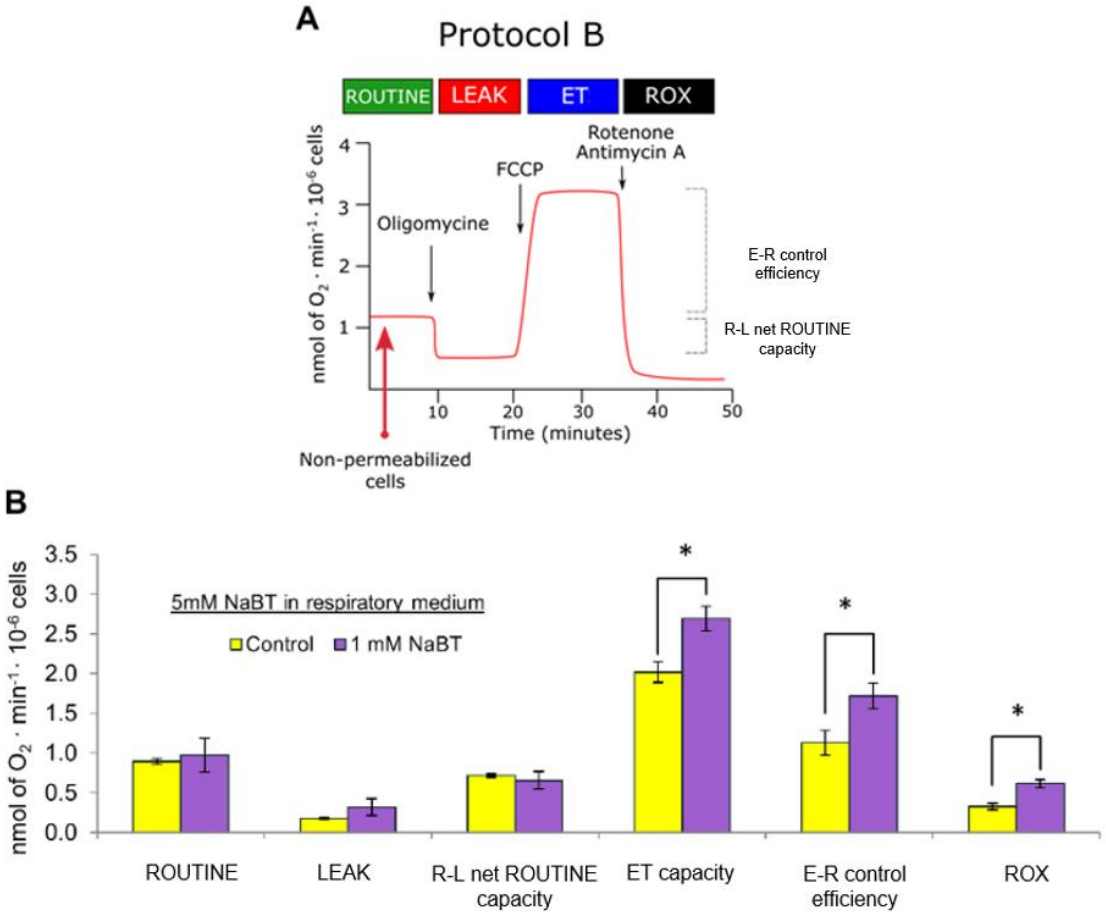

Figure 2. 48**-**hour pre-treatment with sodium butyrate induced an increase of electron transfer (ET) capacity in the presence of uncoupler and the respiratory activity available for phosphorylation of ADP to ATP (R-L net ROUTINE capacity) of Caco-2 cells. **(A)** Schematic of high-resolution respirometry protocol used. **(B)** Parameters of mitochondrial respiration obtained using protocol B**.** All data are presented as mean ± SEM (N = 3–5; * p < 0.05). NaBT – sodium butyrate.

Butyrate which is present at relatively high concentrations (mM) in the colon lumen, is used as a substrate for oxidative metabolism in more differentiated colon cancer cells. Treatment of Caco-2 cells with sodium butyrate (NaBT) allowed a shift in energy metabolism towards more oxidative metabolism, where butyrate is used as a preferred substrate for OXPHOS. Modulating cell metabolism through NaBT could be an effective strategy for treating colorectal cancer.

Reference: Klepinina L, Klepinin A, Truu L, Chekulayev V, Vija H, Kuus K, Teino I, Pook M, Maimets T, Kaambre T (2021) Colon cancer cell differentiation by sodium butyrate modulates metabolic plasticity of Caco-2 cells via alteration of phosphotransfer network. PLoS One 16:e0245348.

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