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Whey as cell growth supplement in cultivated meat production

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Milk whey is one of the earliest dairy by-products, shown to promote the growth of various mammalian cell types. Milk contains three vital elements of cell culture media as growth factors, adhesion factors, and transport proteins. Presently we demonstrated whey proteins (WPs) as a sustainable alternative to FBS in cultivation of C2C12 muscle cells, for application in cultivated meat production. Cells were cultured in media with WP mixture (β -lactoglobulin 0.07%, α -lactalbumin 0.15%, bovine serum albumin 0.15%), 10% FBS (positive control), or without (negative control) for 48h (day-1 and -2) to support proliferation. Subsequently, cells were switched to low-mitogenic 2% horse serum medium until full differentiation (day-6). Both WPs and FBS media significantly enhanced cell viability and proliferation (XTT assay, microscopic analysis), while maintaining cell membrane integrity (lactate dehydrogenase assay) on day-2 compared to untreated cells ($p < 0.05$). On day-6, these cells differentiated into myotubes and expressed myogenesis-specific markers, creatine kinase and citrate synthase ($p < 0.05$). Also, RT-qPCR analysis showed increased expressions of myogenesis-specific genes (MYOG, DES, MRF4, MYH2) compared to untreated cells ($p < 0.05$). Furthermore, preliminary proteomics analysis revealed WPs to positively regulate cellular pathways corresponding to myogenesis.

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