BEN-MEN-1

Established in 2003 from the meningothelial meningioma (grade I, WHO, #1238-03) attached to the parietal falx of a 68-year-old woman after surgical tumor resection; cells were immortalized by retroviral transduction with human telomerase reverse transcriptase (hTERT) [1].

Püttmann et al. developed this meningioma cell line by retrovirally transducing primary cells derived from a human WHO grade I meningothelial meningioma with the human telomerase reverse transcriptase (hTERT) gene, which enables bypassing cellular senescence. Five clones have been cultured for more than 21 months so far, while corresponding nontransfected cells ceased proliferation within 3 months. Quantitative RT-PCR and a telomeric repeat amplification protocol (TRAP) assay revealed high hTERT mRNA levels and high telomerase activity in all transduced populations, while nontransduced cells were negative. The average telomere size of transduced cells was considerably longer than that of parental cells and the biopsy specimen. One clone, designated Ben-Men-1, was characterized in more detail, and exhibited typical cytological, immunocytochemical, ultrastructural and genetical features of meningioma, including whorl formation, expression of epithelial membrane antigen, desmosomes and interdigitating cell processes, as well as -22q. Following subdural transplantation into nude mice, tumor tissue with typical histological features of meningothelial meningioma was found. They conclude that Ben-Men-1 represents an immortalized yet differentiated cell line useful for biological and therapeutical studies on meningioma [2].

Ben-Men-1 cells ingest neurotoxic peptides amyloid-β (Aβ1-40) and protein Alpha-synuclein up to about 10-fold more efficiently compared to neuronal-like SH-SY5Y cells. Aβ1-40 and α-synuclein are mainly taken up via macropinocytosis. Caveolar endocytosis in addition contributes to α-synuclein ingestion. Upon uptake, both are trafficked towards lysosomal degradation. While production of reactive oxygen species (ROS) following exposure to Aβ25-35 and α-synuclein was similar between Ben-Men-1 and SH-SY5Y cells, mitochondrial function in Ben-Men-1 was significantly more robust to Aβ25-35 treatment compared to neuronal-like SHSY5Y cells. Similarly, Ben-Men-1 were significantly less susceptible to Aβ25-35-induced cell death than neuronal-like cells. Furthermore, co-culture with Ben-Men-1 offered significant protection to neuronal-like cells against Aβ25-35-induced apoptosis. This study reveals for the first time the function of meningothelial cells as scavengers of neurotoxic Aβ and α-synuclein, thereby connecting these cells to neuroprotective processes and suggesting a new mechanism and pathway for clearing neurotoxic substances from the CSF [3].

Like most tumors, meningiomas prefer anaerobic glycolysis for energy production (Warburg effect). This leads to an increased synthesis of the metabolite methylglyoxal (MGO). This metabolite is known to react with amino groups of proteins. This reaction is called glycation, thereby building advanced glycation endproducts (AGEs). In a study, Selke et al investigated the influence of glycation on two meningioma cell lines, representing the WHO grade I (BEN-MEN-1) and the WHO grade III (IOMM-Lee). Increasing MGO concentrations led to the formation of AGEs and decreased growth in both cell lines. When analyzing the influence of glycation on adhesion, chemotaxis and invasion, they could show that the glycation of meningioma cells resulted in increased invasive potential of the benign meningioma cell line, whereas the invasive potential of the malignant cell line was reduced. In addition, glycation increased the E-cadherin- and decreased the N-cadherin-expression in BEN-MEN-1 cells, but did not affect the cadherin-expression in IOMM-Lee cells [4].

1)
https://www.dsmz.de/collection/catalogue/details/culture/ACC-599
2)
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