**Abstract**

The expression of voltage-gated calcium channels (VGCCs) has not been reported previously in melanoma cells in spite of increasing evidence of a role of VGCCs in tumorigenesis and tumour progression. To address this issue we have performed an extensive RT-PCR analysis of VGCC expression in human melanocytes and a range of melanoma cell lines and biopsies. In addition, we have tested the functional expression of these channels using Ca(2+) imaging techniques and examined their relevance for the viability and proliferation of the melanoma cells. Our results show that control melanocytes and melanoma cells express channel isoforms belonging to the Ca(v) 1 and Ca(v) 2 gene families. Importantly, the expression of low voltage-activated Ca(v) 3 (T-type) channels is restricted to melanoma. We have confirmed the function of T-type channels as mediators of constitutive Ca(2+) influx in melanoma cells. Finally, pharmacological and gene silencing approaches demonstrate a role for T-type channels in melanoma viability and proliferation. These results encourage the analysis of T-type VGCCs as targets for therapeutic intervention in melanoma tumorigenesis and/or tumour progression.