Mucins as Potential Markers for Disease Progression and Chemotherapy Response in Colorectal Cancer

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Colorectal cancer (CRC) represents a major health challenge with significant mortality rates. Due to the difficulties in early intervention, many patients fail to receive optimal therapeutic regimens. Mucins (MUCs), a family of glycoproteins involved in epithelial protection and cellular signaling, have emerged as key players in CRC pathogenesis and progression. This study evaluates the gene/protein expression levels of MUCs in CRC patients and their potential in early screening, management, and modulation of chemotherapy. Through an integrative approach combining the power of bioinformatics analysis and experimentation, the expression levels of the MUC gene/protein were measured in both malignant and non-malignant colonic tissues. This comprehensive analysis revealed significant expression alterations of MUCs family. These expression alterations in mRNA expression were validated in over 1200 CRC samples. In addition, they were closely associated with both tumor progression and poor overall survival. Receiver operator curve analysis revealed that MUC7 and MUC21 are the best candidates to differentiate between malignant and non-malignant samples with high accuracy, AUC > 0.9, for both. Furthermore, analysis in CRC cell lines revealed a heterogeneous response of MUCs to chemotherapeutic agents, including 5-FU, Irino, & their combination, ranging from sensitivity to resistance, suggesting their involvement in treatment response. Collectively, this study suggests that MUC expression profiles could be promising early screening markers of CRC, as well as for tailoring chemotherapy regimens, which could significantly improve clinical outcomes, patient survival, and quality of life.