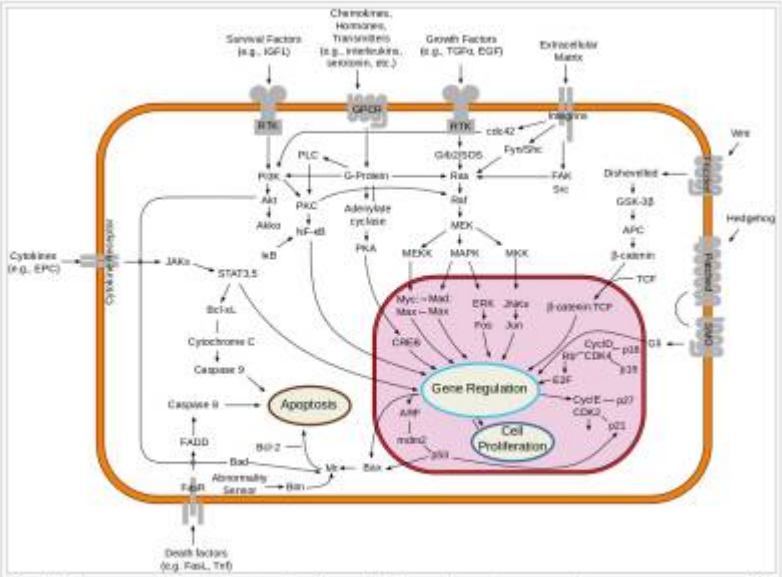
Extracellular matrix

The extracellular matrix (ECM) is a collection of extracellular molecules secreted by cells that provides structural and biochemical support to the surrounding cells.



Simplified representation of major signal transduction pathways in mammals.

Gliomas develop within a mechanically challenged microenvironment that is characterized by a dense extracellular matrix (ECM) that compromises vascular integrity to induce hypoxia and activate HIF1A.

Because multicellularity evolved independently in different multicellular lineages, the composition of ECM varies between multicellular structures; however, cell adhesion, cell-to-cell communication and differentiation are common functions of the ECM.

Extracellular matrix in vestibular schwannoma

- Single-cell RNA sequencing reveals ECM remodeling-tumor stiffness-FAK as a key driver of vestibular schwannoma progression
- Quantitative Assessment of Collagen Architecture to Determine Role of Tumor Stroma During Vestibular Schwannoma Progression
- From bench to bedside: Advancing towards therapeutic treatment of vestibular schwannomas
- Matrix metalloproteinase 9: An emerging biomarker for classification of adherent vestibular schwannoma
- Identifying Tumor Microenvironment Biomarkers in Adherent and Cystic Vestibular Schwannomas
- Tumor Microenvironment in Sporadic Vestibular Schwannoma: A Systematic, Narrative Review
- Intra-cerebellar schwannoma with various degenerative changes: a case report and a systematic review
- Identification of Key Biomarkers and Immune Infiltration in Sporadic Vestibular Schwannoma Basing Transcriptome-Wide Profiling

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The extracellular matrix (ECM) in vestibular schwannomas (VS), also known as acoustic neuromas, plays a crucial role in tumor growth, cell signaling, and cellular microenvironment. VS are benign tumors arising from Schwann cells in the vestibular nerve, and understanding the ECM in these

tumors is important for insights into their vestibular schwannoma pathophysiology and potential therapeutic approaches. Here's an overview:

ECM Composition: In vestibular schwannomas, the ECM consists of various structural proteins (collagen, laminin, fibronectin) and glycoproteins, which provide support and influence cellular behaviors. Collagen IV, laminin, and heparan sulfate proteoglycans are commonly expressed in VS.

Role in Tumor Growth: The ECM in VS may promote tumor cell proliferation and survival through interactions with cell surface receptors, such as integrins. It can also influence cell adhesion, migration, and apoptosis resistance, supporting tumor progression.

Signaling Pathways: ECM components interact with Schwann cells, activating signaling pathways like PI3K/Akt and MAPK/ERK, which can drive cellular proliferation and survival. Alterations in ECM-related genes and signaling proteins are often observed in VS and are thought to contribute to tumor development.

Vascularization and Angiogenesis: ECM plays a role in angiogenesis within vestibular schwannomas. The presence of ECM proteins like fibronectin can support the formation of new blood vessels, aiding tumor growth by increasing nutrient supply.

Potential Therapeutic Targets: Given the ECM's role in VS, targeting ECM components or the interactions between ECM and tumor cells is a potential therapeutic strategy. Drugs that modify ECM composition or inhibit specific ECM-cell interactions may reduce tumor growth or improve outcomes in VS treatment.

Research in this area is ongoing, with a focus on understanding the specific molecular interactions within the ECM that could be exploited to prevent or slow VS growth.

Larger VS exhibit increased collagen abundance in the tumor stroma, and a more disorganized collagen architecture compared to smaller VS and normal peripheral nerve tissue. This finding indicates that collagen organization may play a significant role in extracellular matrix remodeling and the progression of VS [1)]

1)
Fisher M, Duhon BH, Nguyen HTN, Tonniges JR, Wu KC, Ren Y. Quantitative Assessment of Collagen Architecture to Determine Role of Tumor Stroma During Vestibular Schwannoma Progression. Otolaryngol Head Neck Surg. 2024 Nov 7. doi: 10.1002/ohn.1018. Epub ahead of print. PMID: 39506612.