# Immunological landscape

The immunological landscape refers to the overall state and composition of the immune system in a given organism or population. This includes factors such as the types and numbers of immune cells present, their activation status, and the presence of antibodies or other immune factors. The immunological landscape can vary greatly depending on many factors, including age, health status, genetics, exposure to pathogens, and other environmental factors, and can have a significant impact on an individual's susceptibility to disease.

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The immune landscape within the Tumor Microenvironment is the result of a complex interplay between many immune components, including the presence of chemoattractant factors, immunogenicity associated with the mutational burden of the tumor, alteration of antigen presentation mechanisms, or the action of immunosuppressive mechanisms (anti-inflammatory factors and immune checkpoints). Other extrinsic factors, such as vascularization and tumor location, can be critical aspects that influence the immune status of the tumor as well. In this context, it is clear that there is a causal relationship between the immune response and cancer development, and, therefore, analysis of the immune context holds enormous clinical potential.

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Karimi et al. applied imaging mass cytometry to characterize the immunological landscape of 139 high-grade glioma and 46 brain metastases tumours from patients. Single-cell technology analysis of more than 1.1 million cells across 389 high-dimensional histopathology images enabled the spatial resolution of immune lineages and activation states, revealing differences in immune landscapes between primary tumors and brain metastases from diverse solid cancers. These analyses revealed cellular neighbourhoods associated with survival in patients with glioblastoma, which we leveraged to identify a unique population of myeloperoxidase (MPO)-positive macrophages associated with long-term survival. The findings provide insight into the biology of primary and metastatic brain tumours, reinforcing the value of integrating spatial resolution to single-cell datasets to dissect the microenvironmental contexture of cancer [1)]

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Karimi E, Yu MW, Maritan SM, Perus LJM, Rezanejad M, Sorin M, Dankner M, Fallah P, Doré S, Zuo D, Fiset B, Kloosterman DJ, Ramsay L, Wei Y, Lam S, Alsajjan R, Watson IR, Roldan Urgoiti G, Park M, Brandsma D, Senger DL, Chan JA, Akkari L, Petrecca K, Guiot MC, Siegel PM, Quail DF, Walsh LA. Single-cell spatial immune landscapes of primary and metastatic brain tumours. Nature. 2023 Feb 1. doi: 10.1038/s41586-022-05680-3. Epub ahead of print. PMID: 36725935.