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Eosinophils as biomarker in melanoma immunotherapy and solid tumors

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Eosinophilic granulocytes have been described in relation to cancer for a long time. Their accumulation has often been observed to be associated with a good prognosis in cancer patients. Just recently, eosinophil counts were found to increase during the treatment with immune checkpoint inhibitors in melanoma patients who exhibit a clinical response. Therefore, the aim of this thesis was to study the role of eosinophils as a biomarker in cancer and especially in melanoma patients treated with immune checkpoint inhibition (ICI).

We investigated the potential of eosinophils as a biomarker in solid tumors and created an overview by performing a literature research of published studies of different tumor types. Eosinophil accumulation, either in the peripheral blood or the tumor tissue, was often described as a prognostic marker associated with a beneficial outcome. However, in some tumors a correlation to an impaired prognosis has been reported. We further gathered information about detailed mechanisms and functions of eosinophils in tumor defense.

We analyzed peripheral blood samples from melanoma patients and found an eosinophil accumulation associated with a clinical response to ICI. Alterations in the genetic profile and the activation status of eosinophils were observed during immunotherapy. We further identified IL-16 as a cytokine in the peripheral blood which correlated to the eosinophil frequency. In tumor tissue samples, we could show an enhanced degranulation of eosinophils after ICI. A positive correlation between the infiltration of eosinophils and CD8+ T cells has also been observed. In summary, our findings suggest eosinophils as a biomarker of response to ICI in melanoma patients and they present different mechanisms of ICI effects on eosinophils.

Altogether, we found eosinophil accumulation to be a potential biomarker for melanoma patients who may benefit from ICI and for an improved prognosis in most solid tumors. However, additional research should be performed to understand the mechanisms of their accumulation and their modulation of tumor growth.