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PII: S1568-1637(17)30025-9
DOI: http://dx.doi.org/doi:10.1016/j.arr.2017.03.008
Reference: ARR 756

To appear in: *Ageing Research Reviews*

Received date: 3-2-2017
Revised date: 30-3-2017
Accepted date: 30-3-2017

Please cite this article as: Jackaman, Connie, Tomay, Federica, Duong, Lelinh, Razak, Norbaini Bintu Abdol, Pixley, Fiona J., Metharom, Pat, Nelson, Delia J., Aging and cancer: The role of macrophages and neutrophils.Ageing Research Reviews http://dx.doi.org/10.1016/j.arr.2017.03.008

Aging and cancer: The role of macrophages and neutrophils

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Highlights

- Age-related changes to macrophages and neutrophils may impact on age-related diseases
- Aging coincides with a decline in anti-tumour immunity
- Imbalanced pro/anti-inflammatory signals may alter the tumor microenvironment
- Age-related changes to tissues that supply immune cells may impact tumor growth

Abstract

Impaired immune function has been implicated in the declining health and higher incidence of cancer in the elderly. However, age-related changes to immunity are not completely understood. Neutrophils and macrophages represent the first line of defence yet their ability to phagocytose pathogens decreases with aging. Cytotoxic T lymphocytes are critical in eliminating tumors, but T cell function is also compromised with aging. T cell responses can be regulated by macrophages and may depend on the functional phenotype macrophages adopt in response to microenvironmental signals. This can range from pro-inflammatory, anti-tumorigenic M1 to anti-inflammatory, pro-tumorigenic M2 macrophages. Macrophages in healthy elderly adipose and hepatic tissue exhibit a more pro-inflammatory M1 phenotype compared to young hosts whilst immunosuppressive M2 macrophages increase in elderly lymphoid tissues, lung and muscle. These M2-like macrophages demonstrate altered responses to stimuli. Recent studies suggest that neutrophils also regulate T cell function and, like macrophages, neutrophil function is modulated with aging. It is possible that age-modified tissue-specific macrophages and neutrophils contribute to chronic low-grade inflammation that is associated with dysregulated macrophage-mediated immunosuppression, which together are responsible for development of multiple pathologies, including cancer. This review discusses recent advances in macrophage and neutrophil biology in healthy aging and cancer.

Keywords: Macrophage, neutrophil, cancer, tumor microenvironment, aging