The role of cellular senescence in aging and cancer: Molecular analysis of host-microbial relationships

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Oncogenic proliferative signals are coupled to a variety of growth inhibitory responses, such as the induction of apoptotic cell death or irreversible cell cycle arrest termed “cellular senescence”. Therefore, both apoptosis and cellular senescence are thought to act as important tumor suppression mechanisms. Unlike apoptotic cells, however, senescent cells remain viable for long periods and accumulate with age in various organs and tissues *in vivo*. Notably, it has also become clear that some senescent cells that accumulate *in vivo* secrete various pro-inflammatory and pro-tumor factors, a phenomenon known as "SASP," which can cause harmful side effects. It is therefore conceivable that the accumulation of senescent cells *in vivo* may contribute to aging-associated inflammatory diseases, such as cancer. Thus, the development of methods to remove senescent cells accumulated in the body as a means of tumor suppression and anti-aging has been actively pursued in recent years, and more than 20 candidates for senescent cell removal drugs (senolytic drugs) have already been reported so far. On the other hand, it has been reported that SASP may also play important roles in wound healing, immune activation, and other aspects of homeostasis in the body depending on the biological context. Thus, it has also been suggested that indiscriminately removing senescent cells accumulated in the body may not lead to an increase in healthy life expectancy, but rather may reduce biological functions. Therefore, we believe that it will be safer and more effective to identify the causes of cellular senescence in the body and prevent it than to indiscriminately remove senescent cells accumulated in the body. Here, I focus on changes in the gut microbiota as one of the causes of cellular senescence, and discuss its mechanism of action and its role in aging and cancer.