(5) An increasing number of gerontological experiments are performed on model systems providing only indirect information on the mechanisms of aging, and its interpretation largely depends on the basic concept supported by a given research team. In particular, this concerns the usage of the term "cell/cellular senescence," which was originally introduced to designate a complex of various adverse changes occurring in normal cells due to the exhaustion of their proliferative potential.[23–27] Today, however, many authors apply it to the phenomenon of suppression of proliferative activity in cells (including transformed cells) under the effect of various DNA damaging factors, which is accompanied by a certain cascade of intracellular events.[28–31]

There are also some extra problems we will touch on in the next sections concerning various approaches to testing of geroprotectors (anti-aging compounds or physical factors) in experiments on cultured cells.

4.2 Cytogerontological Model Systems

Cytogerontology deals with analysis of aging mechanisms on cultured cells.[5,21,32–34] It is the cytogerontological approach that is increasingly being used to test potential geroprotectors (any physical or chemical factors retarding the increase in the probability of death with age). It should be emphasized that cytogerontology as a branch of gerontology cannot successfully develop in the absence of the correct general gerontological concepts and definitions described in Section 4.1. Because of this, we will review various approaches to the testing of geroprotectors in experiments on cultured cells keeping all our general considerations in mind.

There is the issue of what we call "the problem of reductionism." In the absolute majority of gerontological theories proposed in the past few decades, the mechanisms of both "normal" and accelerated or retarded aging of multicellular organisms are reduced to certain macromolecular changes (no matter stochastic or programmed) in their constituent cells. As a consequence, numerous model systems have been developed to study "age-related" changes in the cells relieved from "organismal noise" associated with the functioning of the neurohumoral system. Such reductionism in experimental gerontology ("it all depends on adverse changes in individual cells") has played its role, particularly in the development of the Hayflick model and also of some models used in our laboratory, such as the "stationary phase aging" model, the cell kinetic model for testing of geroprotectors and geropromoters (any factors that accelerate aging), and the model based on evaluation of cell colony-forming capacity.

What is not often remembered is that the foundations of this science were laid by August Weismann[35,36] as early as in the late 19th century. As for the term "cytogerontology," it was introduced by Leonard Hayflick[32,37] to describe research on aging *in vitro*, *i.e.*, "age-related" changes in cultures of normal cells that have exhausted their mitotic potential (in fact,