How Many Cell Divisions in 'Old' Cells?

Dear Editor

We would like to make an important comment on the review (Hipkiss, 1992) of our book (Gavrilov and Gavrilova, 1991) published recently by the *International Journal of Geriatric Psychiatry*.

It was written in that review '... the authors are not themselves without error: when considering the division of human fibroblasts during *in vitro* culture and the reduction in viability in "old" cells, they suggest (p. 217) that if only 10% of a population is capable of division, such cells must divide *10* (my italics) times to reach the numbers if all the cells had divided. However, it appears that the authors have neglected the exponential nature of cell growth. 10 cell divisions would produce an 846-fold increase in cell numbers, whereas fewer than 5 divisions would be required in the example outlined.' (Hipkiss, 1992).

The calculations of Dr. Hipkiss would be correct if ALL the cells produced by cell division in old cell cultures are capable for further division too. This is definitely NOT true since the percentage of dividing cells in old cultures is very low (about 10%) and is NOT increasing (in fact it is decreasing). Otherwise, if the assumption of Dr. Hipkiss would be correct, the percentage of dividing cells would continuously increase and the cultures would be 'immortal'.

Now let us estimate a fraction of new-formed cells that lose ability for further division in old cultures. Simple calculations show that this fraction is very high and close to 50% (Gavrilov and Yaguzhinsky, 1978)! Otherwise there would be a continuous increase in the percentage of proliferating cells and the cultures would be 'immortal'. Thus, you will inevitably come to a conclusion that about 10 cell divisions are necessary to double the culture when the percentage of dividing cells is 10% only and does not increase (about 50% loss in proliferative activity of new-formed cells). Although this old problem was solved long ago (Gavrilov and Yaguzhinsky, 1978), the recent book review is an excellent illustration that the solution of this important problem is not yet well known among the gerontologists.

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