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REJUVENATION OF CULTURES OF TISSUES *

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The duration of the life of cultures of tissues, up to now, has been very brief. In approximately from three to fifteen days after the preparation of the culture, the growth becomes progressively less rapid until it stops altogether. Following this; the tissues die and the cells disintegrate.

It may easily be supposed that senility and death of tissues are not a necessary phenomenon and that they result merely from accidental causes, such as accumulation of catabolic substances and exhaustion of the medium. The suppression, then, of these causes should bring about the rejuvenation of the arrested culture and thus increase considerably the duration of its life. As it would be important, for many reasons, to keep tissues alive outside of the organism for a long period of time, I attempted to develop a method for the rejuvenation of the cultures of tissues.

The rejuvenation consists in removing from the culture substances that inhibit growth and in giving to the tissue a new medium of development. It is accomplished by extirpating with a cataract knife the fragment of coagulated plasma containing the original piece of tissue and the surrounding new cells, which are washed for several minutes in normal or slightly hypotonic Ringer's solution.

Afterward, the fragment is placed in a hypotonic medium composed of three parts of normal plasma and two parts of distilled water. The time of rejuvenation is chosen before the appearance of the changes of senility or when they are just beginning to appear. The process described is repeated more or less frequently according to the rate of the growth and the condition of the cells.

The results of rejuvenation were studied on cultures of connective tissue. The original connective tissue was taken from the spleen, the skin, the pericardium, and the portal vein of sixteen- to twenty-day-old chick fetuses. The first rejuvenations were made when the cultures were still in the period of full growth or at the beginning of the declining period. A few hours after the passage into the new medium, elongated cells or chains of cells radiated through the plasma, and the growth went on rapidly. The washing and passage into new media were repeated when the rate of growth decreased or when large granulations appeared in the cytoplasm of the cells.

Many of the cultures were rejuvenated five, six, seven, eight and even nine times. It was observed that after the seventh or eighth passage, fusiform cells appeared in the new medium as rapidly as after the second or the third passage. Thus, the occurrence of senility in these cultures was prevented and the length of their life very much prolonged. A culture of portal vein after the ninth rejuvenation is still growing actively on the thirty-first day of its life outside of the body.

These results demonstrate that rejuvenation of the cultures of tissues is possible. They show also that, under the conditions and within the limits of the experiments, senility and death are not a necessary, but merely a contingent, phenomenon.

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