SALT CONCENTRATIONS WHICH LIMIT BACTERIAL GROWTH (INCUBATION PERIOD—THREE DAYS).

Salt.	Molar Conc. No Growth.	Growth.	Salt.	Molar Conc. No Growth.	Growth.
$HgCl_2$.....	.00001	.000005	TlCl.....	.005	.001
$CdCl_2$.....	.0001	.00005	$NiCl_2$.....		
$CeCl_2$.....	.0001	.00005	$SnCl_4$.....		
$AlCl_3$.....	.0005	.0001	$TiCl_3$.....	.01	.005
$PbCl_2$.....					
$CoCl_2$.....			$MnCl_2$.....	.05	.025
			$BaCl_2$.....	.25	.1
$FeCl_3$.....	.001	.0005	$CaCl_2$.....	.5	.25
$FeCl_2$.....			$MgCl_2$.....	.5	.25
$CuCl_2$.....			$SrCl_2$.....	1.0	.25
$ZnCl_2$.....					
			LiCl.....	1.0	.5
			NH_4Cl.....	1.0	.75
			NaCl.....	2.0	1.0
			KCl.....	2.0	1.0

23 salts studied we found a concentration which caused more rapid growth than occurred in the plain pepton solution, the stimulating salts including not only K, Na, NH_3, Li, Sr, Mg, Ca and Ba, but such toxic salts as those of Ti, Sn, Ni, Pb, Ce and Hg. The stimulating concentrations with the latter salts were of course exceedingly low (.00005 molar in the case of Pb, .00001 molar in the case of Ce, .000005 molar in the case of Hg) while with K and Na .25 molar concentrations were stimulating. It is very possible that stimulating concentrations of the other eight salts could have been established by more exhaustive study.

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A ten-year-old strain of fibroblasts.

By ALBERT H. EBELING (by invitation).

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A strain of fibroblasts, obtained from the heart of a chick embryo on January 17, 1912, has completed the tenth year of its life *in vitro*. On April 19, 1922, our incubators contained about 60 cultures which represented the 1906th generation of the connective tissue cells. Their growth is as rapid as during the past

years, each fragment generally doubling its volume in 48 hours. In 10 years, more than 30,000 cultures have been derived from a fragment of heart less than 1 cubic millimeter in size. This demonstrates first, that the cells transform the food stuffs in their medium into protoplasm. Second, under the conditions of the experiments, the cells are no longer subject to the influence of time, as they are when living within the organism, and demonstrate that they are potentially immortal. The cells have now exceeded the average life of chickens, which disposes of criticisms on this point.

Pure cultures of cells are important in studying biological problems. The strain responds readily to changes in the composition of the culture medium by modifying its rate of proliferation. By perfecting the technique, it could be used as a reagent for detecting substances contained in the humors which have the power of activating or decreasing the rate of cell proliferation, and further, to investigate the interactions of the cells and their medium, which are still incompletely known.

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Bio-radiological studies.

By **HERBERT RUCKES** and **ARTHUR W. FUCHS** (by invitation).

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Animals in which arteries, veins and ducts of various organs are injected with salts of heavy metals, such as mercury, barium, lead, gold and silver are skiagraphed and subsequently studied in either plane view or by means of stereoscopic rœntgenograms. The method is especially valuable for the study of animals from the view point of comparative anatomy, Such preparations show clearly first, the general construction of the arterial or venous system and secondly the minute ramifications of the respective arteriole systems on and within the organs. Probably the most valuable use that this method has is in the study of developing systems and ducts in embryos. Here the homologies of the embryonic blood vessels and the adult arteries and veins can readily be demonstrated.