

or low phthalein output. From these observations we conclude that 20 mg. per 100 c.c. may be taken as upper normal limit of urea nitrogen in the blood of hospital patients.

166 (1344)

Production of transplantable growth.

By RHODA ERDMANN.

[From the Osborn Zoölogical Laboratory, Yale University.]

After analyzing the known numerous theories on the origin of abnormal growth and especially of malignant growth, which have been devised either with or without reference to facts, it seems possible to concentrate the apparently necessary postulates for the successful origin of abnormal growth to the following conditions which cover all important theories on this subject. The presence of a cell group in an indifferent stage of growth, the dissociation of this cell group from its surrounding and its change from the indifferent stage of growth to a stage of proliferation, the inflammation of the connective tissue, neighboring this cell group, and a changed metabolism of the cells, in which this cell penetrates and which it destroys. Supposed these conditions are true to actual facts it must be possible to produce experimentally these factors either in various sequence or all at once and observe results.

I. Embryonic tissue of the chicken heart, after twelve days' incubation, was cultivated in a plasma medium for three days, and three 1 mm. square pieces implanted subcutaneously into a chicken. The implants produced after *ten days* small protuberances. Sections show cyst formation, caused by the isolation of the epidermis above the implants and *inflammatory* proliferation of the connective tissue of the host. Cyst formation, destruction of the feather follicles and accessory apparatus of the feather after previous isolation of the feather-forming complexes are visible. The implanted embryonic heart-muscle tissue which is surrounded by lymphocytes and newly formed connective tissue cells shows no considerable development. Protuberances produced in the same manner disappear after three weeks, as was to be expected.

II. The size of such a growth can be enlarged by a few injections of a *growth-promoting* substance, *i. e.*, tetheline, into the protuberance itself. The growth treated with tetheline is three times as big as its untreated neighbor. Sections show the implant, bordering on the unchanged skin, closely connected with it by newly formed tissue. The embryonic heart-muscle tissue particles are visible after 10 days. Newly formed connective tissue penetrates into the subcutaneous connective tissue of the host. The implant is vascularized by the blood vessels of the chicken. In the skin above the implant, the previously described disarrangement of the epidermal parts and the feather follicles has also taken place. But though these growths often reach the size of a hazelnut, they are finally resorbed.

III. The diet of the host, in which the prepared tissue particle was going to be implanted, was now changed from mixed diet to a vitamine-restricted diet. Chickens were fed with corn gluten meal and the same implantation performed. Breasts of chickens of the same age, but fed on different diet, showed a marked difference in the development of the breast muscles which are nearly atrophied in chickens on vitamine-restricted diet. Protuberances appeared after implantation in the same manner, as in birds fed with mixed food. After twenty-four days half of a protuberance was extracted and sectioned. The destruction processes in the skin are nearly finished, all feather follicles are destroyed, and it could be seen during the extraction that the tissue of the growth had penetrated into the underlying tissue of the host. The remaining half of the protuberance gradually disappeared and in its stead a tumor-like growth appeared. It was partially extracted eight weeks after the original implantation, the chicken dying three days after this operation. Horizontal and transverse sections show the penetration of fibrous connective tissue into the striped muscles, their compression and destruction, together with compressed blood vessels and blood sinuses. Where these processes are finished muscular tissue and fibrous connective tissue of surprising structure appear. The hard tumor shows macroscopically deep pockets in which we see the destroyed blood vessels and muscles; they seem to be filled with brown detritus. Part of this original growth could be successfully grafted on

chickens on vitamine-restricted diet. The fourth generation after thirteen days' growth from February 12 to 25, 1918, showed the character of the original growth, especially the capacity to penetrate into the underlying tissues and to destroy them.

I will not omit to point out that the growth described here did not show bacterial contamination. The possible objection, that this growth which is very similar to those described by Rous,¹ 1910, *a* and *b*, and Rous and Lange,² 1913 (compare 1910, Fig. 5, 1910, Figs. 2 and 3, and 1913, Fig. 7) might be a "spontaneous growth," I will refute immediately by saying that the repetition of this series of experiments on a larger scale was successful. Only in two of twelve chickens, which had received (1) implantation of heart tissue, (2) tetheline injections into the implant, (3) vitamine-restricted diet, growths were produced, the other ten, in which one or two different factors are lacking, showed no protuberance formation.

The produced growth, the genesis of which I have outlined, seems to be a connective tissue growth. It is infiltrable, destructive and transplantable. Further cytological investigation, especially the solution of the question, whether the implanted embryonic tissue cells are really forming by their descendants part of the growth, will be necessary to name this transplantable growth correctly.

A detailed description of this growth and two others, together with their descendants, will appear later.

167 (1345)

Immunization of monkeys against poliomyelitis.

By **H. L. ABRAMSON** (*by invitation*).

[*From the Bureau of Laboratories Dept. of Health, N. Y. C.*]

This work represents efforts made toward developing a practicable method of immunization against acute poliomyelitis. Highly potent monkey polio virus is attenuated by heat in two ways. In one case 5 c.c. of brain and cords in 10 per cent. saline

¹ Rous, *Jour. Exp. Medicine*, 1910, p. 285 and p. 397.

² Rous and Lange, *ibidem*, 1913, p. 651.