The purines and purine metabolism of tumors, and the chemical relations of primary and secondary tumors.

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One of the most characteristic features of tumor biology is that metastatic growths breed true to the primary growth, so far as histological evidence shows, with few exceptions. The chief influence which the site of a secondary growth seems to have upon its structure is largely mechanical or nutritional, and the secondary growth shows no evident inclination to acquire any of the structural characteristics of the tissue in which it has taken growth. Whether the chemical structure also breeds true is a matter which has had less consideration. There is some affirmative histological evidence on this point, in the fact that such products of cell metabolism as can be demonstrated microscopically, e.g. mucin, melanin, keratin, are found to appear quite regularly and characteristically in secondary growths in different parts of the body. In the case of carcinoma of the thyroid with metastasis it has been found by analysis that the secondary growths may contain iodin [Ewald\(^1\), Gierke\(^2\)]. Carlson and Woelfel\(^3\) not only found iodin in both the thyroid and secondary growths of a dog with thyroid carcinoma, but in another dog with the same sort of tumor, whose thyroid contained no iodin, the secondary tumors were also devoid of iodin. Indeed, everything we know concerning the biology of tumors would lead us to expect that chemically as well as structurally secondary tumors should remain true to the parent tissue and not assume the characteristics of the soil upon which they grow, but this question has not yet been investigated to any considerable extent.

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The chief references bearing directly upon this point are the following:

Waring 1) found that in a carcinoma of the pancreas, both the primary tumor and the metastatic growths in the liver contained the ferments characteristic of the pancreas, that is, trypsin, amylopsin, rennin, and steapsin.

Neuberg 2) found pentose in the autolysate of a carcinoma of the liver and not in the autolysate of normal liver tissue. The same author 3) also found that a primary carcinoma of the stomach yielded no pentose, while from a carcinoma of the liver secondary to a gastric carcinoma he obtained pentose. Beebe 4) found that carcinoma of the breast usually contains more pentose than normal breast tissue, irrespective of the amount of nuclear material present, but lower than the amount in normal liver; carcinoma of the liver secondary to a mammary carcinoma was found to have a lower content of pentose than the liver, thus resembling the primary tumor. On the other hand, the pancreas contains much more pentose than does the liver, yet in a carcinoma of the liver secondary to the pancreas the pentose figure was more like that of liver than pancreas. Finally, the pentose content of a carcinoma of the stomach and its secondary growths in the liver were quite similar to each other. Therefore it would seem from these few observations that there is no regularity in the relationship between primary and secondary tumors and the soil in which they grow, in respect to their pentose content. Somewhat more positive evidence was obtained by Beebe 5) when the nucleo-histon was investigated. This complex is characteristic of lymphatic tissue, and was found present in secondary carcinomas in lymph glands, although never present in appreciable quantities in tumors in other tissues.

It is possible, however, that the nucleo-histon found in these growths may have been derived from lymphatic tissue included with in the tumor growth, or not removed from about it, for no mention is made of any control of this source of error. Without having some proof that the nucleo-histon found had been formed by or was a constituent of the tumor cells, rather than of the lymphatic tissue, which they have invaded, the evidence afforded by these observations on nucleo-histon scarcely warrants the statement that „although histologically the secondary growth is similar to the primary, there may be differences in chemical constitution.”

1) Waring, Journ. anat. and physiol. 1894. XXVIII. 142.
2) Neuberg, Berliner klin. Wochenschr. 1904. XL. 1080.
3) Neuberg, Berliner klin. Wochenschr. 1905. XLII. 118.
4) Beebe, Amer. journ. physiol. 1905. XIV. 231.
5) Beebe, Amer. journ. physiol. 1906. XV. 341.