That lipoid solvents cause anaemia and fatty infiltration of the liver is well known. Benzol is in this class. It has been possible for us to show that such substances do not act or cannot be transported so they can act except when the system is saturated with vitamin A.

[1] Jorstad, L. H., *J. Exp. Med.*, 1925, xliii, 221.
[2] Jorstad, L. H., *J. Cancer Res.*, 1925, ix, 232.

3240

The Effect of Vitamin Feeding on the Growth of Cancer.

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Cramer[1] states that the removal of one or the other of the vitamins from the diet of animals with transplanted and growing tumors has little or no effect on the growth of the tumors. The animal alone suffers from the deficiency. We have noted a similar result excepting when very large doses of vitamin B are given in a diet deficient in vitamin A. Rats inoculated with the Jensen sarcoma were used for these experiments. Rats given very large doses of vitamin B in a diet deficient in vitamin A suffered a marked anemia with a rapid disappearance of the tumor in a few cases and an early death of the rats in most cases. Tumors in two men broke down with this diet much the same as with X-rays. The tumors were lip cancers metastasizing to the neck. These patients also suffered marked anemia and it was necessary to stop the treatment after a short time, not only on account of the anemia, but because of a developing parenchymatous nephritis.

Quite different from the animals, men with malignant tumors have responded more readily to small changes in the vitamin A content of the diet. A man with a melanoma arising from a birthmark on his head and a large mass of metastases on one side of his neck, recovered from his cachexia and anemia com-

pletely after six weeks, and worked hard during the next four months, maintaining his nutrition and suffering no extension of his tumor. The diet he received contained a large amount of vitamin A and a moderate amount of vitamin B. He left us at this time and a competent diagnostician thought the tumor was not malignant on account of the patient's good physical condition. He removed the tumor with eventual disaster. Another case, a girl of 27, with thousands of metastases over her body, recovered from her cachexia completely and the tumors remained stationary for over three months, when she died of intestinal perforation. A single very large dose of vitamin B caused a marked loss of vigor and increased her measurable tumors one-half, and on another occasion a small dose of X-ray to a painful area of her back also increased the size of her skin metastases. These tumors regressed again on a diet high in vitamin A. X-rays, as we have shown, liberates vitamin B in the organism.

Even old men, having a marked arteriosclerosis and myocarditis, besides cancers of mouth and neck, have recovered from their cachexia and have responded much better to X-ray treatment under a high vitamin A diet than usual.

As pointed out in other papers,[2] our experiments have shown that the stimulus for the growth of body cells is a water soluble and actively diffusible substance, which has been called the archusia. It is formed by the cells but cannot be retained by them excepting in a restricted stagnant environment. This substance is not specific in many instances at least, and when fed to animals has been found to be vitamin B.[3] The normal animal organism contains not only this growth stimulus, but an excess of growth inhibitor, a lipoid substance known as the ergusia. The ergusia is formed by all cells in nature but not in quantities sufficient to inhibit their growth. It is a necessary and intimate part of their protoplasm. The ergusia is either vitamin A or formed from vitamin A.[4] It is forced in excess on the cells of higher animals from the food. In the presence of this high ergusia or vitamin A the cells do not form and retain ample archusia or vitamin B for their life. This must be supplied also from the outside. In low concentration (S^1) the archusia (S) or vitamin B has no effect. In medium concentrations (S^2) it causes the cells to differentiate and function. In high concentrations (S^3) it causes them to lose their differentiation and grow. In all higher concentrations (S^4) they degenerate.

The ergusia is used for differentiation. The proper life of the organism depends on the proper balance of these two vitamins. Cancer develops in the organism at any point where the cells are relieved of the excess of vitamin A and are crowded into masses having a poor blood circulation where they can form and retain ample archusia (S) for their independent growth.

Any slight addition of vitamin A to such a system must retard its growth. Any slight addition of vitamin B must accelerate this growth. The addition of greater amounts of vitamin B must disturb function as well as destroy a cancerous tissue. Cachexia results from either removing the vitamin A from the organism or increasing the vitamin B. Vitamin B is liberated by all actively growing cells. Cancerous tissues liberate large quantities of it. The same large quantities are liberated by actively growing bacteria. A patient with a moderate tuberculous lesion grows excessively. With a larger lesion he suffers cachexia unless given a diet rich in vitamin A. He will suffer the cachexia from a much smaller lesion if this vitamin is withheld. The same has been found to be true for cancer patients. A patient suffering from the terminal fever or *spleno-myologenous leukemia* was relieved of his fever for a period of ninety days with a diet rich in vitamin A. His fever could be returned by a single large dose of either vitamin B or X-rays. He was able to be up and around, dying finally of a hemorrhage into a leukemic spot in his pons. He might have been relieved of this at an earlier time if proper local X-ray treatment had been given.

It has thus been possible in our experiments to show that the symptom complex of many diseases can be reduced to terms of vitamin imbalances. The growth of the cells in cancer is not the result of external agents, but the result of a previous disturbance in the balance of vitamins at a local point in the organism. It is the high vitamin A content of the tissues which prevents the cells of the body from growing independently at all times. Cancer is induced by anything which removes this excess from a locality or increases the vitamin B in that locality. Its subsequent effect on the body is the result of its liberating an excess of vitamin B to other tissues and the removal of vitamin A used for the growth of its cells.

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[1] Cramer, W., 8th *Sci. Rep. Imper. Cancer Res. Fund*, 1924, p. 17.

[2] Burrows, M. T., and Johnston, C. G., *Arch. Int. Med.*, 1925, xxxvi, 293.

[3] Burrows, M. T., and Jorstad, L. H., *Am. J. Physiol.*, 1926, lxxvii, 24.

[4] Burrows, M. T., and Jorstad, L. H., *Am. J. Physiol.*, 1926, lxxvii, 38.