It is seen that complete protection was afforded by injections of 1 cc. of the solution, equivalent to an average daily dose of 3.98 mg. of phosphorus. The total amount administered during the 28 day period of the experiment was 111.55 mg. Injection of lesser amounts gave only incomplete protection.

Data as to the phosphorus retention of rats on Diet 84, with and without cod liver oil or light treatment, are available from the published analyses of McCann and Barnett.[3] Their table shows that the mean total phosphorus content of the bodies of four untreated rachitic rats, was 203 mg.; and of 5 treated rats on the same diet, 306 mg. There was thus, under the influence of these prophylactic agents, an additional total retention of 103 mg. of phosphorus, or an average daily retention of 3.7 mg.

This figure corresponds in an interesting way with the above figure of 3.9 mg., needed to afford protection by subcutaneous injection.

The average daily food consumption of two rats (Nos. 111 and 116) on Diet 84 plus 0.4 per cent K_2HPO_4, was found to be 8.94 and 8.86 gm. respectively. This corresponds to an approximate daily intake of 6.7 mg. of added phosphorus—an amount which may be taken as the minimal protective dose per cc. If this estimate holds true for a larger series, one may consider the protective *subcutaneous* dose as approximately 60 per cent of the amount required when administered with the food.

253 (2485)

A comparative cytological study of the neoplasms of animals and plants.

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The attempt to compare animal cancer and plant overgrowths must involve a cytological study of their respective tissues. For animal cancer three cases of epithelioma were mainly studied

[3] McCann, G. F., and Barnett, M., *J. Biol. Chem.*, 1922, liv, 203.

together with several cases of breast and rectal carcinoma and spindle cell sarcoma. Of the plant cancers, crown gall was the chief subject of my study, while the hyperplastic tissue of the potato wart was also used.

The cytology of human cancer has been much studied. The existence of multipolar spindles has been described by many workers on animal cancers. I find that nuclei with innumerable chromosomes cannot be due only to unequal distribution of the chromosomes on the spindle, in division. From my preparations of animal cancer a more plausible interpretation leads to the conclusion that these hyperchromatic cells arise from large multinucleate cells and from cells with two or more lobulate nuclei. The nuclei in these cells with their centrosomes undergo simultaneous division; their nuclear membranes disappear and we thus get the appearance of multipolar spindles.

Lobulate nuclei in cancerous tissue are not evidence of the existence of amitotic division. The lobulate nucleus indicates rather a high metabolic activity of these cells similar to that found in actively growing tissues of animals.

The monaster stages recorded by von Hansemann and others are rare in my preparations and those that occur are suggestive in appearance of a section through a dividing cell in which the chromosomes have not reached the poles nor have the centrosomes disappeared, yet the constriction for cell division has been almost completed.

Hyperplastic cells are found in crown galls and potato wart. Binucleate and quadrinucleate cells appear in crown gall tissue. No multipolar spindles have been found in my preparations. In plant tumors I have found nothing comparable to the hyperchromatic and hypochromatic cells of Klebs, von Hansemann, Farmer, and others. No true multinucleate anaplastic giant cells appear although large uninucleate and occasionally binucleate cells are found in crown galls. Nuclei with simple constriction on one surface are found in crown gall cells quite commonly. Prankard, and Beer and Arber, and others have found binucleate cells with lobed nuclei in normal tissues of a great number of plants. My preparations show that the mitotic divisions in tissues of crown gall and potato wart are normal in character and not unlike the divisions of young normal growing tissues.

It appears that the abnormality in neoplastic diseases of plants is found in the rate of division rather than the character of the division. The rapid increase of cells is a response to the parasitic stimulation. In animal cancer both the rate and character of the divisions are aberrant.

This paper was read, in Boston, before the Botanical Society of America in December, 1922. A full report with three plates of figures will appear shortly.

254 (2486)

Further studies with the Dick test and active immunization with scarlet fever streptococcus toxin.

By ABRAHAM ZINGHER.

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Further studies have been made with the Dick test along the following lines:

1. Results with the test among special groups of children and adults.
2. Study of the control test with heated toxin and with toxin neutralized with convalescent serum.
3. Study of scarlet fever cases during convalescence.
4. Study of toxins produced by special strains of hemolytic streptococci.
5. Retest of a group of children actively immunized with increasing doses of scarlet fever streptococcus toxin.

1. The application of the Dick test to a group of 320 children at the Horace Mann School and at the Riverdale Country School, New York City, has shown a very high percentage of susceptible individuals in this class of children coming from the more well-to-do homes. The test showed that of 320 children varying in age from 5 to 18 years, 266 or 83.0 per cent were susceptible and gave a positive reaction. The Dick test was also given to 80 nurses at St. Vincent's Hospital, and of these 42 or 52.5 per cent showed a positive reaction. The nurses at this