Papers Presented to Local Branches

THE SELENIUM TREATMENT OF CARCINOMA.*

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It is not a direct question for the pharmacists, if selenium will cure cancer or not; but it is important for the pharmacist to know if one or more derivates are efficient in the cure of cancer. It is also important to know how to handle these preparations for the making ready of medicines. In this particular it is necessary for the pharmacist to know more than the treating physician.

The main point of salvarsan is, that the poisoning effect of arsenic persists for the spirochaete, but in a persistent manner loses the poisoning effect on the human body. This preparation must be handled very carefully, and therefore it is put up in a special form ready for the physician's use. All the dividing into single doses is done in the manufacturing laboratory and there is no work for the druggist except to be the retail salesman. Mostly the selling of salvarsan is a direct business between the manufacturer, the wholesaler and the treating physician, and very often without the assistance of a druggist. The profit goes to the manufacturer and the unpaid dispensing trouble to the physician. This would not be necessary, if at the first, arsenic work on syphilis had been known to druggists.

For the cure of cancer the treatment of mice starts in the same way as the first salvarsan experiments. But the selenium application in the United States has gone further because it went the old way of pharmaceutical preparation without intravenous work.

The first thing to be known is the modus of the working of selenium. In the body you have albumins, fats and carbohydrates. These matters are burned up and the oxidized products given out. These mentioned foods consist of carbon, hydrogen, nitrogen, sulphur, phosphorus and other elements. Only carbon, hydrogen and sulphur are oxidized in the body. The other elements are only split off or formed into new compounds but are never changed in their degree of oxidation. It would take too much time to tell all the evidence which I found in cancer cases showing that the oxidation of carbon and hydrogen is increased and of sulphur decreased. A special treatment of cancer must be to improve the sulphur oxidation and to retard the oxidation of carbon and hydrogen. Especially selenium can do this.

Previously there were many other chemicals proposed for cancer cures. These were either oxidizing materials or aniline derivatives. The proofs for experimental efficiency were all right, but practically it was never possible to bring this efficient material to every carcinoma cell, and only in this way can cancer be cured.

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Selenium as a cancer cure must be able to come to every pathological cell. There the selenium will take oxygen and give it over to a higher oxidation of sulphur and will again take oxygen. The selenium and its compounds have such a high affinity for special albumins and keratines, that they elect the carcinoma cells, if there is any possibility to get to them.

Elementary selenium in coarse powder is never absorbed, either by the mouth, nor by the skin, nor by subcutanous or intravenous injection. Very fine freshly precipitated selenium can be absorbed when given through the mouth or applied as ointment to the skin, but only to a slight extent, and this amount depends on the fineness of the powder, and the freshly precipitated material is more actively absorbed than the old. In a material as poisonous as selenium it is important to have an exact idea of the amount absorbed. Therefore precipitated selenium has no practical use.

The compounds of selenium in the form of selenium-hydrogen, or in the oxidized forms as selenous and selenic acids, are reduced by contact with living albumin to metallic red selenium. At first we used selenium dioxide through the mouth. If this selenium dioxide is diluted enough, or mixed with enough other substances, in the digestive tract, a very fine suspension of reduced red selenium is formed, which becomes absorbed in the smaller intestine. A small part goes into organic compounds, as methyl-selenide and another part swings between oxidized and reduced salts, i. e., between selenites and selenides. About the same thing happens, if we give selenites, selenides or selenates of an organic character.

The toxicity of selenites, selenides and selenates is about always the same and depends only upon the solubility. Insoluble salts as copper selenide cannot be absorbed and are therefore not poisonous and not efficient. The efficiency and poisoning amount of the soluble salts are about as close together as in arsenic. The poisoning amount of soluble selenium salts is for an adult man between 4 and 15 grains. The efficient amount is between 1/20 and 1/5 of a grain per day.

These properties make it more desirable to have soluble organic compounds. The old treatment of cancer by different aniline dye stuffs gave us an idea to use a compound of an organic dye stuff with the selenium. This corresponds to the preparation of Wassermann and Ehrlich in Selen-Eosin. We first used aniline and selendioxide. Later on we used the selenocynates. At first we used the sodium salt, later on the potassium salt.

The idea for the use of selenocyanates is this: In the whole body, especially in the saliva, we have sulfocyanates, and these have a very high affinity for the plasma of the cells. In the selenocyanates only the sulphur of the sulfocyanates is replaced by selenium. These soluble compounds are very easily absorbed. Up to this time this preparation is the best we have seen for practical use. Later on it may be that we will use a substituted thiosinamin with selenium in the place of sulphur, or phenylallyl-selenocarbamide or other similar compounds. In all these cases the idea is that the selenium acts upon the tumor cells as a special katalytic agent causing a decreased oxidation of carbon and hydrogen and an increased oxidation of sulphur.

Only a very finely distributed selenium compound of this kind will be sufficiently absorbed and transported by the blood to the tumor. We may give

solutions, powders, pills and other preparations, very well; distributed but coarsely mixed preparations will not be useful. Also all ingredients which are used in these preparations should not be able to react in any way with the selenium.

I think the use of pharmaceutical preparations of inorganic selenium compounds will not be practical for the treatment of cancer. The organic compounds will be in the first line. These organic compounds are used through the mouth, if I am right; and intravenously if Prof. Wassermann is right. The use either through the mouth or intravenously is a very important question for the pharmacist, and I will ask you to pay attention to this point.

Mice can never be treated through the mouth. Mice will never take medicine directly, food mixed with medicine is always refused by them. Even if it were possible you would never know the amount eaten by them. They take the food and carry it from one place to another before eating any amount and make their excrement on the residue. The only way to bring selenium into the system of the mouse is to inject the compound. With human beings this is not necessary. It would be very much more trouble to give this treatment intravenously than to give it through the mouth. I have strong evidence that the intravenous treatment by selenium is very dangerous, whereas the treatment through the mouth is harmless.

Prof. Wasserman has cured mice from cancer in ten days, but in twenty days the cured mice died. We have cured some people and they have not died. But we have also evidence that it would be dangerous if we had not been very careful. We controlled all these cases by exact quantitative urine analyses.

It was found that many derivates of the cancer had gone into the circulating fluid of the body after the use of selenium. These derivates are dangerous tc the body and can be made less dangerous by a synthesis with sulphuric acid to etherfied sulphuric acid. In one case a fifth of a grain was given per day; the case recovered very quickly, but 90 per cent. of the sulphuric acid of the metabolism was used for the etherification of the circulating derivates of the tumor. A palpatory examination of the tumor showed that it was partly decreased and in different places very much softened.

Without the control with exact urine analysis every patient and every physician would have made the mistake not only as to the further use of the same medicine, but also to increase the doses. We are sure, if we had done so the patient would have died by auto-intoxication. In the selenium treatment of cancer the sulfur-metabolism and especially the amount of circulating absorbed products must be exactly measured. If we give selenium three times a day through the mouth we can find out at what time the treatment must be stopped. If we used intravenous treatment, it would not be possible to give the selenium three times per day for six weeks. If too much selenium is given by intravenous treatment, it works too quickly and when it is too late, we find out that the doses were too high. Therefore my conclusion is that the intravenous treatment is all right for experimental work on mice, but it is very misleading if we want to find a cure for sick people. Our proved cure of cancer goes through the mouth. This is the point wherein we disagree with Wassermann. The druggist should know of this disagreement.