

THE EFFECT OF AN EXCESS OF VITAMIN C ON THE NATURAL RESISTANCE OF MICE AND GUINEA PIGS TO TRYPANOSOME INFECTIONS.¹

BY

DAVID PERLA.

(Received for publication June 18, 1937.)

The interest in the importance of vitamins in the diet on the bodily well-being and the accumulation of evidence of the intimate dependence of natural resistance to infection on dietary factors has led investigators to test the value of an excess of such factors on resistance. Much of such work has been disappointing. It may be that a deficiency of a factor essential to normal cellular metabolism results in a depression of the organism to abnormal stimuli as infection, toxemia and the like. It does not necessarily follow that an excess above the bodily requirements would increase the natural resistance of the host above the normal.

However, in the case of vitamin C, sufficient evidence has accumulated to suggest the importance of ascorbic acid in oxidation reduction processes of cellular metabolism and it is conceivable that an increase in its availability might raise the capacity of the tissues to destroy toxic substances introduced into the body. For a review on the role of vitamin C in resistance, see Perla and Marmorston (1)...

¹ From the Laboratory Division, Montefiore Hospital, New York, N.Y.

rate of cellular metabolism is increased. In the presence of infection, therefore, an increase in the intake of vitamin C may be of considerable importance.

It has been suggested by the work of Harde (2), Harde and Philippe (3), Greenwald and Harde (4), Jungeblut and his coworkers (5, 6), Kligler (21) and others that vitamin C may have a direct detoxifying effect on bacterial toxins, and according to Kligler (21) and Gagy (22) that its value in the treatment of infectious diseases may be dependent on the inhibitory action of vitamin C on bacterial growth as well as toxin formation. It would appear that the action *in vivo* of vitamin C either as a direct bactericidal or detoxifying agent is problematic. It is doubtful whether such a high degree of saturation of the cells of the body with vitamin C could be attained, as is apparently necessary for a bactericidal action comparable to the *in vitro* experiments. Not only is this improbable due to the rapidity with which vitamin C is excreted in the urine when administered in excess, but vitamin C in very large amounts may prove deleterious. It is more probable that it exerts its influence independently of any direct bactericidal effect by its rôle in oxidation reduction processes in cellular respiration.⁴

Granting the importance of vitamin C in tissue respiration, are we certain of what constitutes the optimal vitamin requirement? Can the criteria of growth, progressive weight increase and the absence of clinical evidences of deficiency be accepted as adequate? It is possible for all these to be present and still in the event of a given stress, such as invasion with microorganisms, or injections with poisons, the apparent optimal requirements for normal conditions prove to be inadequate. -

In view of these facts, the least we may demand of experiments on the effects of an excess of a vitamin on resistance is rigid control of the stock from which the experimental animals are drawn. The animals used should be of the same stock, the history of which is known. The dietary regimen of the mother prior to the birth of the young, as well as the experimental animal since birth, should be under control and adequate in vitamin content. A relative deficiency during the early weeks after birth may cause a permanent impairment

⁴ The influence of vitamin C in resistance is dependent in part on its importance in the production of intercellular cement substances. Its absence inhibits reparative processes secondary to injury in connective tissue and bone (Wolbaeh and Howe (23)). Ascorbic acid may accelerate the rate of proliferation of monocytes (Baker (24)). It is essential, also, in the respiration of erythrocytes.