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Comparison of Oral and Subcutaneous Administration of Protective Doses of Ascorbic Acid (Vitamin C)

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The administration of antiscorbutics other than the oral route was first tried by Hess and Unger.[1] They found that neutralized orange juice given subcutaneously produced no antiscorbutic effect, whereas given intravenously a marked curative effect was noted. Recently the intravenous administration of ascorbic acid has been employed clinically by several workers (Schultzer,[2] Kramár,[3] and Wright,[4]) with successful result, but the dosage used was apparently taken at random. Subcutaneous injection of ascorbic acid into guinea pigs was employed by Jadassohn and Schaaf[5] in connection

* P represents a preliminary, C a complete manuscript.

1 Hess, A. F., and Unger, L. T., PROC. SOC. EXP. BIOL. AND MED., 1918, **15**, 141.

2 Schultzer, P., *Lancet*, 1933, **225**, 589.

3 Kramár, E., *Deutsch. Med. Wochenschr.*, 1933, **59**, 1428.

4 Wright, I. S., PROC. SOC. EXP. BIOL. AND MED., 1934, **32**, 475.

5 Jadassohn, W., and Schaaf, F., *Klin. Wochenschr.*, 1934, **13**, 845.

with their study upon skin pigmentation. The dose used was very large, being 5-50 mg.

Using a sample of ascorbic acid obtained from the British Drug House aud employing Höjer's method of biological assay (diet same as that reported previously Hou[6]) we found that with the same subminimal protective dose the degree of protection (graded according to Key and Elphick's[7] method) of 9 guinea pigs receiving the ascorbic acid by mouth was on the average exactly ½ that of 9 receiving the ascorbic acid by subcutaneous injection. According to Key and Elphick's interpretation, this result indicates that the minimal protective dose of ascorbic acid by oral administration is twice as large as that by subcutaneous injection. This may mean that part of the ascorbic acid given orally is possibly lost in the alimentary tract. Experiments are being carried out to test this point.

The ascorbic acid solution used was prepared fresh every other day and the remaining portion kept in a refrigerator. Before each feeding the actual content of ascorbic acid was determined by titration with iodine standard and also with 2-6 dichlor-phenol-indophenol. Oral administration was made by means of an accurate 1 cc. pipette and the subcutaneous injection by means of a 1 cc. tuberculin syringe, the solution being taken from the same bottle. Table I illustrates the result of one representative experiment. In each experiment 3 negative control animals showed 0 degree of protection, and 3 positive controls 4 degrees of protection.

TABLE I

Protection afforded by oral and subcutaneous administration of ascorbic acid (average daily dose 0.88 mg.)

Oral Administration		Subcutaneous Injection	
Guinea Pig No.	Degree of Protection	Guinea Pig No.	Degree of Protection
386	1.5	390	3.0
385	1.0	388	2.0
389	1.5	387	3.0
Aver.	1.3	Aver.	2.7

[6] Hou, H. C., *Chinese J. Physiol.*, 1935, in press.

[7] Key, K. M., and Elphick, G. K., *Biochem. J.*, 1931, **25**, 894.