

FLAVONOIDS AND COLD INJURY

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SINCE the discovery of Szent-Györgyi and co-workers^{1,2} that citrin, a mixture of flavonoids including hesperidin under the term of "Permeabilitäts vitamin" or "vitamin P", had the property of reducing capillary fragility and permeability, the biological effects (about 33 kinds of activity) of flavonoids³ have been studied by various workers^{4,5} and their action tried on such clinical conditions as hypertension, diabetes, rheumatic fever, arthritis and pregnancy. In recent years, there has been some claim for the use of flavonoids in the treatment of common cold and citrus flavonoids mainly hesperidin and rutin are included in a number of proprietary remedies in the United States. Dihydroquercetin has also been shown to be effective like rutin, and quercetin has been stated to be superior to rutin in the treatment of initial spontaneous capillary fault associated with hypertension. Although according to Pearson,⁶ bio-flavonoids cannot be considered essential as other vitamins in nutrition, the biological activities they possess need not be ignored, and it is worthwhile to re-investigate these properties more systematically in the context of the present emergency and with special reference to our medical needs.

A survey of the literature on the biological effects of flavonoids also reveals that dietary flavonoids have definite influence in frost-bite in rats, and orally administered rutin and related compounds on experimental frost-bite in rabbits. Fuhrman⁷ and Crismon⁸ of the Stanford University, California, had reported that the extent of tissue loss in rats with frost-bite was less in the group of animals fed with diet containing moderate amounts of flavonoids than in the flavonoid-free group, and particularly the flavonoids were more effective with cases of mild injury. Ambrose, Robbins and De Edds⁹ of the U.S. Department of Agriculture, further confirmed this observation and reported that rutin, quercitrin, methyl hesperid in chalcone and dihydroquercetin all appeared to offer some degree of protection. In the rabbits untreated with flavonoids, most of the frozen foot was involved in the tissue loss, while in the flavonoid-treated ones the loss of tissues was confined chiefly to the toes with partial to complete loss of phalanges.

During the last twenty years, considerable amount of work on the chemistry of flavonoids⁵ from Indian plant sources has been reported,

and certain flavonoids have been shown to be potentially useful as anti-oxidants.⁵ Special mention may be made of the work of Seshadri and co-workers and the study of gossypetin (8-hydroxy quercetin) for its significant vitamin P activity.¹⁰ This pigment could be isolated in good yields from the flowers of certain Indian Hibiscus species.¹⁰⁻¹²

One of the difficult conditions which our Jawans had to face recently at the Himalayan front has been the bad effects of cold injury, particularly at high altitudes and in view of the limited information available on the different aspects of cold injury, it is suggested that we should undertake a more specific study of the problem of cold injury and the possible use of flavonoids. Here, it is interesting to make special note of the recent report¹³ regarding vitamin C in relation to cold temperature tolerance; it has been shown that vitamin C in large doses is beneficial to animals such as rats, guinea pigs and monkeys when they are exposed to a cold environment. Since bio-flavonoids are known¹⁴ to potentiate the effects of ascorbic acid, it would be worthwhile to study the role of bio-flavonoids in conjunction with vitamin C in cold tolerance from the physiological, biochemical and histopathological angles and make use of them. They could also be tried as medicaments in anti-frost ointments.

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