SYNERGISM OF d- AND l-α-TOCOPHEROL*) DURING ABSORPTION

F. Weber, U. Gloor, J. Würsch and O. Wiss
Department of Vitamin and Nutritional Research and Physical Research Department of F.Hoffmann-La Roche & Co.Ltd., Basle (Switzerland)

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In a preceding communication (Weber et al., 1963), various biological aspects of d-α- and l-α-tocopherol were compared. As far as their distribution in various tissues and their metabolic degradation is concerned, no marked differences between the two compounds could be found. However, some differences were observed in the absorption of the compounds inasmuch as l-α-tocopherol was absorbed more rapidly than the d-form. It must, therefore, be considered that this behaviour may affect the absorption of d-α- and l-α-tocopherol when administered as a mixture, all the more as it is known that the intestinal absorption is a limiting factor for the biological availability of α-tocopherol. To study this problem, it was necessary to distinguish between the single components of such a mixture by analytical procedures. For that reason, a mixture of differently labeled α-tocopherols, i.e. of carbon-labeled d-α-tocopherol and ^{3}H-labeled l-α-tocopherol, was used for these studies.

2 mg of the mixture (1 : 1) of (5-methyl-^{14}C)-d-α-tocopheryl acetate (specific activity = 1.6 μC/mg) and (1',2'-^{3}H)-l-α-tocopheryl acetate (specific activity = 99.7 μC/mg) were administered to rats as described previously (Weber et al., 1963) and were compared with 2 mg of ^{3}H-labeled d-α- and 2 mg of l-α-tocopheryl acetate. To determine the radioactivity, aliquots of the tissue homogenates and of the blood samples were combusted (Kalberer and Rutschmann, 1961) and the two isotopes were counted in the same sample according to the discriminator-ratio method of Okita et al. (1957) using a Packard Tri-Carb scintillation counter. To render a direct comparison possible, the radioactivity measured in the various tissues was converted into weight units for both ^{14}C-d-α- and ^{3}H-l-α-tocopherol.

*) The d-α- and l-α-tocopherol preparations used correspond to (2R,4'R,8'R)-α- and (2S,4'RS,8'RS)-α-tocopherol, resp. (Mayer et al., 1963).

From the results shown in Fig. 1 and 2, it can be seen that the absorption of the mixture of d- and l-α-tocopherol was considerably higher (about 55 % on the average) than it was to be expected from the data obtained after administration of the single compounds. The increase of the absorption of the mixture concerns both d-α- and l-α-tocopherol in about the same ratio.

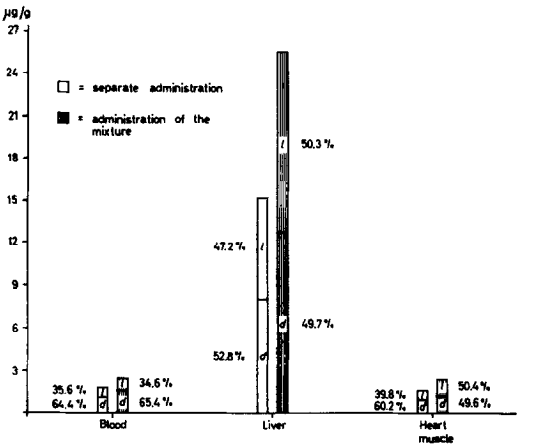

Fig.1. The α-tocopherol content of blood, liver and heart muscle of rats, 2 hours after the oral administration of 2 mg of a mixture of ^{14}C-d-α- and ^{3}H-l-α-tocopheryl acetate and after separate dosing of 2 mg of ^{3}H-d-α- or ^{3}H-l-α-tocopheryl acetate. In order to render a direct comparison possible, the values obtained for d-α- and l-α-tocopherol administered separately were halved and put together in one column. Average of two animals.

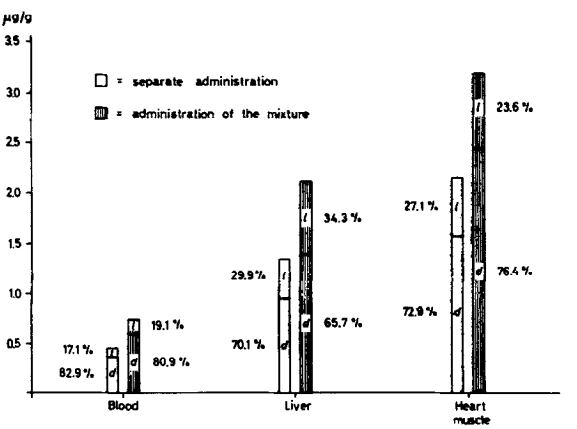

Fig.2. Comparison of the α-tocopherol content of blood, liver and heart muscle of rats, 96 hours after the oral administration of labeled d-α- and l-α-tocopheryl acetate, mixed or separately, as described under Fig.1.

In virtue of these results, it must be considered that the calculation of the biopotency of dl-α-tocopherol from that of the single components may not be justified without taking into account the different behaviour of the mixture and of the single compounds during absorption.

References

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