

# 運動時に増加する活性酸素を消去する ビタミンCとEの相互作用に関する研究

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## **Interaction between Vitamins C and E, Scavengers of Activated Oxygens which Increase during Exercise**

by

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### **ABSTRACT**

To investigate *in vivo* interactions between antioxidant vitamins C and E, sparing effects of vitamin C on vitamin E as well as of vitamin E on vitamin C was evaluated using inherently scorbutic [Osteogenic Disorder Shionogi (ODS)] rats, which were divided into 4 groups (the control, vitamin E-deficient, vitamin C-deficient and simultaneously vitamins C and E-deficient). The levels of vitamins C and E in tissues were determined on 0, 14 and 21 day (d) of deficiency. On d 14, the vitamin E concentrations in plasma, liver, brain and lung of the vitamin C-deficient group were significantly lower than that of the control, supporting the literature concerning the sparing of vitamin E by ascorbate. The vitamin E concentration of the vitamin C-deficient group was also significantly lower in plasma, heart, liver, lung and kidney than that of the control on d 21. Based on 2-way ANOVA, significant interactions between vitamins C and E were observed on d 21 concerning vitamin E concentration in plasma, heart, lung, liver and kidney. The ascorbate levels in plasma, heart, liver, muscle and kidney of the vitamin E-deficient group were significantly lower than the corresponding control on d 21. Based on 2-way ANOVA, significant interactions between vitamins C and E were observed on d 21 concerning vitamin C concentration in plasma, heart, liver, kidney and muscle. These

results suggested a sparing effect of vitamin E on vitamin C and this effect was observed for the first time in the present study. The extent of the interaction depended on the nature of the tissue. Thiobarbituric acid reactive substances (TBARS) in plasma and liver of the vitamin C-deficient rats were significantly higher than those of the control and the vitamin E-deficient groups on d 21. This result supported a view that the deficiency of vitamin C was more serious in raising oxidative stress than that of vitamin E. TBARS of the liver in the simultaneously vitamins C and E-deficient rats were significantly higher than those in all other groups, suggesting an additive effect of the deficiencies of vitamins C and E on TBARS.

## 要 旨

運動時に増加する活性酸素を消去する2つのビタミンC, Eの相互作用を, 我々が開発したビタミンCの正確な定量法を用いて動物実験で初めて明確にした. 人間と同様, ビタミンCを合成できないODSラットを4つのグループ(対照群, ビタミンC欠乏群, ビタミンE欠乏群, ビタミンC, E同時欠乏群)に分けた. これら4つの群の各臓器のビタミンC, E量の変化を正確に測定すると, 両ビタミンの間には相互作用が存在し, どちらのビタミンが欠乏しても他のビタミンの欠乏を引き起こすことが判明した. とくに試験管内の研究で提唱されていたビタミンCによるビタミンEの再生反応と共に, 試験管内の研究では存在しない逆の相互作用, すなわち, ビタミンEによるビタミンCの節約効果が動物実験によって初めて明らかにすることができた. 本研究により, 運動選手は筋肉をはじめとする臓器を活性酸素の障害から守るため, 両ビタミンの補給に注意すべきであることが明らかになった. 酸化的障害のパラメーターであるチオバルピツール酸反応性物質(TBARS)についても両ビタミン間に相互作用が存在することが明らかになった.