Garlic can induce both GTP cyclohydrolase and nitric oxide synthase activity in choriocarcinoma cells.

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Several properties of garlic (Allium sativum L.) can be attributed to its ability to physiologically increase nitric oxide (NO)[1]. NO is produced from arginine by NO synthase (NOS; EC 1.14.13.39) which can exist in both constitutive (calcium-dependent) and inducible (calcium-independent) isoforms [2]. Tetrahydrobiopterin, an essential co-factor for NOS 131, is synthesized from GTP by GTP cyclohydrolase I (GTPCH-I; EC 3.5.4.16). Tetrahydrobiopterin is also a co-factor for other reactions that produce (i) tyrosine from phenylalanine, (ii) DOPA from tyrosine, (iii) 5-OH-tryptophan from tryptophan and (iv) carboxylic acid and glycerol from glyceryl esters. The enzymes NOS and GTPCH-I have both been shown to be present in the tissues of pregnancies complicated by pre-eclampsia and growth retardation [4] and our results suggest that garlic may help to alleviate these pathophysiological conditions. Also, NO donors may arrest the initiation of pre-term labour [10] and garlic may similarly prove to be of use in women at risk from this condition.

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References

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Fig. 1. Effect of garlic on NOS activity in BeWo cells. The results are presented as the means ± SEM of the experiments (n = 30 for controls; n = 9 for each garlic concentration). * and ** represent P < 0.05 and 0.001 respectively when compared to controls by the Student’s t test.

In culture medium, NO released by cells rapidly metabolizes to the stable end-product nitrite, measurement of which reflects intracellular NOS activity. Neopterin in the medium reflects GTPCH-I activity. 24h incubation of BeWo cells with garlic increased the activities of both NOS (Fig. 1) and GTPCH-I (Fig. 2) activities in a dose-dependent manner.

Fig. 2. Effect of garlic on GTPCH-I activity in BeWo cells. The results are presented as the means ± SEM of the experiments (n = 20 for controls; n = 9 for each garlic concentration). * and ** represent P < 0.05 and 0.001 respectively when compared to controls by the Student’s t test.

The ability of garlic to increase both NOS and the production of one of the essential co-factors for the enzyme, adds support to the claim that garlic can exert some of its therapeutic properties by increasing NO production in the body [1]. Recent studies have shown that NOS activities are decreased in placental tissues of pregnancies complicated by pre-eclampsia and growth retardation [4] and our results suggest that garlic may help to alleviate these pathophysiological conditions. Also, NO donors may arrest the initiation of pre-term labour [10] and garlic may similarly prove to be of use in women at risk from this condition.

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