Effects of aspirin and garlic on cyclooxygenase-induced chemiluminescence in human term placenta.

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The spontaneous emission of chemiluminescence appears to reflect changes in the intracellular steady-state concentration of oxygen radicals. Stimulation of arachidonic acid metabolism in human platelets also induces chemiluminescence, which indicates the formation of highly reactive species by cyclooxygenase and/or lipooxygenase [1,2]. It was observed that arachidonic acid, linoleic acid and linolenic acid can induce luminol-induced chemiluminescence in human term placental villi. The luminol-dependent chemiluminescence activity after addition of these fatty acids was investigated after incubation of villi with aspirin and garlic extract.

1-2mm³ placental villous tissue from normal term pregnancies were washed with PBS at 4°C and scrapped with a scalpel to free villi. This was made up to 5 volumes with PBS. Garlic extracts were prepared by 1% alcoholic extraction of garlic powder (g/2mL). Perchloric acid (PCA) extract of garlic was prepared similarly using 1% alcoholic 0.5M PCA [3]. Acetylsalicylic acid (aspirin), arachidonic acid, linoleic acid and linolenic acid and other chemicals were dissolved in absolute alcohol. All chemicals were obtained from Sigma Chemicals Co. Ltd., Dorset.

The chemiluminescence experiments were carried out in a LKB-Wallac Luminometer 1250 with a LKB 2210 one channel recorder. The experiments were carried out at 22-23°C. 0.4mL of placental villi (4.0-9.6mg of protein) was incubated with 0.1mL of 10mM luminol in 0.4mL of buffer (134mM NaCl, 12mM NaHCO₃, 2.9mM KCl, 0.4mM NaH₂PO₄, 1mM MgCl₂, 5mM HEPES, 5mM glucose, pH 7.4) containing 1mM calcium chloride.

Addition of fatty acids produced signals which reached a maximum within 90 seconds. Pre-incubation of placental villi with aspirin inhibited the arachidonic, linoleic and linolenic acid-induced chemiluminescence (Figs. 1 and 2). Similar effects were observed with garlic as well as with perchloric acid-treated garlic extract (allicin negative). These inhibitions are dose-dependent and additive showing aspirin-like effects of garlic extract on the cyclooxygenase and/or lipooxygenase activity in placental villi.

The results suggest that cyclooxygenase inhibition by garlic is not dependent on allicin-derived products, and that garlic could have beneficial effects similar to aspirin.

Fig. 1. Effect of aspirin and garlic on (a) linoleic and (b) linolenic acid-induced chemiluminescence of placental villi.

A=Control; B=1 mM aspirin; E=1/40 garlic extract; F=1/40 PCA extract. P<0.05 versus control values for B, E and F.

Fig. 2. Effect of aspirin and garlic on arachidonic acid-induced chemiluminescence of placental villi.

For 100% control n=8. 0.04mM/1 mM arachidonic acid/mg protein.
A=Control; B=1 mM aspirin; C=2.2mM aspirin; D=3.3mM aspirin; E=1/40 garlic extract; F=1/40 PCA extract. P<0.05 versus control values for B, C, D, E and F.

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