Protective Effects of the Antioxidant, Gingko Biloba Extract and the Protease Inhibitor, Aprotinin, Against Scorpion-Induced Tissue Damage

Amal J. Fatani, PhD; Amal A. Abdel-Fattah, PhD, Fairouz E. Mohammed Ali, PhD, Hana H. Al-Zuhair, PhD, Hazar I. Yaqub, PhD, Musheera Ibrahim, PhD. Dept. of Pharmacology, College of Pharmacy, King Saud University, Riyadh, SA

INTRODUCTION

Although much is known about scorpion venom–elicited pathological changes (1), the role of free radicals and oxidative stress on the observed tissue damage needs to be further investigated. Oxidative stress has been implicated in several diseases such as hypertension, cardiac dysrythmias, and thrombocytopenia (2), all of which are observed following scorpion envenomation (3). Extensive evidence indicates that antioxidants decrease the risk of cardiovascular disease and stabilize membranes and prevent their functional damage (2).

On the other hand, Fatani et al. (3) showed that pretreatment of rabbits with the non-selective protease inhibitor, aprotinin, attenuated L. quinquestriatus venom-induced pulmonary edema, arrhythmias and terminal hypotension indicating the possible involvement of proteases in venom-evoked cellular/organ damages. Thus, it would be interesting to discern if the antioxidant, gingko biloba extract (G), or the protease inhibitor, aprotinin (A), would be useful in ameliorating signs of tissue damage and necrosis in the venom of the common yellow scorpion L. quinquestriatus (LQQ). The aim of this study is to test the effectiveness of the antioxidant, gingko biloba extract (G), and the protease inhibitor, aprotinin (A), in blocking LQQ venom-elicited biochemical changes indicative of cellular damage and necrosis, in commonly affected organs such as the heart and lung. This may help determine whether oxidative stress or proteases are involved, and if antioxidants and protease inhibitors have a future niche in the treatment of the scorpion envenoming syndrome.

AIM OF THE WORK

The aim of this study is to test the effectiveness of the antioxidant, gingko biloba extract (G), and the protease inhibitor, aprotinin (A), in blocking LQQ venom-elicited biochemical changes indicative of cellular damage and necrosis, in commonly affected organs such as the heart and lung.

Materials & Methods

Lungs and hearts were excised 60 min after decapitating rats (n = 8/group) injected with LQQ scorpion venom (0.25 mg/kg, s.c.) alone or after pretreatment with aprotinin (46000 K.I. U/kg, i.p., 10 min before venom). EDTA (150 mg/kg, i.p., 3 weeks before venom), or a combination of both. Separate control groups were injected with diluents or selected treatment modalities alone. The following parameters were then measured in either the tissue homogenate or the cytosolic fraction:

- The levels of reduced glutathione (GSH): method of Sedlak and Lindsay (4).
- Degree of lipid peroxidation (LP): method of Uchiyama and Mihara (5).
- Glutathione peroxidase (GPx) activity: method of Paglia and Valentine (6).
- Lactate dehydrogenase (LDH) activity: method of Bergmeyer (7).
- Glucose-6-phosphate dehydrogenase activity: method of Gluck and Mihara (8). Cytosolic protein content: method of Lowry et al. (9)
- Lung edema index = Lung weight/body weight x 100

Statistical analysis was performed using analysis of variance and Tukey Scramm post tests. P < 0.05 was considered significant.

RESULTS

The effects of LQQ venom intoxication following pretreatment with gingko biloba extract (G) and/or aprotinin (A) on mean arterial blood pressure (MAP), heart rate (HR), and lung dry weight (LWDW) is depicted in the graphs. Lungs and hearts [A] and [B] of male rats (n=8). Mean control values are 1.5±0.15 and 1.4±0.11% respectively. Refer to Methods for further details. Mean values are significantly different from saline treated control (◊, P<0.05; ◊◊, P<0.001), and from groups treated with G (◊, P<0.05; ◊◊, P<0.001), or LG (◊◊, P<0.001).% Do f DC o n tro l

DISCUSSION

The exact mechanism of the venom-evoked cellular damage was examined biochemically in hearts and lungs of envenomed rats, with the aid of the antioxidant Gingko biloba extract, to determine whether oxidative stress and free radicals are involved. Moreover, the capacity of the protease inhibitor aprotinin to protect from venom-elicited pathological was examined to further elucidate the exact mechanism of action of the venom and its deleterious effects.

CONCLUSION

The exact mechanism of the venom-evoked cellular damage was examined biochemically in hearts and lungs of envenomed rats, with the aid of the antioxidant Gingko biloba extract, to determine whether oxidative stress and free radicals are involved. Moreover, the capacity of the protease inhibitor aprotinin to protect from venom-elicited pathological was examined to further elucidate the exact mechanism of action of the venom and its deleterious effects.

REFERENCES

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