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Non - neurotoxic activity of Malayan krait (Bungarus candidus) venom from Thailand (Article)

Charoenpitakchai, M.[a], Wiwatwarayos, K.[b], Jaisupa, N.[c], Rusmili, M.R.A.[d], Mangmool, S.[e], Hodgson, W.C.[f], Ruangpratheep, C.[a], Chanhome, L.[g], Chaisakul, J.[c]

[a]Phramongkutklao College of Medicine, Department of Pathology, Bangkok, Thailand
[b]Royal Thai Army Medical Department, Department of Anatomical Pathology, Army Institute of Pathology, Bangkok, Thailand
[c]Phramongkutklao College of Medicine, Department of Pharmacology, Bangkok, Thailand
[d]International Islamic University Malaysia, Kulliyyah of Pharmacy, Kuantan Campus, Bandar Indera Mahkota, Kuantan, Pahang Darul Makmur, Malaysia
[e]Faculty of Pharmacy, Mahidol University, Department of Pharmacology, Bangkok, Thailand
[f]Monash University, Monash Venom Group, Department of Pharmacology, Biomedical Discovery Institute, Clayton, VIC, Australia
[g]Thai Red Cross Society, Queen Saovabha Memorial Institute, Bangkok, Thailand

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Abstract

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Background: Envenoming by kraits (genus Bungarus) is a medically significant issue in South Asia and Southeast Asia. Malayan krait (Bungarus candidus) venom is known to contain highly potent neurotoxins. In recent years, there have been reports on the non - neurotoxic activities of krait venom that include myotoxicity and nephrotoxicity. However, research on such non -neurotoxicity activities of Malayan krait venom is extremely limited. Thus, the aim of the present study was to determine the myotoxic, cytotoxic and nephrotoxic activities of B. candidus venoms from northeastern (BC-NE) and southern (BC-S) Thailand in experimentally envenomed rats. Methods: Rats were administered Malayan krait (BC-NE or BC-S) venom (50 μg/kg, i.m.) or 0.9% NaCl solution (50 μL, i.m.) into the right hind limb. The animals were sacrificed 3, 6 and 24 h after venom administration. The right gastrocnemius muscle and both kidneys were collected for histopathological analysis. Blood samples were also taken for determination of creatine kinase (CK) and lactate dehydrogenase (LDH) levels. The human embryonic kidney cell line (HEK-293) was used in a cell proliferation assay to determine cytotoxic activity . Results: Administration of BC-NE or BC-S venom (50 μg/kg, i.m.) caused time-dependent myotoxicity, characterized by an elevation of CK and LDH levels. Histopathological examination of skeletal muscle displayed marked muscle necrosis and myofiber disintegration 24 h following venom administration. Both Malayan krait venoms also induced extensive renal tubular injury with glomerular and interstitial congestion in rats. BC-NE and BC-S venoms (100-0.2 μg/mL) caused concentration-dependent cytotoxicity on the HEK-293 cell line. However, BC-NE venom (IC_{50} = 8 ± 1 μg/mL; at 24 h incubation; n = 4) was found to be significantly more cytotoxic than BC-S venom (IC_{50} = 15 ± 2 μg/mL; at 24 h incubation; n = 4). In addition, the PLA_2 activity of BC-NE venom was significantly higher than that of BC-S venom. Conclusions: This study found that Malayan krait venoms from both populations possess myotoxic, cytotoxic and nephrotoxic activities. These findings may aid in clinical diagnosis and treatment of envenomed patients in the future. © 2018 The Author(s).

Author keywords

Bungarus candidus | Kidney | Krait | Myotoxicity | Nephrotoxicity | Venom

Indexed keywords

EMTREE drug terms: chloride ion, creatine kinase, creatinine, lactate dehydrogenase, nitrogen, phospholipase A2, potassium ion, snake venom, sodium ion, urea

EMTREE medical terms: animal experiment, animal tissue, Article, blood sampling, Bungarus, Bungarus candidus, cell proliferation assay, cell viability assay, chloride blood level, concentration (parameters), controlled study, creatine kinase blood level, cytotoxicity, embryo, envenomation, enzyme activity, enzyme assay, gastrocnemius muscle, geographic distribution, HEK293 cell line, histopathology, human, human cell, IC50, kidney injury, kidney tubule disorder, lactate dehydrogenase blood level, male, muscle disease, muscle necrosis, myotoxicity, nephrotoxicity, nonhuman, potassium blood level, rat, skeletal muscle, sodium blood level, Thailand, toxicity, urea nitrogen blood level

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Chemicals and CAS Registry Numbers:

creatine kinase, 9001-15-4; creatinine, 19230-81-0, 60-27-5; lactate dehydrogenase, 9001-60-9; nitrogen, 7727-37-9; phospholipase A2, 9001-84-7; potassium ion, 24203-36-9; snake venom, 55230-69-8; sodium ion, 17341-25-2; urea, 57-13-6

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Chaisakul, J.; Phramongkutklao College of Medicine, Department of Pharmacology, Bangkok, Thailand;
email:janeyuth.cha@pcm.ac.th

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