Anti-malarial and anti-inflammatory effects of gynura procumbens are mediated by kaempferol via inhibition of glycogen synthase kinase-3β (GSK3β)

Abstract

Gynura procumbens is a medicinal plant, traditionally used to treat inflammation and fever. A yeast-based assay detected GSK3â-inhibitory activity in the aqueous extract of G. procumbens. GSK3â is now known to have a central role in the modulation of host inflammatory response during bacterial infections. In this study, we investigated the involvement of GSK3â in the anti-malarial and anti-inflammatory effects of an aqueous extract of G. procumbens. Our results showed that G. procumbens inhibited growth of P. falciparum 3D7. Consecutive four-day administration of 250 mg/kg body weight (b.w.) G. procumbens resulted in strong chemosuppression and improved survivability in P. berghei-infected mice. B. pseudomallei-infected mice treated with G. procumbens (50 mg/kg b.w.) showed increased survivability. TNF-â and IFN-â levels in liver and serum of B. pseudomallei-infected mice were lowered by G. procumbens treatment. IL-10 level was higher in serum of G. procumbens-administered infected mice. G. procumbens treatment of P. berghei-and B. pseudomallei-infected animals each resulted in increased hepatic GSK3â (Ser9) phosphorylation. It is noteworthy that kaempferol (one of the compounds in G. procumbens) also inhibited the growth of P. falciparum 3D7; showed strong chemosuppression and improved survivability in P. berghei-infected mice at 5 mg/kg b.w. B. pseudomallei-infected mice treated with kaempferol (10 mg/kg b.w.) showed improved survivability. Concomitantly, the described effects due to kaempferol also involved enhanced GSK3â (Ser9) phosphorylation as observed with G. procumbens. In summary, the observed anti-malarial and anti-inflammatory effects of G. procumbens involved inhibition of GSK3â and kaempferol may in part be responsible for the pharmacological effects.