Manganese exacerbated chronic khat-induced neurological deficits, inflammation and organ toxicity in a mouse model

Objective

This study sought to determine whether chronic exposure to khat (*Catha Edulis*, Forsk) increases the vulnerability to the toxic effects of manganese (Mn^{2+}), when co-exposed.

Methods

Three (3)-week-old forty (40) Swiss albino mice were randomly divided into four groups (n = 10). The various groups received khat and manganese separately or both. The experiment was conducted for 132 days to mimic chronic exposure to khat, with manganese administration in the last twelve days.

Results

Khat-induced neurological deficits were markedly pronounced on co-exposure with manganese. Notably, deficits in motor performance, touch escape and aggression were deepened by manganese. Co-exposure (khat + Mn^{2+}) induced more profound changes in hematological indices such as suppression of RBCs, low hematocrit and hemoglobin levels. Manganese enhanced khat-induced depletion of a very powerful antioxidant, glutathione (GSH) in the brain, liver, heart and lung tissues. Exposure to khat and/or manganese led to significant elevations in the pro-inflammatory cytokines—tumor necrosis factor alpha (TNF-α) and interferon gamma (IFN-ϒ), with a concomitant suppression of the anti-inflammatory cytokine and interleukin 10 (IL-10). Similarly, there was enhanced suppression of IL-10 following co-exposure (khat + Mn). Khat-induced hepatotoxicity and nephrotoxicity were exacerbated by co-exposure.

Conclusions

In conclusion, acute exposure to manganese appears to aggravate neurological deficits and other multiple organ toxicities driven by chronic exposure to khat.