MICROBIAL, STEROIDS AND HEAVY METALS CONTAMINATION AND ANTIMICROBIAL RESISTANCE OF BACTERIAL ISOLATES IN THAI HERBAL PRODUCTS

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Abstract. Screening for the presence of bacteria, steroids, and heavy metals is essential for the protection of consumers of herbal medications. Samples of Thai herbal medicine (n = 59) were collected from one metropolitan region and four provinces to test for the presence of bacteria, steroids and heavy metal contamination. Total aerobic microbial and total yeast/mold counts ranged from 0 - 9×10^6 and 0 - 20 colony-forming units (CFU)/g respectively. The range of 0 – 1,100 CFU/g represented the most likely coliform bacterial concentrations. *Clostridium* spp, *Escherichia coli* and *Pseudomonas aeruginosa* were detected in 19, 14 and 3 percent of the samples, respectively, whereas *Salmonella* spp and *Staphylococcus aureus* were not present. Overall, 47% of the herbal medicine samples fulfilled the standards for quality set forth by the WHO guidelines and Thai Pharmacopoeia. The percentage of samples that met the quality standards was 100, 64, 50, 50, 40, 33, and 0 percent for tea, tablets, capsules, liquids, pills, and powder forms, respectively. While all *P. aeruginosa* isolates were sensitive to the seven test antibiotics, 25% of *E. coli* isolates demonstrated multidrug resistance, namely, resistance to amoxicillin/clavulanate, ampicillin, ciprofloxacin, and trimethoprim/sulfamethoxazole. PCR-based assays revealed that all *E. coli* and *P. aeruginosa* isolates carried bla_{TEM} but not bla_{SHV} gene, while 25% of *E. coli* also contained $bla_{\text{CTX-M}}$ gene. An immunochromatographic assay revealed that 2% of the herbal medicine samples were positive for dexamethasone (confirmed by a reference laboratory of the Ministry of Public Health Thailand) and paracetamol and diclofenac (non-steroid anti-inflammatory drugs) were also detected. The mean ± standard deviation (SD) (range) of cadmium and lead evaluated in 32/59 randomly selected samples using in-house methods based on AOAC