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The effect of tea and polyphenol free tea extracts on serum protein binding of caffeine in rats

Caffeine is present in tea leaves and has broad spectrum of pharmacological effects. It has been shown that the disposition of caffeine is altered when caffeine is administered with tea extract. Black tea also contains polyphenols, which can interfere with caffeine metabolism. Serum protein interactions with caffeine were investigated following administration of pure caffeine, caffeine with tea or polyphenol free tea infusions. Blood was collected at 1 and 3 hour after administration to Sprague Dawley rats (n=8) at a dose of 100 mg/ kg-body weight. Proteins were separated using centrifugal filter tubes with a cut off value of 4 kD molecular weight. Serum and the filtrate were analyzed for caffeine by reverse phase HPLC. Total serum caffeine levels (%/ml to the administered dose) were 0.223±0.017, 0.372±0.022 and 0.221±0.026 after 1 h and 0.211±0.020, 0.354±0.015 and 0.210 ± 0.017 (Mean ±SEM) after 3 h for pure caffeine, caffeine with tea and caffeine with polyphenol free tea respectively.

The values were significantly higher ($p<0.05$) with tea extract compared to the caffeine or polyphenol free tea at both 1 h and 3 h. Percentage protein unbound fraction of caffeine to the total serum caffeine was 76±1, 85±2 and 79±2 at 1 h serum and 78±2, 82±2 and 83±2 (Mean ±SEM) at 3 h for pure caffeine, caffeine with tea and caffeine with polyphenol free tea respectively. Protein unbound caffeine is significantly higher ($p<0.05$) at 1 h for caffeine with tea extract compared to the other two modes of administration. The present study shows that polyphenols in tea increase the protein free fraction of caffeine, increasing the bioavailability.