Pharmacokinetic Evaluation of a Curcumin Co-solvent Formulation
M. K. John, H. Xie, E. C. Bell, D. Liang
Texas Southern University

Purpose
Poor solubility and oral bioavailability are major limiting factors in the clinical application of curcumin. The objective of this study was to develop a liquid formulation with increased solubility and systemic bioavailability.

Methods
A co-solvent formulation with increased solubility of 20 mg/ml containing n-methyl pyrrolidinone, tween 80, ethanol and water was developed and optimized. Pharmacokinetics was evaluated using Sprague Dawley rats receiving either 50mg/kg intravenous (n=5) or 50mg/kg intramuscular administration (n=5) of formulation, compared with a control group of rats which received 50mg/kg intramuscular injection (n=5) of pure curcumin solution. Blood samples were collected and plasma concentrations were measured using LC-MS/MS.

Results
Intramuscular injection of formulation resulted in 30% absolute bioavailability and provided sustained release by maintaining plasma concentrations above 240ng/ml for up to 4hrs. Furthermore a 29-fold increase in the Cmax and 28 fold increase in AUC lead to a 28 fold increase in relative bioavailability for co-solvent formulation group compared to the control group of rats.

Conclusion
The optimized curcumin co-solvent formulation provided high aqueous solubility, a significant intramuscular bioavailability and higher sustained curcumin plasma concentrations. These findings suggest that the clinical application of curcumin as an anticancer agent can be better exploited with the co-solvent formulation developed. Research infrastructure support was provided by grants G12RR003045 and CO6RR012537 awarded by the National Center for Research Resources, National Institutes of Health (NIH). The G12 program is now a part of the National Institute on Minority Health and Health Disparities (NIMHD) and the C06 program is in the Office of Research Infrastructure Programs in the Office of the Director, NIH.