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Evaluating the Bioavailability of Carbamazepine Using a Novel SNEDDS Formulation

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Presenters

Gina M. Mattes, Zachary A. Wallace, Derrick L. Chapman, Jinwon Byun, Rebecca A. Kyper, and Elisha R. Injeti

Effect of Particle Size on Bioavailability of Carbamazepine Administered as a Nanoemulsion

Jinwon Byun, Derrick Chapman, Rebecca Kyper, Gina Mattes, and Zachary Wallace | Dr. Elisha Injeti | Cedarville University

Introduction

- Carbamazepine (CBZ) is an anticonvulsant drug primarily used to treat epilepsy, bipolar disorder, trigeminal and glossopharyngeal neuralgia.
- CBZ is a lipophilic and poorly soluble drug with limited ability to diffuse across biological membranes.
- To increase its bioavailability, CBZ is formulated into specialized nanoemulsions called Self Nano-Emulsifying Drug Delivery Systems (SNEDDS).
- SNEDDS are isotropic mixtures of oil, surfactants and cosurfactants that form fine oil-in-water nanoemulsions upon mild agitation, followed by injection into aqueous media of gastrointestinal tract.
- SNEDDS have shown to reduce the particle size of CBZ molecules and improve its solubility and ability to cross the biological membranes¹.
- However, the *in-vivo* bioavailability of CBZ in SNEDDS hasn't been investigated.

Objective

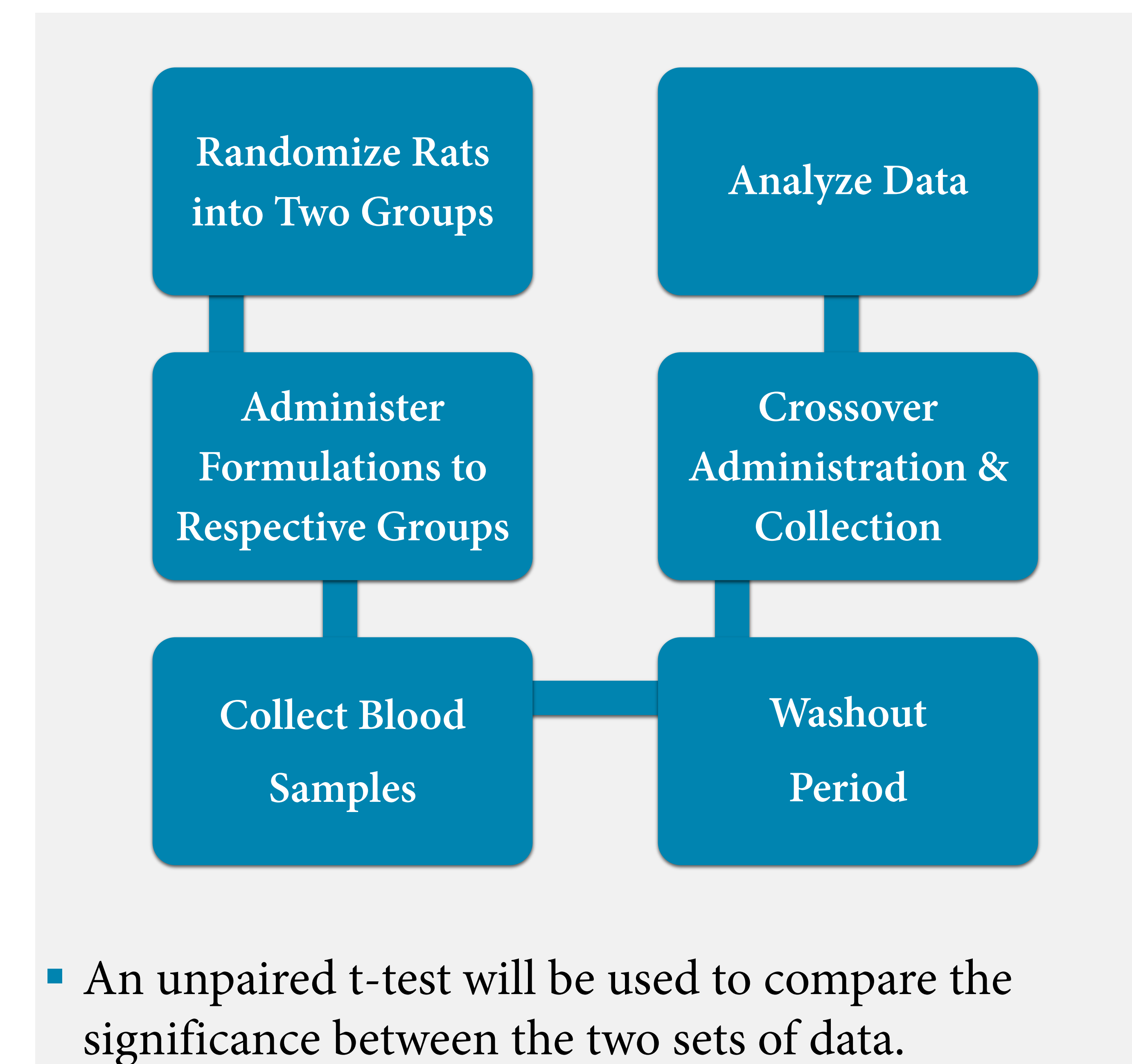
- The objective of this study is to study the effect of particle size on *in-vivo* bioavailability of CBZ administered as SNEDDS compared to a standard formulation

Experimental Methods

- The study will be conducted as a randomized controlled crossover experiment utilizing a rat model.
- Sprague-Dawley rats (n=12) will be divided randomly into two groups of same size.
- One group will be administered CBZ in standard formulation and SNEDDS for other group.
- After administration, blood samples will be collected at 5, 10, 15, 20, 30, 45, 60, 90, and 120 minutes².
- Tail vein incision method will be used to collect blood samples.
- Samples will be stored at -20°C until ready for analysis².
- CBZ in blood samples will be analyzed by reversed phase High Performance Liquid Chromatography (HPLC).



Data Analysis



Results and Conclusions

- Bioavailability is expected to increase due to the decreased particle size of SNEDDS formulation.
- Limitations include a small sample size which will lower statistical power of the results.

References

1. Kumar GP, Rambhau D., Aapte S.S. Oral bioavailability enhancement of carbamazepine in healthy human volunteers. *J Pharm Research*. 2011;4(2):361-365.
2. Fluttert M, Dalm S, Oitzl MS. A refined method for sequential blood sampling by tail incision in rats. *Laboratory Animals*. 2000;34(4):372-378.