Title:
The relationship between analgesic concentration and motor impairment

Intro:
The field of drug discovery and development is very large, comprised of a multitude of interconnected steps that a drug candidate must go through to be approved as a marketable product. Before these potential drugs can be tested on humans in clinical trials, they undergo a variety of examinations in what is called the preclinical phase. This phase includes in vitro and in vivo testing. In vitro testing deals with the analysis of drugs on the molecular basis while in vivo testing is animal trials. In these trials, animal models, which are previously shown to resemble the human system in some way, are administered the drug and their reaction to the substance is analyzed. Toxicology and pharmacokinetics is the analysis of the data received from the animal models testing the drugs. This is completed through tests aimed at determining drug concentration and distribution, the chemical changes caused by the substance, and the manner in which the substance is passed from the body. Analgesics are drugs meant to alleviate a patient's pain. Previous studies have shown that analgesics are able to cause motor impairment in test subjects.

Review of Literature:


**Hypothesis:**

The concentration of Compound X necessary to create an analgesic effect is less than the concentration of Compound X necessary to cause motor impairment.

**Independent Variable:**

Analgesic concentration will be manipulated in the test subjects.

**Dependent Variable:**

Motor impairment will be measured in the subjects.

**Controlled Factors:**

The analgesic type, animal model species, diet, and living conditions will not be altered throughout the experiment.

**Control:**

The animal group given the known analgesic will function as the experiment's control.

**Materials:**

- 25mL 1g/mL solution Compound X
- I. V. Compound X solution
- 125 Sprague Dawley rats
- 15 Sprague Dawley rat blank brains
- 100 mL Sprague Dawley rat blank plasma
- LC/MS/MS mechanical system
- Automated nociception analyzer
- Formalin injections
- Open field testing mechanism

**Procedure:**

1. Separate the rats into Group A (n=50) and Group B (n=75)
2. Separate Group A into 4 more groups: 10 mg/kg (n=12), 40 mg/kg (n=12), 60 mg/kg (n=12), and Morphine (n=14)
3. Take a rat from the 10 mg/kg group, inject it with 10 mg/kg Compound X, place it in the open field testing mechanism, and record the distance traveled in the mechanism over the course of an hour
4. Repeat this for the rest of the animals, giving the 10 mg/kg group 10 mg/kg Compound X, the 40 mg/kg group 40mg/kg Compound X, the 60 mg/kg 60 mg/kg Compound X, and the Morphine group 10 mg/kg morphine
5. Sacrifice the rats and harvest brain and plasma samples
6. Separate Group B into 5 groups: 10 mg/kg (n=12), 20 mg/kg (n=12), 40 mg/kg (n=12), 60 mg/kg (n=12), and Morphine (n=27)
7. Take a rat from the 10 mg/kg group and inject it with 10 mg/kg Compound X
8. Inject the rat with formilin in its front right paw, place it on the automated nociception analyzer, and record the number of paw flinches over the next hour
9. Repeat steps 7 and 8 with the rest of the animals, giving the 10 mg/kg group 10 mg/kg, the 20 mg/kg group 20 mg/kg Compound X, the 40 mg/kg group 40mg/kg Compound X, the 60 mg/kg 60 mg/kg Compound X, and the Morphine group 10 mg/kg morphine
10. Sacrifice the rats and harvest brain and plasma samples
12. Prepare the plasma and brain samples harvested following the experiments
13. Run the Curves and the samples through the LC/MS/MS mechanical system to analyze concentration data