Drug/Food Self-Administration v.2.23

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Technology description

Summary

This software and accompanying bioassay measure the pharmacodynamic（“PD”）and pharmacokinetics（“PK”）properties of a psychotropic compounds. Three properties of the compound can be measured: bioavailability, potency, and half-life. The compound’ s potential for abuse/addiction can also be quantified.

Conventional analytical methods for measuring PD and PK properties are time-consuming and cumbersome. In order to measure these properties by conventional means, blood must be sampled numerous times and then later analyzed by chemists using expensive machines and complex techniques. Using conventional methods screening large numbers of compounds is expensive—approximately $100k-$500k per compound.

Conversely the bioassay and accompanying software drug compounds can be quickly, more precisely and cost-effectively analyzed. Using this system, researchers can identify compounds with the longest half-life, the greatest bioavailabilty, those that cross the blood-brain barrier, and those that are the least likely to be habit-forming. The cost of testing a single compound using this bioassay is estimated at $10k-$50k per compound.

This system relies on the pharmacological theory that competitive antagonists increase the concentration of agonist required to produce a response. The response used in this method is the satiety threshold. Increases in the satiety threshold reflect the PD potency of the antagonist in vivo. The time course of the effect reflects the antagonist PK. And the area under the time-concentration curve (AUC) following different routes of administration (e.g., i.v., subcutaneous, or intraperitoneal) measures the bioavailability of antagonists.

For the bioassay, rats are trained to self-administer indirect or direct agonists such as cocaine apomorphine. Once a baseline satiety threshold is established the rats are given doses of the compound to be evaluated. Changes in the frequency of the rats’ self-administration and satiety threshold are measured and from the changes the PK and PD of the compound are be calculated.

The sensitivity of this system is approximately 50-100 fold greater than conventional methods. Conventional methods have a typical limit of detection (LOD) of GC/MS is 1,540 nmol/kg i.v. dose, assuming a volume of distribution of 10 L/kg. This system works optimally at 20 nmol/kg i.v. dose.

Software Requirements:

MS Windows XP

MS Access

MED-PC (Software for testing and collecting data from medical devices)

MPC2XL (For transferring the contents of MED-PC® data files to Excel spreadsheets, Access databases, etc.

Sigma plot (Graphing software)

Institution

University of Cincinnati