Animal behavior and applied pharmacology

Presented by: Mina Almayouf

Definitions

- **Pharmacology** is the branch of medicine and biology concerned with the study of drug action.
- **Applied pharmacology** is the study of how drugs and medications affect in how our body works.
- **Behavioral pharmacology** is a maturing science that has made significant contributions to the study of drug effects on behavior, especially in the domain of drug-behavior interactions.

Applied research aims

- To solve specific and practical problems which is usually carried out in the pharmaceutical industry or by universities in commercial partnerships. In turn, such applied studies may be an early stage in the drug discovery process. Examples include:

1. Genetic modification
2. Studies on models of naturally occurring disease and condition.
3. Studies on induced animal models of human diseases.
4. The use of placebo testing

1- Genetic modification of animals to study disease

- These models allow investigations on how and why the disease develops, as well as providing ways to develop and test new treatments:

1. Transgenic animals have specific genes inserted, modified or removed, to mimic specific conditions such as single gene disorders, such as Huntington's disease.

2. models mimic complex, multifactorial diseases with genetic components, such as diabetes,

3. transgenic mice that carry the same mutations that occur during the development of cancer.

2- Studies on models of naturally occurring disease and condition.

- Cats are used as a model to develop immunodeficiency virus vaccines and to study leukemia because their natural predisposition to FIV and Feline leukemia virus.

- Certain breeds of dog suffer from narcolepsy making them the major model used to study the human condition.

- Armadillos and humans are among only a few animal species that naturally suffer from leprosy; as the bacteria responsible for this disease cannot yet be grown in culture, armadillos are the primary source of bacilli used in leprosy vaccines.

3- Studies on induced animal models of human diseases.

- Here, an animal is treated so that it develops pathology and symptoms that resemble a human disease.
- Examples include restricting blood flow to the brain to induce stroke, or giving neurotoxins that cause damage similar to that seen in Parkinson's disease.

4- The use of placebo testing

- In these cases animals are treated with a substance that produces no pharmacological effect, but is administered in order to determine any biological alterations due to the experience of a substance being administered, and the results are compared with those obtained with an active compound.

general strategy in behavioral pharmacology research that have been employed to increase understanding of behavioral processes.

taking advantage of specific behavioral or physiological actions of drugs.

1- Using Predictable Physiological Effects

- Using Predictable Physiological Effects Drugs administered to behaving animals can alter not only overt behavior but also measurable concurrent physiological responses.
- To the extent that effects on the two classes of responses diverge, information is gained about causal relationships between the physiological responses and the behavioral responses.
- If the two classes of response are affected differently or at different doses, then the case that one causes the other is weakened.

- As an example a study by Hunt and Campbell (1997).
- rats were exposed to a trials procedure in which a 10-s illumination of a light was followed immediately by presentation of a food pellet.
- Rearing and orientation were measured, as was heart rate. After exposure to several trials, both the behavioral and physiological measures revealed changes.
- **Result:**
- Rearing and orientation were increased during the signal, whereas heart rate was decreased.
- In this case, the change in heart rate might be considered part of (or perhaps reflective of) the private events associated with the presentation of the signal, whereas the changes in overt behavior might be considered responses to those events.

- Hunt and Campbell (1997) then continued their analysis by studied the effects of atropine and atenolol (drugs were chosen because of their known effects on heart rate). The two drugs, at the doses tested, produced no changes in the overt behavior from that observed in the control (no drug) condition.
- The dose chosen from atropine completely eliminated changes in heart rate during the signal. That is, those results reveal a clear dissociation between the physiological response and the behavioral responses, indicating that the physiological response is not a precursor to the behavioral ones.

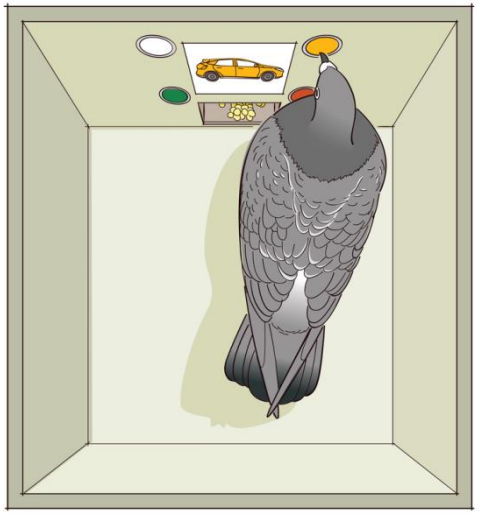
2- Using Predictable Behavioral Effects

- The intermediate doses of psychomotor stimulants will increase the relatively low response rates under reinforcement schedules that require that responses be spaced in time, that is, schedules which arrange for reinforcement of inter response times (IRTs) longer than some minimum (IRT.t schedules, also called DRL schedules).

- Those same doses usually result in decreases in the high rates of responding under schedules in which reinforcement is delivered after varying numbers of response.

3- Using Unplanned Behavioral Effects

- In many cases, the precise effects that a drug will have in a behavioral preparation are not known in advance of experimentation, but even in cases such as those it is possible on occasion to take advantage of drug-induced behavioral changes to enhance understanding of the behavioral processes involved. A good example of this kind of event is provided in research by Laties (1972).



- He was studying drug effects on behavior under a fixed - consecutive - number (FCN) procedure. Specifically, pigeons worked in a chamber with two keys, and food reinforcement occurred if the pigeon made eight or more consecutive pecks on one of the two keys before pecking the other. If the pigeon pecked the second key before completing eight or more on the first key, the count reset and the pigeon had to start over. The behavior of pigeons comes under excellent control under such a procedure, with a substantial majority of sequences of pecks on the first key equaling or slightly exceeding eight.
- Of theoretical interest is how the pigeon "does it." That is, there are at least two possible sources of stimulus control that could lead to accurate performance in the task:
- Switches to the second key could be under
- 1-the control of the number of pecks just made on the first key
- 2- under the control of time taken to complete eight pecks.

- A study of haloperidol by Laties (1972) provided information that helps to distinguish between the two possibilities.

- Haloperidol had the interesting effect of reducing pecking rate on the first key in a dose-dependent manner.

- Under nondrug conditions, pigeons pecked the key about 75 times per min.
- Under the largest dose of haloperidol, the rate was reduced to about 25 pecks per min.
- Thus, under this dose of the drug, it took a pigeon about three times as long to finish eight pecks as it had without drug.

- If switches were under control of the time taken to complete the eight pecks on the first key, then accuracy would be reduced substantially by this dose of the drug.

- Accuracy, however, was not decreased by this or any other dose of the drug. That finding, coupled with results with other drugs that decreased both rate and accuracy, supports the view that the important controlling variable in the FCN procedure is the response count, not time taken to complete the count.

- Laties was able to take advantage of an unpredicted drug effect to gain information about the sources of behavioral control in a complex behavioral procedure.