

AMM -18

Nuggets for Successful Animal Experiments

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Abstract

The success of an experiment depends on several factors that need to be taken into consideration. From the identification of the problem to be solved to the conceptualization of the research procedures to be adopted, careful planning must be done. The problem identified must be properly understood, in terms of scope and materials needed to carry out a meaningful investigation. The researcher must understand the need and urgency of the problems to be solved or why the research is justified. A clear and well-articulated objective(s) that addresses the step by step actualization of the conceptualized topic to be addressed. The choices to be made to obtain a successful result will include proper selection of experimental materials, animals, adequate data collection and collation, appropriate experimental design and employment of analytical /statistical tools for effective analysis.

Keywords: Animal, experimental design, data collection and analysis, analytical package

Introduction

In carrying out any form of an animal experiment for a meaningful result that can be verifiable and stand the test of experimental proof, certain procedures and techniques need to be taken into consideration. Failure to properly understand and conceptualize the expected outcome and how to plan may lead to faulty setup and wrong data collection and interpretation. This will definitely lead to wrong result and conclusion. Ultimately this will lead to a watered down and spurious findings that cannot be published in reputable scientific journals. A good grasp of the topic, what is being sought for, designing and setting up the experiment as well as the data to be collected and interpreted very important. Today many students are given topics of research that they know little or nothing about. In many cases, it is in furtherance of the academic pursuit of the supervisors that the students are made to key in and in such cases such areas may be beyond the understanding of the student. Research that will result in undeniable scientific proof and can be empirically tested must contain certain nuggets. The following will help students and other researchers to articulate their research proposal and follow through to achieve a good experimental result.

Understanding the topic

A good understanding of the topic will bring into clear focus the direction and finally the end result is expected. It is a roadmap that will guide the researcher on what the subjected to be investigated is all about. This must be explained in clarity to the would-be researcher to the extent that it is internalized and properly understood. Such topics must not be ambiguous or encompass so many research topics within it. It should be focused, specific and targeted towards a particular outcome or outcomes. The topic should fall within the scope and level of the students' intelligence, capability, and resources. Otherwise, insufficient data will be collected and analyzed and thus mar the outcome.

The justification/identifying the problem

Many students do not know why they are carrying out the certain experiment. In most cases, this arises because the topic was "forced" on them by their supervisors. Understanding the justification makes it clear on what the research is all about. Simply put, justification means why the research is being carried out or what problem exists and why the experiment is necessary. It identifies the gap/problem and the necessity for the research. It is the main motivation behind the work to be done. The justification will tailor the direction and focus of the research and drive the work towards the outcome. It is the zeal for the work and points the light to the problem. It must be properly grasped and articulate. Justification must be put in the right perspective and outlined clearly. All that will be done in the research are guided by the justification. It is the driving force and must be focused on. At no time should the researcher lose sight of justification. It is why the research is being conducted. At every stage of the research work, the researcher must remind himself of the reason why the work is being

done. It makes the researcher focus on the right information and data to be collected. Justification must be concise, clear, understood and kept in focus throughout the conduct of the research. Justification is like the rudder that steers the ship. If the result obtained in the research does not answer the justification, then the research has not achieved its full objective (Abekeet *al.*, 2013)

Objectives of the study

This is the step by step itemization or the breakdown of the various work to be done for a specific or group of data to be collected. It is how to organize the research work into phases for ease of data collection. Objective breaks the entire research work into bits so that certain information can be easily obtained. Simply put, the objective is the step by step activities leading to the achievement of the justification. The research objective must be simplified, clear, concise and chronologically itemized. It ties what is to be tested or researched upon to the expected outcome. It looks at the effect of the test material on the result that is hoped to be obtained. It points to what should be done and what is to be expected. A good objective helps the researcher to know what step by step procedure he will adopt to achieve the final goal of the research. It aids organization, prevents omission of data to be collected and eliminates waste of time and resources. When the objective/objectives of a particular research are well articulated, achieving the justification becomes easy.

Hypotheses

In life, outcomes can be positive or negative. The probability of success and that of failure is assumed to be equal. Therefore whether the objective will be achieved or not is a probability. This is because outcomes of biological experiments cannot be fully predetermined. It is a measure of certain doubt whether the research will be a failure or a success. However, results obtained are viewed in line with stated objectives and whatever the outcome, it is a result. In research both positive and negative results are good. This is because negative results are the precautionary and positive result is progress. It is well known that precaution leads to progress because it gives alternative way on how the next step of the research work is to be carried out. Hypotheses, therefore, give an alternative for either positive or negative outcome. The null hypotheses (H_0) are expected to answer the objective in a positive way while the alternate hypotheses (H_a) are seen to be negative to the stated objectives. As long as the condition for the research work is good and every right procedure has been followed, whether the outcome is positive or negative, the research is seen to have answered certain questions and therefore a success.

Experimental materials

The material to be tested needs proper handling and processing. The way it is obtained, handled, transported, processed and packaged is very important. Every procedure adopted to bring the material to the point of being tested on the animal must be stated clearly. Precaution if any on the usage of such materials for the animal experiment must be stated boldly. It must be ensured that safety standards and welfare considerations are put in place. Administration and dosage levels must be clearly stated. Materials must be processed and presented in forms for voluntary intake or administered in humane ways as much as possible. Except for drug test or other lethal substances as in disease trials, materials for the experiment should be safe, pure and can be ingested by the intended animal. Proper investigation should be done on the material to obtain the correct information about it. Initial laboratory investigation is a condition for safe use of any material for the animal experiment. Experimental materials may also include the equipment and facilities for the research work. These include proper feeder types, sizes and arrangement, good feeding space, good watering space, adequate floor space or stocking density, provision for comfort, water quality and administration, feed presentation, quality of litter or cages and housing comfort. Each of these plays vital roles in the expression of animals in response to the test material.

The experimental animal

This is one of the most important considerations for a successful animal experiment. The choice of animal to use, the breed, the age, the physiological condition, size, and health status are very important. Animals to be used for the experiment must be healthy, obtained from a fast-growing stock and carefully handled. Runts, unthrifty, sick and injured animals should not be used (Abeke *et al.*, 2013, 2010). Also, an adequate number of animals should be used so as to reduce statistical errors. For large animals such as ruminants, they should be quarantined for a while for proper investigation of their health and other physiological status. For smaller animals like poultry, time should be given to eliminating birds that are weak, unhealthy, stressed and those with some

form of deformity or the other like unhealed navel, birds with hooked beaks, blind birds and those with crooked toes. Experimental animals must be obtained from reliable sources where their pedigree is known. For example chickens for the experiment should not be obtained from roadside vendors as they tend to supply poor growing birds from poor hatcheries because of their desire to make more profit. For an experiment that involves using large animals of both sexes, the influence of the sexes on the overall results must be clearly stated. The choice of the animals may make or mar the result of the experiment.

The experimental design

This is where many researchers get it wrong. The improper design will lead to improper data collection and analysis and therefore wrong conclusion. Many run away from a factorial design even though that is what is needed to bring out the various interaction and contribution of each material being tested. In the body of the animal, materials ingested work in synergy to bring about certain outcome therefore without proper design such important information are lost. A research involving the use of more than one test material within the same experiment should be designed in a way to bring out the contribution of each material and the combined effect of the materials on the result (Abeke *et al.*, 2012). A factorial design research work carried out in the form of a completely randomized designed experiment cannot bring out the expected results. In the same vein, a split-split plot designed experiment cannot be carried out as a split-plot design. A wrong application of design will mar the data analysis and bring about the faulty conclusion. A proper understanding and application of experimental design are therefore necessary to obtain the needed data for a successful analysis and result.

Data collection/collation

Data are facts, figures and observations collected from the experiment. Data are the empirical proofs that the experiment was carried out. Data should be collected with utmost care and deliberate precision. It should be noted that no data is useless in an experiment. The type or nature of data to be collected must be planned and articulated from the onset of the experiment. Insufficient data collection may mar the result of the experiment. For example, in feeding trials apart from data on physical observations like growth and feed intake, data collection should include digestibility/retention, haematology, blood chemistry, the effect on internal organs, carcass and other physiological parameters. If the right data are collected and collated, analysis and interpretation become easy. Collation involves a systematic arrangement of the collected data for input into the computer for analysis. Since data is the tool for analysis, a well-collected data will ensure proper result outcome. (Abeke *et al.*, 1998)

Analytical package

Analytical tool or the choice of which computer package to use for analysis depends on the experimental design and data collected. Some packages are deficient in analyzing certain parameters while some are not appropriate for other parameters. A right choice of computer package will bring out the analysis in such a way that interpretation becomes easy. For example, in an experiment that involves graded dietary levels, trend analysis may be useful in obtaining optimum inclusion levels.

Conclusion

Certain procedures and information are necessary to obtain a meaningful result from target research work. Understanding the dynamics and requirement for a successful experimentation is necessary for good research outcomes. The above nuggets are intended to guide would-be researcher on what is required to obtain desired results in an experiment.

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