

## TRAVELLING CONFERENCE

### Animals in Medical Research

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#### Introduction

Medical research is as old as the practice of the science and art of medicine. Medical treatises and compendia such as the Chinese Veda, the Ebers papyrus, the papyrus of Kahn are replete with information on procedures, techniques and remedies developed and tested in animals, for treatment and management of both human and animal ailments. Medical research therefore tries to distinguish between practices that are considered rational and orthodox from those that are superstitious and unorthodox, there by establishing the basis for generalisation, standardisation, and universal application.

The objectives of biomedical research are to solve health related problems of man and animals leading to better remedies, methods and techniques for alleviation of suffering and advancement of health, thus enhancement of well being of human subject are devised. However, much if not all experiments meant for application in humans are performed with animals, the so called 'animal model experimentation'. Thus even after the establishment of the first Veterinary School for treatment of animals at Lyon in the 17<sup>th</sup> century, several procedures of animal experiments were used in the relief of human suffering and advancement of human health. This close collaboration between these scientists despite their wide grounds gave rise

to the concept of unity of medicine.<sup>4</sup> So one can then say that although the subject of Veterinary practice is the animal species the ultimate objective is the well being of man.

Animal model experimental is one approach among others, to researching human ailments, where animals are used to simulate human disease situations with a view to finding remedies for such disease. The technique of research remains the only tool available for validating, re-validating and standardising methods for investigating some human and animal ailments. The application of in-vitro tissue cultures, epidemiology, clinical trials, autopsy, endoscopy, biopsy, as well as other imaging methods to investigate human and animal ailments represent more recent techniques that have yielded invaluable data on disease. Similarly, Molecular epidemiology which employs genetic, metabolic and biochemical characteristics along with epidemiological data on disease offers significant promise for identifying the causes of human and animal ailments.

Animal model experimentation was conceived in order to bring into sharper focus those factors that can be easily qualified under varied experimental circumstances.

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That is not to say that animals have more predictable behavioural pattern than humans. Other than human higher animals rely on animals to express experiences.<sup>2</sup> This behaviour can then be referred to as empirical, similarly the ethical framework upon which rights obligation and values of individuals and groups exist are established and it recognised higher status for human than animals. This has been the situation until the emergence of "Animal Rights" groups and "Scientists" in the West in the later part of the 1960's coupled with the recent advances in research technique and methods, which seem to question the social, economic, moral and to lesser extent the scientific values of contemporary practices in animal model experimentation. Consequently, funding for researches requiring the use of animal models have declined in favour of other "non-animal model" techniques.

The objective of this paper is to review animal model experimental as it relates to the development of the human and animal medical sciences and practices. It is also to explore interdisciplinary approaches to human disease investigation including historical antecedents to such collaboration between human and veterinary medicine.

### **Unity of Medical Research**

Schwabbe<sup>1</sup> perhaps first elaborated the concept 'Unity of medicine in 1925'. The concept was borne out of mutual relationship between medical and veterinary research over the years. Indeed this type of partnership has played a crucial role in the development of medical sciences and would continue to be necessary as long as the vocation of medicine exists and medical research seeks to alleviate existing ailments and response to the emergence of new disease challenges.<sup>3</sup>

There is abundant evidence in medical literature to show that medical ontology and epistemology have common beginning and source, and also the acute dependence of human medicine on some discoveries possible in animal research. Such review of literatures are contained in most ancient treatises such as the Chinese Veda, The Egyptian Papyrus, The Papyrus of Kahn, The Greco Roman *Materia Medica* and many religious practices (Islamic and Judeo-Christian) contain essentially general principles (remedial/therapeutic), and techniques of treatments of human and animal ailments. The basic principle of clinical practice from recorded history to date is "primum non nocere", that is, above all do not hurt. The principle of "Cause and Effect" was employed to rationally demonstrate aetiology of a condition, and also to expantiate on the course and outcome of such conditions. Based on this principle, the father of the medical sciences, Hippocrates ascribed disease generally to physical imbalances in body fluids "humour". Later scientist soon discovered other causes to include psychological, occult and spiritual.

The work of Leuwenhoeck on paper particles gave birth to microscopy, and the discovery of other forms of life, which either have beneficial or deleterious relationship with man. This feat also served as the rational basis for laboratory and diagnostic medicine. The isolation in pure culture of causative agents of abscesses, the ability of the pure culture to cause similar abscess when introduced into previous non infected clean subject, coupled with further demonstration in pure culture of the causative organism from the test subject, enabled Robert Koch to establish what is popularly known as the Koch's postulates of infection. Similarly Jacob Nuffer, a Swiss Veterinary performed the first successful caesarean section on

a woman using techniques developed in animals and Rabies, Anthrax and Fowl cholera vaccines were first developed in animals. Calmette, a Veterinary Surgeon worked in collaboration with Guerin a physicians to produce the so called Bacille Callmette – Guerin vaccine (BCG), following the work of Danish in 1880, that demonstrated the usefulness of tuberculin as an epidemiological tool.<sup>1</sup> Gaston Ramon developed vaccines against Diphtheria and Tetanus in 1894.

Recently, in 1997, scientists developed and tested vaccines against *Haemophilus influenzae* type B in rabbits and mice. The result of the clinical trials in humans showed that mortality due to the disease dropped by 75% from 800 to 200 per annum in United States of America.<sup>3</sup>

Animal research has also contributed to the control of bacterial infections in humans and domestic animals. The sulfonamides and penicillin were novel antimicrobial agents that reduced the deaths due to puerperal sepsis. The mouse protection test popularised the use of penicillin.

In the early 1990's a drug derived from a fungus *Streptomyces inermectilis* was developed by MSD<sup>R</sup> to treat bovine gastrointestinal worms. It was soon to become the wonder drug against both endo and ectoparasites with a broad spectrum of activity of between 70 – 90% and some degree of activity against the protozoa infections, coccidiosis) and dermatophilosis. The same drug is now being developed and tested against human guinea worm as Mectizan®. Other areas where animal research has creditably served include the open – heart surgery. John Gibbon conducted 20 years ago; research into animal open – heart surgery and the technique is currently used to save thousands of cardiac patients,

especially in the United States of America. Also tissue and organs transplantation were in dogs and cats. Experiments in cats helped develop techniques for suturing blood vessel from host to donor organ. Before the introduction to bioengineering the cattle and pig insulin for over 30 years have been life saving for the diabetic patient.<sup>3</sup> These and many other examples demonstrate that animal research is necessary for human health, and that animal research is an important aspect of medical science since many research questions can only be answered through animal research. Thus animals over the years have not only answered health problems, but research in animal behaviour, psychology, physiology and anatomy has developed to identify the similarities and differences relevant to human and animal existence. However, man is faced with some constraints, such as finding the perfect animal model for experimentations and the ethical use of animals as it relates to modern movements on animal rights.

### **Animal Model Experimentation**

Modern medicine utilises animal models as tool for research into human ailments. Animal models of disease are designed to study identical problems and procedures in humans. However, the diverse physiological, anatomical and psychological characteristics of animals, both domesticated and wild has made it very difficult for one animal species to be suitable as a general model for all forms of medical research.

A utilitarian approach whereby those animals that have anatomical, physiological better-developed functional olfactory functions can serve as good model for research into such areas as in olfaction experiments using the cat. Developments in

behaviour, anatomy and physiology in animal biology and human health form the basis for any medical research as earlier demonstrated in previous experiments in the areas of medicine and surgery.

The rats uterine muscles have high elasticity and have been used to study smooth muscle function, while the turtle's heart exhibits conduction and contraction characteristics similar to those of mammals, but at a slower rate of 20/minute and form a good model for the study of cardiac rhythm. Similarly, the frog gastrocnemius muscles are better developed and are good model for study of neuromuscular junction activity.<sup>4</sup> The neurological system is the most highly differentiated and complex in mammalian body. Thus, various reflexes require different animals for study. The cat's eyes for example are best for the study of pupillary reflexes, while the knee reflexes are better studied in dogs. Knowledge of anatomical difference help to design experiments. The dog has a prostate gland and so is better used for comparative study of male reproductive problems. These and many similarities and differences are necessary for medical research design. This points to the need for a continuous collaborative research between veterinary and medical researchers for the development of animal and human health, and for advancement of knowledge.

### **Ethical Issues in the use of Animals in Medical Research**

Ethics, the systematic examination of moral issues for the purpose of distinguishing right from wrong is a question raised often in biomedical research. These questions are basically aimed at identifying and justifying the use of animals to obtain knowledge that may improve life and health of both animal

and man.

Ethical use of animals in biomedical research can therefore be seen in the veterinary bioethics which is the derivation of ethical principles of animal welfare, health and well being from the biologic understanding of the animal especially, of their physiologic, behavioural, emotional, social and environmental needs.<sup>5</sup> However, the veterinary ethics of the 90's is far from the ethics of the 50's because researchers are now faced with problems non-existent.

Generally, the ethical use of animals in biomedical research must put into consideration the appropriateness of animal species for a particular experiment. The treatment of animals, before and after experiments, must be humane, thus animals must be treated in a manner to avoid unnecessary discomfort, pain, anxiety or poor health and the perceived risk from research must be documented.

In biomedical research new perspectives always lead to a new and unexpected knowledge, and animal research would always inevitably lead to valuable and exciting new information on health and disease. Therefore, ethical biomedical research admits that animals are close enough to humans, their bodies, brains and even psyche are good models for human conditions, thus making it a fundamental base for medical research to use animals for medical and scientific research.

### **Conclusion**

The importance of animals in medical research has been demonstrated in several experiments. However, in the context of development and advancement of science in a country like Nigeria, animal experimental knowledge, especially in a developing

country needs to be encouraged and supported with funds and workable policies for both short and long term success. Both man and animals are still struggling to overcome the existing miseries of survival in the face of so many diseases yet to be controlled or eradicated. Thus, research into animal health and the use of animals in medical research is necessary for medical science to develop for the general well being of the society.

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