MEDICAL RESEARCH AND THE PRACTICE OF MEDICINE IN WEST AFRICA
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by

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To

My late father Mr. Emmanuel Quarmino ARCHAMPONG who, while not being academic himself, tirelessly strove to introduce us all in the family to the academic world.
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INTRODUCTION

Medical research is a relatively new entity in West Africa. Even so its scope in contemporary West Africa is surprisingly wide and the problems it presents are as diversified and daunting as elsewhere; this diversity of scope is indeed a measure of the tremendous pace of advancement.

The development of medical research has lagged behind that of the practice of medicine in all fields. From the very early days emphasis has been on curative medicine and this perhaps has largely been responsible for the apparent discrepancy. On first principles, practice and research in medicine are inseparable. It is hardly possible to practise contemporary medicine with any degree of seriousness without engaging in some measure of data collecting and processing and this applies to all countries. The two processes are complementary and undue emphasis of one to the exclusion of the other is surely detrimental to the overall outcome.

The historical aspects of medical research in West Africa would appear to bring this issue into sharp focus. Medical research in West Africa has been and remains essentially utilitarian. It has always been predominantly applied research, restrictive and aimed at specific problems. The trend continues to date and the contemporary young practitioner at the threshold of an academic career is clearly in danger implicitly of assuming a superiority in "usefulness" of applied over pure research. Official backing of this attitude without establishment of proper perspectives is unfortunate, for progress in scientific knowledge has come more from the results of pure research than applied re-
search. Applied research in West Africa has retained apparent pre-eminence because the circumstances attending the beginnings of scientific observations in medicine made this inevitable. These have taken the form of emergency measures to cope with endemic disease or outbreaks of epidemic disease.

The evolution of methods of prevention, eradication and treatment of malaria emphasizes this point. Malaria has been for long endemic on this coast and has been responsible for the unfortunate reputation usually attributed to the climate and vividly portrayed in books and journal articles like Gelfand's "Rivers of Death". With the demonstration in India first by Manson (1879) and later by Roland Ross of the role of the blood-sucking mosquito, a large new territory for scientific investigation was laid open. West Africa was directly involved because 20 years later in 1899, Sir Roland visited Sierra Leone and there demonstrated the vector of human malaria for the first time on African soil, subsequently setting out proposals for its control (Burke-Gaffney, 1968). This would appear to be the beginning of the long association between the Liverpool and London schools of tropical medicine and medical research on this coast.

The circumstances of establishment of research units were on occasions more dramatic. In Ghana, the erstwhile National Institute of Medical Research was the direct descendant of the organization centred on the one-roomed laboratory set up in February 1908 by Professor later Sir W.J. Simpson, who had been invited by the colonial government of the then Gold Coast to direct operations to control the country's first experience of epidemic plague (Tettey, 1960). The Pasteur Institutes in Dakar and Abidjan arose in similar circumstances as extensions of the parent institute in Paris.

Perhaps for this reason, one notable feature of early
medical research in this region was that it took the form of applications and projections of pilot studies elsewhere so that the basic concept of the investigation was precast. This was particularly true of the epidemiological studies on the outbreak of plague, yellow fever, and small-pox in Ghana, Nigeria and Ivory Coast (now known as Cote d’Ivoire). This is not to detract from the originality of these investigations for in many cases they provided the spring board for important advances in the understanding of epidemic disease.

The development of research into the epidemiology of yellow fever was one such phenomenon (Scott, 1965). The first investigations of yellow fever had, of course, been undertaken in the American zone, where the disease had considerably hampered exploration and constructional work in Cuba and the Central States. Reports of yellow fever in West Africa had been fragmentary and contradictory to the point of frank denial of the existence of the disease from Senegal to Nigeria. It was against this background that the Rockefeller Foundation sent its yellow fever commission first in 1920 and again in 1925. The base of this research was at Yaba near Lagos, but members travelled widely in the region and at least one member was constantly in Accra.

The timing of the commission was particularly propitious, for within a short period one of the largest epidemics ever known on the West Coast came to light in the then Gold Coast and provided early opportunity for laboratory and field investigation on a considerable scale. The visitors in collaboration with local scientists were able to establish some fundamental facts:

1. For one thing the concept that yellow fever was a whiteman’s disease became no longer tenable; it very seriously affected the African population but the mortality was much lower.

2. The rhesus monkey emerged as the most suitable
experimental animal susceptible to infection, and permitted the isolation of the causative virus for the first time in a farm labourer at Kpeve in the Volta Region, and the result was the discovery of the famous Asibi Strain (17D Strain), the name of the patient; it was the strain that gave birth to the yellow fever vaccine and it was for research in this area that Max Theiler won the Nobel Prize in Medicine in 1951 (Chaplan, 1964).

3. The disease was the same as yellow fever in the Americans and was transmitted by the same vector.

These brilliant results were achieved at some price: the lives of three scientists, Dr. Adrian Stokes, Dr. Hidego Noguchi and Dr. W.A. Young, names which must be accorded a permanent place in the history of medical research in West Africa. Noguchi's work is already the basis of our present accord with Japanese scientists in medical research. This discourse serves to emphasize the dividends liable to accrue in local medical research from properly-adapted projections of global pilot studies.

From the intense co-ordinated inter-territorial and international activity that characterized medical research at the end of the last century and the earlier decades of the present century, a period of individual initiatives gradually emerged. Clinicians and pathologists in their routine work made observations, based on carefully-kept records, of far-reaching implications. Dr. Cecily Williams's original description of Kwashiorkor in 1933 distinguished this special syndrome of protein calorie malnutrition, which has since been recognized in most tropical and sub-tropical countries. The discovery by Edington and Lehmann of Haemoglobin C outside America in 1954 opened the way to the modern breath-taking advances in haemoglobinopathy research in West Africa. This pattern of research based solely on individual initiatives constitutes
the substance of much of the research currently in progress in the region (Dean, 1968).

MODERN TRENDS IN MEDICAL RESEARCH

Priorities in Research

The African himself is now at the centre of the vigorous research effort; it is a matter of concern, therefore, that the priorities in these endeavours severely fall short of expectation. There has been a tendency to trifle treatment of records; indeed there seems to prevail a tacit assumption that this is a lower plane of research. There could be no grosser fallacy, for it is the collection of accurate data together with the organization of a good record system which will provide the essential background for the understanding of local disease and of the problems ultimately to be tackled. Besides, as the late Professor Lord Max Resenheim has indicated, teaching students in such an atmosphere of enquiry will in the long run stimulate the occasional student to probe further into some of the problems.

In this light, it is distressing that no single West African State to date has established a country-wide system of collection of such basic vital statistics as births and deaths. In Nigeria for example, in spite of comprehensive plans drawn up for this by Harkness and Walker as far back as 1946, Otolorin (1968) points out that this is far from being achieved.

On specific statistical standards of the indigenous population important studies are in progress, notably by workers in Nigeria, Ghana and Senegal (Morley et al., 1968, Masse et al., 1961 and National Food and Nutrition Board of
There is a wide measure of agreement in the results about height and weight from several countries but these statistics need to be made dependable and meaningful by relating them to the changing subject; for if it is accepted that the figures arrived at represent standard heights and weights of West African children they must reflect the average picture of a child who is predominantly undernourished, malnourished and diseased. This situation emphasizes the difficulties of compilation of standards when the environments are so varied that the extent to which growth potential is being achieved is uncertain.

Biochemical and physiological standards are indispensable to normal practice of medicine as well as research in West Africa. It has become increasingly clear that physiological normals within this area differ significantly from values accepted elsewhere. Such differences whether from environmental, social or racial factors need special investigation if serious errors in interpretation are to be avoided. A wealth of information has been built up by the industry of several workers, for example, the Ibadan group under the leadership of Endozien on blood and urine normals, Ringelhann, Dagadu and Sodhi in Accra on blood lipids, and gastric secretory function estimations in Accra and Lagos. Much of this took place in the late 1960’s and the momentum is now slacking. Particularly useful basic practical information was provided by Badoe (1969) and Elebute (1969) who demonstrated independently and by different methods that the insensible pulmonary and cutaneous loss of fluid in the West African environment was nearly double that in the temperate climate. The figures they arrived at were 1.70 and 1.71 respectively — a remarkable degree of agreement and a testimony to the high quality of such research as goes on in our higher centres of learning. This information makes it possible for us to give the appropriate amounts of fluid to our seriously ill patients; and it is info-
that only local research can provide.

Nutrition

In West Africa, as in all developing regions, nutrition is fundamental to the well-being of the people and the advancement of their economy: *ipso facto* it has direct bearing on the results of treatment of the sick. The compiled statistics are startling that in the Savanna belt adults lose 2.3kg during the “hunger season” or *soudure* and 0.95kg in the forest belt; this must of course reflect a drastic curtailment of energy output.

Lack of protein lies at the heart of the food and nutrition problem and there is much need for research into the production of low-cost protein-rich food culturally acceptable and with a low wastage rate. Particularly desirable is domestic research determining the varying costs of food in terms of fully-utilized protein. Some studies have shown that while staples may be inexpensive, in terms of actual protein-content, other foods may be cheaper. Thus, Sai (1968) has shown that, based on 1965 prices in Ghana, the cost of 10g yam protein was three times that of pulses and legumes and that the cost of 10g fully-utilized cassava protein was ten times that of pulses and legumes proteins. The message is to reinforce the teaching that the meagre buying power had better be expended on protein-rich legumes than on traditional roots.

I have had to resort to 1968 figures because no subsequent work has been done on these lines and yet this is research that seeks to make maximum use of available nutritional resources and should command serious attention.

Disease Patterns

Proficiency in the diagnosis and management of illness
depends on knowledge of the disease patterns in our environment. A wave of expansion is developing in the actual cartography of West African disease but perhaps this is belated and the momentum needs to be doubled. It has already been established that hypertension is at least as common in West Africa as in Europe (Callender, 1953; Smith, 1966; Akinkugbe, 1969 a+b) and that, in its complications, this disease shows a predilection for the cerebrovascular rather than cardiovascular circulation. The peculiar patterns of cardiovascular disease which claims high mortalities in the region have rightly attracted much attention, for example endomyocardial fibrosis and cryptogenic heart disease or African cardiomyopathy.

A wide range of disease entities has been examined in the cartographic exercise and it is not the object of this address to cover these comprehensively. Two groups have been selected for special attention because of their relevance and the principles that these studies have outlined; they are the haemoglobinopathies and liver cancer.

**Haemoglobinopathies**

From the early observations (Edington and Lehmann, 1954; Edington and Laing, 1957), the work on the haemoglobinopathies has blossomed into an intensely-active field embracing several disciplines in Accra, Lagos, Abidjan and Dakar (Konotey-Ahulu, 1965; Konotey-Ahulu *et al.* 1968, 1969 a+b+c; Boyo, 1963, 1972; Watson-Williams *et al.*, 1965; Cabanes 1965; Sankale *et al.*, 1968, 1970); of particular importance socially, economically and clinically is the determination of the size of the problem. In Ghana, it is now known that one in three of the population possesses a qualitative and quantitative hereditary haemoglobinopathic gene: S, C, F or B thalassaemia. Statistically this works out that 1 in 36 (or 28,000 out of every million Ghanaian children) is completely haemoglobinopathic. Twenty thousand will have
sickle-cell disease. Systematic clinical studies in Accra have shown that most of these now can and do survive if their nutritional requirements are seen to and they are sufficiently shielded from the insults of endemic disease represented not only by malaria but killers such as typhoid fever, pneumonias, urinary infections and septicaemias. Unless responsible authority takes note of the ever-increasing numbers of the surviving sicklers and plans for their special needs, delivery of health care in this particular area must necessarily suffer. Here it may be argued that the enterprising activities of researchers create socio-economic problems in medical practice. Such would be a short-sighted view for it is known that healthy sicklers are no less intelligent than the rest of the population and are indeed often found filling highly responsible positions in service of the society.

In this respect, the basic philosophy underlying research into the sickle cell problem in West Africa and America seems to be at variance. In America, amniocentesis is gaining ground. Amniocentesis is the process whereby amniotic fluid from the conceptus is extracted and studied for the genetic constitution of the foetus with a view to performing therapeutic abortion. This is done ostensibly in the hope that the sickle cell gene will be eventually entirely eliminated. In West Africa, the emphasis has been on the demonstration with remarkable success that these haemoglobinopathic individuals lead normal lives as part of the national human resource if they are accorded the rudiments of basic health care and nutrition.

The clinical patterns of the various genotypes of sickle cell disease have been largely worked out (Konotey-Ahulu, 1969 a, b, c; Cabanes, 1965; Sankale et al., 1968, 1970; Thompson, 1963). This exercise has led to the unmarking in Ghana of five new haemoglobin variants including Haemoglobin Korle Bu and Haemoglobin Christiansborg. It is now possible at least for the major haemoglobinopathies to surmise the genotype from the phenotype, a useful device for those of us...
who have to practise in remote areas of this continent without the luxury of a routine laboratory.

But what is being done towards the control of the sickling process in and out of crisis? It is true that after several agents the latest of which were urea and the snake venom ARVIN nothing much has accrued from the search for a principle that would regularly terminate a crisis. The most outstanding development in the field seems to be the investigations pioneered in Accra on the preventive aspects of the problem on the lines of genetic counselling by means of lectures aimed particularly at the schools. They are followed by the now quite popular blood-tests for determination of genotype, necessary advice being given according to the results. In this way, it is possible to avoid the pairing of genotypes certain to produce incapacitating disease in the progeny.

Liver Cancer
The present status of liver cancer in this country emphasizes what influence systematic research may exert on practice of medicine. Primary liver cell cancer is now recognized as the commonest form of malignant tumour in the country at least in the male, yet in the early decades of this century it was reported as uncommon and this view was echoed in 1955 and again in 1969. With the opening of the cancer registry first in Ibadan and later in Accra, systematic efforts at detection and accurate compilation and processing of data have put the condition in its proper perspective as the greatest killer among the tumours in this country. Current research aims at earlier diagnosis in the hope that a more radical approach will improve the outlook in this lethal condition. To this end, a battery of immunological diagnostic tests (Sankale et al., 1970; Abele, Masseyeff and Camin, 1968; Tatarinov', 1966; Uriel, 1968; Alpert, 1968; Foli, 1969–1970) is being evaluated including radio-isotopic refinements of the α-taeto protein test and the SH Antigen test. Preven-
tion now has pride of place in most fields of medicine and efforts currently being expended on casual associations should eventually yield dividends.

CONVENTIONAL MEDICAL PRACTICE AND RESEARCH INTO INDIGENOUS HERBAL MEDICINE

There is no doubting the enormity and potential value of knowledge of the medicinal uses of plants possessed by Africans and handed down generations by oral traditions. Retrieval of this information by co-operative research is seriously hampered by suspicions and sometimes well nigh impossible attitude of the traditional healers, staving off invasion of their magic and mysticism. This is a generalization, however, requiring qualification. There are in fact three main categories of traditional healers in Ghana (Addae-Mensah, 1975):

1. The properly trained competent herbalists often running clinics and who usually emphasize the actual efficacy of the herbs.
2. The herbalists who place particular reliance on supernatural causes and curses for disease and therefore use herbal agents not as cures but as means of driving away evil spirits responsible for a particular ailment, and
3. Finally, the itinerant herbalist, a more shady character who pushes his wares from house to house or at street corners and usually claiming cures for a wide spectrum of ailments for one preparation.

It is clearly more practicable to work with the first category than the second and the third, once mutual confidence
has been established. In saying this one is not doubting the role of the spiritual or psychological factor in the art of healing but investigations of its efficacy, as demonstrated by Field in her book *Search for Security*, would involve identification and exclusion of quacks and establishment of a degree of mutual confidence.

There is a clear need for systematic research into plant medicine in West Africa; a lot that is going on at the moment is ill-conceived and ineffectually executed. Like every scientific research, it has to be undertaken by properly-prepared personnel—scientists, medical practitioners, and the first category of traditional healers; the need to avoid undue sensationalism should be recognized and instead strict scientific criteria for clinical assessment of claims attributed to plants should be laid down. Without these provisos nothing in progress can be regarded with any degree of seriousness.

I will give examples. *Rauwolffia serpentina* has been used in India as an antidote for snake bite, a febrifuge, and sedative from ancient times. It was the isolation of reserpine, an anti-hypertensive agent, from this plant in 1952 that more than anything else regenerated research into plant medicine in recent years; reserpine is now part of our armamentarium in treatment of hypertension. Recently, a group of scientists in one of our Universities isolated reserpine from *Rawoulfia vomitoria* (Kakapenpen), a perfectly natural scientific event. The Ghanaian press blazoned this in bold headlines: “Ghanaian Scientists” discover cure for hypertension. This form of communication not only embarrasses the scientists but also it could be dangerous to the public. Hypertensives could easily take to indiscriminate use of concoctions of Kakapenpen with fatal consequences.

This was precisely what happened in Nigeria recently in relation to the plant *Fagara xanthoxyloides* and sickle cell disease. This plant occurs widely in West Africa—the Gas call it Haatso and the Akans Okanto and is used in Nigeria as
chewing stick. At a symposium at the University of Ife on the medical effects of this plant on sickle cell disease, it was reported by one of the research workers that when the isolation of the active ingredient alleged to be active against sickle cell anaemia was announced it was sensationalized by the press. Sickle cell patients attending clinics abandoned established courses of treatment and resorted to self medication with *Fagara* extracts and trade in this suddenly boomed. This was particularly alarming to the doctors as it was quite clear that a lot of work remained to be done on the new-found agent. Its side effects including asthmatic attacks are now known to be serious and many lives may have been lost; the extent may never be known.

The other important principle that needs to be seriously considered when discussing research into plant and traditional medicine is the enormity of the task, if it is to be done properly, and the cost in time and money. Not only must the agent be isolated and tested for physiological and pharmacological activity (3–20 years — Addae Mensah, 1975) but the active principle must undergo toxicity, teratology, carcinogenicity and metabolic tests before release for tests on volunteers and finally clinical trials. Without appearing discouraging, one needs to sound the warning that in engaging in this field of therapeutic “innovation” we should be aware of these problems especially in our present national economic plight. The need for regional co-operation cannot be over-emphasized. We should accept the hard realities that perhaps our efforts cannot go beyond the primary and secondary stages. At the moment, several institutions in Ghana alone seem to be independently pursuing the goal — the universities, various organizations under CSIR and the Centre for Research into Plant Medicine at Akwapim Mampong. There is a good deal of duplication and hardly any co-ordination. This applies also at the regional and continental levels; for example the Drug Research Institute at Ife sponsored by the OAU
does not seem to co-ordinate research in this field in West Africa let alone the whole of the continent.

Clearly plant medicine has a major contribution to make to conventional medical practice but it must first be divested of mysticism, regulated and standardized so that practitioners could communicate it rationally to their patients and among themselves. The good work being done should not be submerged by sensationalized pseudo discoveries and for any worthwhile results central co-ordination is essential.

ORGANIZATION OF MEDICAL RESEARCH

Lack of a proper central organization for co-ordination lies at the centre of the medical research problem in West Africa. Without doubt, the most successful ventures have been projections into the region of well-established external research organizations e.g. The Yaba Medical Research Institute 1924, an affiliate of the Rockefeller Foundation; the Pasteur Institutes in Dakar and Abidjan; and the Human Nutrition Research Unit at Fajara in Gambia established by the British Medical Research Council. The results from these earlier ventures exceeded all expectations but the medical research needs of the West African region cannot be planned on this basis - as appendages of on-going projects elsewhere.

With the attainment of independence, West African states have naturally oriented research planning to national requirements but once again research planning has been rather compartmentalized. What is needed is a vigorous co-ordinating national body able to engage in active regional cooperation with other national research bodies, perhaps through the Scientific and Technical Commission of the OAU or ECOWAS or UNESCO. Even now in Ghana we do not have an actively-functioning national medical research
body. Are we going to rejuvenate the old NIH or work out a new national system of control through the CSIR? The arrival on the medical research scene of an institution such as the Noguchi Memorial Institute adds new urgency to the need for central co-ordination of medical research in the country. Could this university-based institution assume leadership for national medical research? The vacuum needs to be filled.

The industrial expansion in West Africa provides a constant reminder of the need for this co-ordinated research on a national or even regional basis, especially where large-scale schemes are undertaken with attendant health hazards of macro- and micro-environmental changes. The implementation of the Volta River Project in Ghana illustrates this kind of challenge. Apart from the difficulties of resettlement of displaced peoples, there was the greater problem of protection of the large number of workers, an estimated 6,000 from diseases endemic in the area as well as from those possibly arising from the flooding. Problems were expected from malaria, schistosomiasis, trypanosomiasis and particularly onchocerciasis.

The planning was excellent and is perhaps never equalled anywhere in the developing world: entomologists (Berner, 1950, Burton and MCaza, et al, 1965), parasitologists (Berry, 1954), pathologists (Hughes, 1951), and medical field units (Waddy, 1956, MacDonald 1955), as well as veterinary, agricultural and community development units worked in close co-ordination under the leadership of world experts. The predictions have largely materialized and some measure of control achieved but schistosomiasis has raised its ugly head again along several areas of the shores of the lake and onchocerciasis transmission has reappeared in the immediate vicinity of the overflow from the dam. What went wrong? It is the all too frequent indifferent application of the results of good research in the
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country. Failure of control of known schistosomiasis foci along the lake and migration from foci down stream has led to phenomenal increase in transmission. Follow up of the original studies has also fallen below expectation. Individual attempts to cure schistosomiasis in the inhabitants and workers along the lake shore would be pointless without support from a co-ordinating data collecting control unit.

What is even more worrying is the sequence of events in the country since the Akosombo experiment. Numerous minor dams have been constructed on the irrigation schemes, some of them not so minor. Close to the capital the new Weija high dam together with its irrigation scheme is fully operational yet no one really knows what has been done by way of basic research into the health hazards attendant on the macro- and micro-environmental changes. We have not utilized our experience from Akosombo and one shudders to imagine the changes in the health statistics of the affected districts in the next few years.

UNEXPLORED AREAS OF MEDICAL RESEARCH

Wide areas of medical research still remain virtually untouched in the West African region, particularly in the fields of medical education and health education and this necessarily affects our practice in the delivery of medical care. Plans for production of personnel at all levels, but particularly for doctors, have been dominated by a perennial dilemma: the desire to produce a large number of doctors who are on the one hand fully orientated and adapted to the region and on the other completely at par with and on terms of reciprocity with European doctors (Bryant, 1969). But neither the early-type schools of Dakar 1918 (Ecole de Medicine de l' Afrique
Occidentale Francaise) (Hailey, 1957) and Yaba 1930 (Schram, 1968), training medical assistants, nor the ultra-
modern style school that was set up in Ibadan, training London-type doctors, is particularly suitable for West Africa. Probably the comprehensive health services experiment now taking shape in the Camerouns may give a clue. Here one com-
plex establishment is attempting to train all personnel - doctors, health assistants and other paramedical personnel and this is likely to achieve integration at an early stage and on a wider scale.

African medical training institutions are faced with an urgent challenge of producing doctors sufficiently adapted and equipped to administer health care at all its levels to the population from the rural majority to the urban minority so as to make health for all by the year 2000 a practical issue. This calls for a new perspective in African medical education which in its objectives and planning of curriculum would appropriately reflect the needs of the 70–80 per cent of the population who produce the wealth of the nations from the rural areas. The response can no longer be delayed.

At the postgraduate level more progress has been made particularly in the clinical fields with the surgeons clearly leading the way. The founding of the West African Post-
graduate Medical College gave political recognition to a burn-
ing academic and professional desire to evolve a suitable physician for the region. It is now virtually possible to train surgeons and physicians for service in West Africa within their natural environment and in full reciprocity with similar programmes in the advanced countries. We would have been saved the embarrassment of trained surgeons coming home to pick up the peculiarities of surgical practice at a stage in their development when they cannot be so readily taught.

One other area need be mentioned and that is population control and family planning. The economic realities of the latter half of the 20th century have impressed on West Afri-
cans, at least the Ghanaians, the need for some limitation of the family size; indiscriminate implementation is a problem. How can the rural family facing an infant mortality 100 times that of the city-dwelling family be expected to limit its size to the same degree? One very healthy recent innovation has been the development of rural model health demonstration centres which, while delivering comprehensive health care to the population, provide an efficient record system which will help to evaluate the operation of the health system as a whole. Egbo-ora near Ibadan, Khambole near Dakar and Danfa near Accra are notable examples. At Danfa, it is already apparent that acceptance of family planning measures may lie in the context of a comprehensive health programme for the entire community.

CONCLUSION

The aim has been to trace the relevance and influence of medical research on practice of medicine in West Africa. Research and practice are complementary and intimately related. If I have shown that the ineffective delivery of health care to the nations of West Africa and Ghana in particular is what it is today because of inappropriate, ill-conceived, poorly directed and unco-ordinated research, I would have realized my objective.

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