

## MAJOR-GENERAL SIR DAVID BRUCE, K.C.B. \*

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### Introduction

BRUCE, Semple, Leishman—one recalls with pride their association with the history of the Royal Army Medical Corps (indeed they made the history of the Corps), but one is constantly reminded nevertheless, with some inevitable weakening of morale and an uncomfortable deflation of one's ego, that these three army medical officers not only occupied at some time during their army service the same 'chair' of the assistant professor of army pathology that I do at present, but also left their indelible foot prints in the sands of the world's medical history.

Of these three army medical officers of international repute, Bruce is the one who is directly concerned with the *raison d'être* of this session. There can be no doubt of what he achieved—a look at the overwhelming list of his published works alone will show the range and depth of his successful labours and is more than enough to daunt the spirit of any but the bravest (or most ambitious) young pathologist, Army or otherwise, who aims to follow in this great master's footsteps; a look at the impressive and numerous honours and decorations granted and extended to Bruce testify to that esteem and even gratitude with which he was regarded by his contemporaries, medical and non-medical.

Bruce was born in Melbourne, Australia on 29 May 1855—a most propitious year it would appear, as it also happened to be the year in which army pathology was first officially established. He was the only son of David Bruce, a Scots engineer who had gone temporarily to Australia to supervise the installation of ore-crushing machinery during the gold rush, with his wife Jane Hamilton from Stirling, Scotland.

When he was but five years old, the Bruces returned to their native Scotland and young Bruce became a pupil at the Stirling High School, in his mother's home town. At an early age he loved all things that lived; he was an enthusiastic member of the Stirling Natural History Society and Field Club, and he loved to roam the countryside around the town. This consuming interest in living things stood him in good stead in his life's work devoted to medical research, medicine being after all only a sector of all embracing biology.

At the early age of 14 he left school to take up a business and commercial career with a firm in Manchester; at this time he was greatly interested in athletics, boxing and football, I suppose it was a great relief and in marked contrast to clerical work in a stuffy office, but a severe attack of pneumonia drastically put the brakes on his athletic prowess and ambitions, and having matriculated at Edinburgh University he enrolled in the biology class intending to make zoology his career (he duly won the class prize in natural history in his first year). Now it so happened that one or another of his undergraduate student friends must have persuaded him to change his academic studies for a course leading to a medical degree; here Bruce showed that enquiring mind and displayed that critical outlook, the hallmark of the born genius, which must have

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pleased some of his tutors and perhaps irritated others, when he pestered them with pertinent questions at the end of each lecture or demonstration.

On graduating M.B., C.M. in 1881 Bruce joined the brain-drain south to Reigate in Surrey and became an assistant general practitioner to a Dr. Stone. Here the gods were extremely kind to him as he met Mary Elizabeth Sisson Steele, daughter of a distinguished general practitioner of the town, who had been Dr. Stone's predecessor in the practice. At this time the salary of an assistant general practitioner was by no means high, so Bruce decided to make the Army his career and to marry Mary Elizabeth Sisson Steele, the lady of his choice.

To continue our story, Bruce's wife must have been a remarkable army wife, and considering what is demanded of our wives in the service today that is really saying a great deal. She not only accompanied her husband to all his overseas military stations, but also journeyed with him to unhealthy parts of wild Africa. She was also his constant companion, his able chief technician, illustrator of his microscopical work. She was his operating theatre sister during the battle for Ladysmith, and later his aide-de-camp in the many commissions and committees on which he was asked to serve. Bruce himself always emphasized with considerable pride the great debt he owed to his wife for the success of his many endeavours; it really was a classic example of a perfect man-and-wife team, David and Mary Bruce.

Even in death they were not to be separated, Major-General Sir David Bruce, K.C.B., LL.D., D.Sc., F.R.C.P., F.R.S. died on 27 November 1931 in Artillery Mansions, Victoria, London just four days after the death on the 23 November 1931 of Mary Elizabeth, Lady Bruce, R.R.C., O.B.E.—thus ending together on earth at least a rare, most happy, and very fruitful partnership of nearly 50 years.

### Bruce in Malta

Bruce was commissioned as an army surgeon on 4 August 1883, and the luck of the draw saw him posted on his very first overseas posting to Malta in 1884. Here in Valetta he immediately set to work investigating the problem of 'Malta Fever', which had been for years a major cause of disability in the British Forces stationed on the island, with the gratifying result that he was able to announce the discovery of the etiologic agent *Micrococcus melitensis*. This led to numerous papers and correspondence in prominent journals, some relevant extracts are:—

1886—(a) "there exists in the spleen of cases of Malta fever a definitive micro-organism. (b) this micro-organism can be cultivated outside the human body"

*Practitioner 1887*

and further to describe its characteristic features and properties:—

1887—(a) "Oval in form, measures .0008 millimetres to .001 millimetres, therefore being one-eighth of the diameter of a red corpuscle" and its isolation (b) "By far the most practical way of demonstrating the micro-cocci in tissues is by cultivating them on Agar-agar nutrient jelly".

*Practitioner 1888*

Please note that in his attempts at the bacteriological isolation and culture of the *Micrococcus melitensis* Bruce was greatly helped by the Maltese Doctor Caruana-Sciicluna.

“I must here thank Dr. Caruana-Scicluna for the very great assistance he has given me, not only in preparing sterilised fluids, but also in supplying apparatus, etc: in fact without his co-operation the following results could not have been attained”.

*Practitioner 1887*

1890—“In regard to the important question as to how the micro-organism gains access to the human subject, whether by the air, in the drinking water or in the food, absolutely nothing is known up to the present and on account of the high temperature required for its growth, the length of time which elapses before the colonies appear, and the absence of any well marked morphological or cultural characteristics, will render the search for it outside the body very difficult, if not impossible”.

*Reports on the Health of the Army 1890*

1905 to 1907—The historic Mediterranean Fever Commission was appointed by the Admiralty, the War Office and the Civil Government of Malta for the investigation of Mediterranean Fever, under the supervision of an Advisory Committee of the Royal Society. Bruce was appointed Chairman of this Committee. The crux of the problem was finally resolved by an eminent local physician Zammit, later Sir Themistocles Zammit, C.M.G., M.D., D.Litt. who was a member of the Mediterranean Fever Commission.

“Dr. Zammit informed the Chairman that he considered goats to be susceptible to Mediterranean Fever, and that the disease is *spread to human beings by goats*” (Fig. 1).

*Reports of the Mediterranean Fever Commission 1905*



Fig. 1. Herding of goats at the entrance to Valetta. This magnificent entrance was demolished about seven years ago to allow passage of modern transport.

“The Conquest of Malta fever is perhaps the most striking example of the application of laboratory methods to the control of communicable disease; it has stood the test of time and is one of the really unequivocal successes of preventative medicine”.

*Journal of the Royal Army Medical Corps 1955*

#### **Cholera—1887**

In view of the intense interest being taken by the World Health Organisation in respect of the present seventh (El Tor) cholera pandemic, readers will be interested to know that Bruce during his Malta stay also tackled cholera (for historical details of

cholera in Malta vide Cassar's Medical History of Malta published by the Wellcome Historical Medical Library 1964).

"From the foregoing considerations Malta" observed Bruce "from a sanitary point of view, cannot be considered cholera proof" (he even succeeded in isolating Koch's comma bacillus from the ileal contents of a soldier on whom he conducted a post mortem investigation).

*Transactions of the Epidemiological Society of London 1888*

For his work on cholera Bruce received the thanks of the Civil Government and the Director-General of Army Medical Services.

### **Bruce in South Africa**

In 1894 Bruce was posted from the Army Medical School, Netley, where he had been assistant professor of pathology, to South Africa for field service, and here two things happened which raised sky-high Bruce's international repute.

1. A severe disease called in vernacular 'Nagana' was affecting cattle.

2. The Governor of Natal and Zululand was Sir Walter Hely-Hutchison, who had been formerly the Lieutenant-Governor of Malta, at the time when Bruce was working on the problem of Malta Fever. Sir Walter used his influence and had Bruce seconded to investigate Nagana.

Bruce was by now even more qualified than ever before to undertake biological research. He spent the year 1888, after leaving Malta, at Professor Robert Koch's unique institution in Berlin which was a Mecca for budding bacteriologists, and here he picked up a mass of scientific information and laboratory technology; consequently at Netley Bruce had established a course in bacteriology which was the very first course in this subject in any medical school in England.

On receiving his summons Bruce set out for Ubombo in Zululand, and within a matter of weeks, but by much hard work, ingenuity, enthusiasm and imagination he found:—

(a) A trypanosome in the blood of affected cattle and, (b) Later proved that the trypanosome was hosted by wild game; that domestic animal such as horses, donkeys, dogs were susceptible and that the parasite was carried to its victim by the tse-tse fly (*Glossina morsitans* or *pallidipes*).

"At this point then I think it will be convenient to give a definite description of the parasite discovered by me in 1884 in the blood of animals affected by Nagana.

For the present I shall call it the Haematazoon or Blood Parasite of Fly Disease.

That this parasite is the true cause of Fly Disease is rendered almost certain from the following considerations

1. It is found in the blood of every animal suffering from this disease, and is absent from the blood in all healthy horses, cattle or dogs.

2. The transference of the smallest quantity of blood from an affected to a healthy animal sets up the disease in the latter, as I have shown above; even the very small quantity of blood conveyed by the proboscis of a few Tse-Tse Flies is sufficient to carry the disease from animal to animal."

*Further Reports of Tse-Tse Fly Disease 1896*

Bruce managed to ship a dog infected with trypanosomes to England (this dog appears to have supplied many of the laboratories in Europe with trypanosomes); his findings were confirmed and the parasite was called *Trypanosoma brucei* in honour of its discoverer.

This it will be noted was the first time that an arthropod was shown to be the vector of a protozoan parasite; and behind the rather bald factual statement given above in the arid, frigid officialese appropriate to his report, there lies much which I find of human, personal and dramatic interest in this epoch-making discovery, when I cast my mind back to the last century and try to visualise the discomfort of travel and the day-to-day living in primitive and often dangerous conditions which Bruce had to undergo while at the same time attempting to do medical research in keeping with the best traditions of the European schools as exemplified by the German Koch and the French Pasteur both of whom so much admired and revered by him. Perhaps we should let Bruce retell his story in his own words as he told it to the fellows and members of the Royal College of Physicians of London some years later—

“ . . . and if you will allow a short autobiographical digression, I will relate the circumstances leading up to the discovery.

Travelling at that time was no easy matter, as the railway into Zululand had not been constructed. My wife and I left Pietermaritzburg on October 27th, 1894, and travelling by mule-wagon arrived seven days later in Eshowe, the capital of Zululand. There an ox-wagon was provided, and in it we trekked to Ubombo, in the centre of the infected district. Here a small wattle-and-daub hut was provided as a laboratory and for living in. As I had just come from the Army Medical College, Netley, where I had been teaching bacteriology for five years, it was natural that a bacteriological examination of the blood and organs of the infected cattle should first be made. This proved negative.

About this time (1894) the study of the blood had become popular, thanks probably in great measure to Ehrlich, and it was the fashion to make elaborate examinations of the red and white corpuscles. To this the discovery of the Nagana parasite was probably due. It must be remembered that these parasites are, as a rule, very few and far between in the blood of oxen, and also that our staining methods in those days were rather primitive. After some days of this blood examination it began to be remarked that a curiously shaped object different from anything previously found in blood was sometimes seen lying among the blood corpuscles. It was then thought that if it was it might be motile in the living state. Fresh preparations of blood were made, and after a long search a rapidly moving object was seen lashing about among the red corpuscles. At that time I knew nothing about trypanosomes, and at first thought that the wriggling object might possibly be a small filaria. There were few or no allusions to these haematozoa in medical literature at that time, but when I returned to Natal and had an opportunity of consulting books, it soon became evident that the rapidly vibrating body was probably a trypanosome.”

*The Croonian Lectures 1915*

From 1903 (when Bruce was in Uganda) to the outbreak of World War I, Bruce was the obvious man to ask for in connection with medical research in Africa. Thus the Royal Society in London sent out many commissions to investigate disease, and when official reports reached the Foreign Office that thousands of the inhabitants around the

shores of Lake Victoria, Nyanza were dying of the Sleeping Sickness Disease, a commission was sent out to investigate the disease in Uganda. Included in this commission, by the good offices and on the strong recommendation of the Father of Tropical Medicine—Patrick Manson himself, was Castellani ( I need hardly remind readers of this Journal that Marchese Sir Aldo Castellani, D.Sc., M.D., F.R.C.P., F.A.C.P., died only a few months ago).

Bruce himself arrived at Entebbe in 1903, and in conference with Castellani was shown:—

- (a) A streptococcus which the latter had isolated from the victims of the disease.
- (b) Also a trypanosome which Castellani had found in the cerebro-spinal fluid of some patients in the late stages of sleeping sickness.

Bruce disregarded the streptococcus, and instead with the sure instinct of the genius chose to investigate the trypanosome. He proceeded to repeat his marvellous work done previously on his investigation of Nagana, and within a period of six months, from 16 March 1903 to 28 August 1903 showed that Sleeping Sickness was caused by a trypanosome. Indeed this dreaded human disease proved to have a similar pattern to Nagana—not only was it caused by a trypanosome (*Trypanosoma gambiense*), but it was also carried by the tse-tse fly (*Glossina palpalis*).

This is how Bruce reported back to his sponsors the Royal Society in London in his Further Report on Sleeping Sickness in Uganda which was received by the Royal Society on 30 September 1903:—

“ For the sake of the future historian, it may be well to point out the exact state of affairs as regards our knowledge of Sleeping Sickness in relation to trypanosomes, when Colonel Bruce and Dr. Nabarro arrived in Entebbe, on 16 March 1903. Dr. Castellani had observed these haemotozoa in the cerebro-spinal fluid of five cases of Sleeping Sickness, and in one of these he had also seen them in the blood.

At the time of the arrival of the Commission, he did not consider this trypanosome had any causal relationship to the disease, but thought that it was an accidental concomitant like *Filaria perstans*.”

Bruce sets out the salient points of the discovery with his usual clarity, here are his own words:—

“ 1. That Sleeping Sickness is caused by the entrance into the blood and cerebro-spinal fluid of a species of trypanosoma.

2. That this species is probably that discovered by Forde and described by Dutton from the West Coast of Africa, called by him *Trypanosoma gambiense*.

3. That the so-called causes of trypanosoma fever, described from the West Coast, may be and probably are, cases of Sleeping Sickness in the earliest stages.

4. That monkeys are susceptible to Sleeping Sickness, and show the same symptoms, and run the same course, whether trypanosomes injected are derived from cases of so-called trypanosoma fever, or from the cerebro-spinal fluid of cases of Sleeping Sickness.

5. That dogs and rats are partially susceptible, but that guinea-pigs, donkeys, oxen, goats and sheep, up to the present, have shown themselves absolutely refractory.

6. That the trypanosomes are transmitted from the sick to the healthy by a species of tse-tse fly, *Glossina palpalis*, and by it alone.
7. That the distribution of Sleeping Sickness and of *Glossina palpalis* correspond.
8. That Sleeping Sickness is, in short, a human tse-tse fly disease."

*Reports of the Sleeping Sickness Commission 1905*

Nothing could be clearer and more definite than his eight salient points.

Castellani was the first observer to have seen the trypanosoma in the cerebro-spinal fluid, and Bruce was the first to acknowledge this finding, but to Bruce himself one must give the credit of having the acumen and the intuitive perception of seizing upon the trypanosome as being the etiological infective agent of Sleeping Sickness. After this third discovery (Brucellosis, Nagana, Sleeping Sickness) it was a fair reward for him to receive the Royal Medal of the Royal Society for 1904. Moreover, the military authorities were not niggardly in recognising his worth. Bruce had been promoted to the rank of Lieutenant-Colonel for his valuable services during the historic siege of Ladysmith, when he displayed operative surgical skill with the same efficiency and effect as he deployed in his more exciting medical discoveries, and now after his work on Sleeping Sickness he was elevated one more step in the military hierarchy:—

"The undermentioned Lieutenant-Colonel to be Brevet Colonel—David Bruce, F.R.S., M.D., R.A.M.C. in recognition of his services in investigating the cause of Sleeping Sickness in Uganda, as well as in consideration of the distinction already attained by him in researches connected with Malta Fever and Tse-Tse Fly Disease".

*London Gazette, 18 December 1903*

In 1911 the Secretary of State for the Colonies requested the Royal Society to undertake the charge of investigating the relationship between human trypanosomiasis and animal diseases, Bruce was naturally selected as the Chairman of the Royal Society Commission, and duly arrived in Nyasaland in January 1912, with the very comprehensive commitment of investigating the connection between parasites, vectors, and disease affecting the African wild fauna, domestic animals and man himself.

A massive volume of work was produced by this the Fourth Sleeping Sickness Commission, and its findings were of great scientific interest and of equally great practical value. A full account of this and previous commissions may be found in the Proceedings of the Royal Society, and perhaps the following quotation from Harley Williams 'The Conquest of Fear' puts in the right perspective much better than I can what this work amounted to. This medical historian comments that Bruce's discoveries:—

"revealed that fascinating and inescapable partnership that must exist between man and all the living things around him—his animals, wild game in the forests, his parasites—even flies. Upon the successful handling of this strange biological relationship depends not merely health and comfort, but even survival".

One of the commission's recommendations was that efforts were to be made to reduce as far as possible the wild fauna, since wild game constituted the reservoir from which the tse-tse fly drew a constant and abundant supply of parasites. It was also found that the trypanosome in this area was *Trypanosoma rhodesiense*, and appeared to be even more pathogenic and virulent than the *Trypanosoma gambiense* of earlier investigations. This is how Bruce described some of the activities of the commission:—

“ The chief object of this commission in coming to Nyasaland was to enquire into the relation of the African fauna to the maintenance and spread of trypanosome disease. When an animal is shot in this fly-country by a member of the Commission a small quantity of the blood is taken in a bottle containing citrate of soda solution for inoculation purposes and thick and thin film of the blood spread on glass slides for microscopical examination.

The blood is then sent to a point on one of the main paths, where a motor cyclist is waiting to carry it to the camp. When the blood arrives it is at once injected into a goat, a monkey or a dog ”.

Some of his observations were:—

“ 31.7 per cent of wild game in the fly-country below Kasu Hill harbour had pathogenic trypanosomes. It is self-evident that these wild animals should not be allowed to live in ‘ fly-country ’ when they constitute a standing danger to the native inhabitants and the domestic animals. It would be as reasonable to allow mad dogs to live and be protected by law in our English towns and villages. Not only should all game laws restricting their destruction in ‘ fly-country ’ be removed, but active measures should be taken for their early and complete blotting out ” (Fig. 2). Coming from a

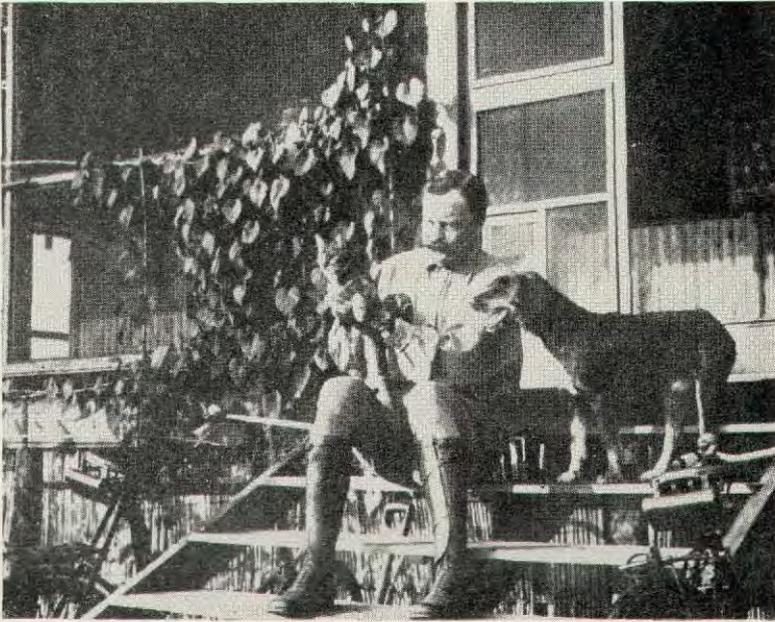


Fig. 2. In sharp contrast, Bruce's love of animals is depicted in this scene at his quarters at Mpumu.

naturalist one must assume that this wholesale destruction of wild life was not advocated without some dismay and sorrow and in fact Bruce hastened to add the rider “ It must be strictly borne in mind that this only refers to wild animals living in the fly area ”.

In another document which I came across quite by chance, he elaborates on this theme and in a strangely modern voice, in terms such as I imagine Prince Philip would advocate today, he passionately urges:—

“*Festina lente*. Let local authorities frame regulations from time to time as the exigencies of the place demand. But there ought to be room for the next thousand years in many parts of Africa for game reserves in which all the varieties of big game may live, thereby gladdening the eye and enriching the imagination and fancy of many future generations, and delaying the day when man will have for his sole companions the domestic hen, the cow and the motor”.

*Manuscript, Royal Society of Tropical Medicine and Hygiene.*

Readers of this Journal who utilise the services of that admirable and indispensable institution, the Bureau of Hygiene and Tropical Diseases, with its excellent monthly publications *The Tropical Diseases Bulletin* and the *Bulletin of Hygiene*, may not be aware of the fact that this Bureau owes its origin to the Sleeping Sickness Bureau which was originally proposed as an international Organisation for the world-wide dissemination of information on trypanosomiasis.

On 26 March 1914 Bruce left Africa for England, but lest it should be thought that his work in Africa was solely that connected with trypanosomiasis, I should mention at least for record purposes, and I think to satisfy the curiosity of the enquiring reader, three further fields of investigation, the first of which will be of undoubted piquancy and by a surprising coincidence very relevant to this meeting.

#### **Muhinyo**

When the Sleeping Sickness Commission passed through Kampala, the native capital of Uganda, at the end of October 1908, on their way to their camp at Mpumu (Fig. 3), they were informed by Sir Apolo Kagura, K.C.M.G., the Prime Minister,



Fig. 3. Bruce in his Sleeping Sickness Laboratory at Mpumu.

that a new disease had broken out in the province of Ankole, and that many people were sick.

On 23 May 1909, Dr. A. D. P. Hodges, the Principal Medical Officer, Uganda Protectorate, accompanied by Colonel Sir David Bruce, Director of the Commission, went to Masaka on the border of Ankole, where they found 50 sufferers from this disease awaiting them.

As a result of the 50 cases sent to Masaka, it appeared that the principal symptoms of 'Muhinyo' are fever, profuse sweating, pains in the joints and along the course of nerves, swelling of various joints, especially the ankles, and extreme weakness and emaciation. The disease is of long duration, most of the patients had been ill for several months.

I am sure that many of the readers of this paper, especially the Maltese physicians would have recognised, as Bruce did, the classical signs and symptoms of 'Malta Fever', and they would have been right. Bruce proved it to be so by:—

(a) *In vitro*—isolating the *Micrococcus melitensis* from the splenic material of human patients.

(b) *In vivo*—by inoculating material into a monkey and a rabbit, whereupon these animals developed antibodies in their blood which specifically agglutinated a strain of *Micrococcus melitensis* from Malta.

He then proceeded to show (c) that 24 goats from the infected area were carrying *Micrococcus melitensis*. Bruce therefore reported that:—

“(1) Muhinyo is Malta Fever. (ii) Muhinyo is conveyed from goat to man by drinking of goats milk”.

*Proceedings of the Royal Society 1910*

### Diarrhoeal diseases

A Commission was appointed by the Secretary of State for War, in August 1900 to enquire into the nature, pathology, causation and prevention of dysentery and its relationship to enteric fever. The following are brief references to the observations made by Bruce (taken from the Introduction and concluding parts of his Report) who undertook the investigation on the bacteriology and pathology of South African dysentery, and its possible relationship to enteric fever:—

“*Part 1 On the Etiology of South African Dysentery*  
By Lieutenant-Colonel David Bruce, R.A.M.C.

In spite of a considerable number of papers written on this subject during the last 15 years, the etiology of dysentery still remains obscure, little also has been done to separate the various diseases which are at present included under the term dysentery, which after all is merely a name for a symptom. Without entering into details I may say that when one looks back on the history of this disease during these years three main theories seem to arrest the eye:—

First, The amoebic theory. Second, The specific bacillus theory. Third, The pathogenic role assumed by the *Bacillus coli* theory.

### Conclusions

From the preceding investigation it may be stated that:—

1. Dysentery in South Africa is not caused by amoebae, as there is some reason is the case with the dysentery of certain other countries.

2. That the organs in dysentery are absolutely sterile. It is a local disease, attacking the mucous and submucous coats of the large intestine, and unlike enteric fever, the causal agent, if any, confines itself to the intestines.

3. That in the large intestines no particular species of micro-organism stands out prominently as in the case of cholera, so that it is impossible in the present stage of the investigation to say that any special bacterium plays a prominent part in the causation of dysentery.

4. That there is not sufficient evidence in this work to bring forward the theory that some of the normal inhabitants of the intestines belonging to the coli group take on a pathogenic power.

5. That there is no connection between dysentery and enteric fever. Eberth's bacillus is not found in the organs or intestines of dysentery.

6. That there is a certain amount of evidence to show that the so-called cases of dysentery following enteric fever are relapses of enteric, where the disease has attacked the intestine".

*Reports of the Commission on Diarrheal Diseases 1903*

It is only fair to add that Bruce admits that the results of his investigations were in the main disappointingly negative, and regretted that his findings were not as full and satisfactory as he wished or as was anticipated, but then work was undertaken in war-time, and the conditions under which he had to labour were far from being in the least congenial; yet I am sure that many members with interest in the entero-pathogenic coliforms, which I daresay to most of us seems to be comparatively recently acquired knowledge, cannot help the lifting of the eyebrow at paragraph 4 of Bruce's conclusions casting doubts even at the very beginning of this century, on the apparent innocence of the 'normal' intestine inhabitants.

### Plague

At the time of the Commission on dysenteric conditions, plague broke out in South Africa; here I assume was a challenge which no true-blooded bacteriologist worthy of his name could resist. Records held in Manson House, Royal Society of Tropical Medicine and Hygiene show that he worked on this problem too when the opportunities presented themselves. Thus we find Bruce performing a post mortem examination on one patient:—

“Badjoe. Male age 40—who died after 4 hours illness on 11 July 1901. Post mortem—Lungs slightly congested. Spleen slightly congested. Kidney slightly congested. Stomach healthy. Micro—Spleen and liver—crowded with bipolar staining bacilli.

Blood also contains bacilli but not in such large numbers. Cultured on agar slope 12  $\frac{7}{01}$  from spleen several colonies; 14  $\frac{7}{01}$  many small colonies which are freely moveable on surface of agar and do not stick bodily to platinum needle. Micro oval rods, bipolar staining, evidently BP.

Experiment 3. Plague in rabbit. 23 July, injected into thigh of rabbit a/m culture from Badjoe spleen. Rabbit died 30 July—Bipolar bacilli seen in rabbit”.

*Manuscript, Royal Society of Tropical Medicine and Hygiene 1901*

### Bruce in England

On the outbreak of the first World War, Bruce was recalled to England in 1914,

and was appointed Commandant of the Royal Army Medical College at Millbank. From this period onwards, although he was not personally involved in technical work, his services were in great demand as an experienced administrator and medical adviser to various commissions, committees, organisations and institutions; thus he was intimately connected for quite a long period with that famous organisation The Lister Institute, and was a respected member of that other great London institution The Royal Society.

It would help, perhaps, to illustrate some aspects of this later work by citing some actual incidents of this sphere of activities in which Bruce was engaged—namely Tetanus and Trench Fever.

### **Tetanus**

In this day and age, with our potent vaccines and battery of antibiotics at our disposal, it may be hard for some of the younger generation to visualise the horrors of tetanus, and therefore I think it may be just as well to mention the part that Bruce played as Chairman of the War Office Committee for the Study of Tetanus:—

*“Tetanus. Analysis of 1458 Cases, which occurred in Military Hospitals during the Years 1914-1918.*

*By Sir David Bruce, K.C.B., F.R.S., Major-General Army Medical Services, Chairman, War Office Committee for the Study of Tetanus.*

The purpose of this paper is to place on record the available figures relating to cases of tetanus which occurred in Home Military Hospitals during the Great War of 1914-1918. It may be considered that some of the tables give no very useful or practical information, but they are nevertheless recorded in order that medical officers at the outbreak of some future war may have the opportunity of learning what was done for the prevention and treatment of tetanus during this war.

The total number of British wounded in all theatres of war has been officially reported as 2,032,142. If the number 2385 be taken as the total number of cases of tetanus which occurred among these wounded, the incidence of tetanus to wounded is 1.17 per thousand.

The most interesting feature . . . is the sudden drop in 1914 from 9 per 1000 in September to 1.4 per 1000 in December. This was undoubtedly due to the introduction of prophylactic injections of antitetanic serum which did not come into force until the middle of October”.

*Journal of Hygiene 1920*

Bruce emphasized the importance of using tetanus antitoxin, and did his utmost to ensure that it was available to the servicemen in adequate quantities; it was a great advance in the treatment of war wounds and it is estimated that this measure may have actually saved the lives of some 20,000 soldiers.

### **Trench Fever**

Another military hazard associated with war-time conditions was one of the typhus group of fevers appropriately called Trench Fever; it is true it was a milder disease than the similarly transmitted epidemic typhus, nevertheless it was a major cause of disability amongst the troops, and indeed at one period it was estimated trench fever accounted for 1 in 5 of all admissions to hospitals. It is hard to believe that this disease was second only to influenza as a cause of morbidity.

Bruce's War Office Trench Fever Investigation Commission showed that the vector of trench fever was the louse, the same ectoparasite as that of epidemic typhus, and hence clearly pointed out a way whereby effective control taken against the louse could interrupt the chain of transmission from man-to-louse-to-man. This committee was formed in November 1917 by Lieutenant-General Sir Alfred Keogh, K.C.B., then Director-General of Army Medical Services for the purpose of investigating trench fever with a view to the discovery of its causation, mode of spread and prevention.

At that time the Medical Research Committee of the American Red Cross was also organising a similar research programme, and contrasting observations between these two teams, Bruce as Chairman of the British War Office Committee observed:—

“ The American Commission came to the conclusion that the organism causing the disease is a resistant filterable virus; whereas the British concluded that it was neither filterable nor ultra-microscopic, which the word filterable is usually supposed to imply, but was in fact a species of *Rickettsia* related to the organism found in typhus fever.

Again the American Commission states that the usual manner of infection is by the bite of the louse. The British Commission on the other hand is of the opinion that infection by the bite is quite exceptional and that by far the commonest method is by infection of scratches or other small wounds, with the excreta of the louse ”.

*Journal of Hygiene* 1921

If I may express my own feelings on this subject what I find most emotionally disturbing in Bruce's report on trench fever is the poignant and prophetic paragraph:—

“ It may be thought that as Trench Fever disappeared at the conclusion of the war, it is not necessary to place these remaining experiments on record. On the other hand it would appear to be all the more important since there will probably be no further opportunity of studying the disease until the next European War ”, and sure enough that was what happened in our last world catastrophe:—

“ In the years between the two world wars the disease ceased to be recognised, but it reappeared in epidemic form during World War II among German troops on the Eastern Front ”.

*Harrison's Principles of Medicine* 1970

### Conclusion

As I am putting the jigsaw pieces of this essay on Bruce's Kaleidoscopic life coherently together in order to bring him 'alive' to the reader, I look around and what do I see? The dragging war in Viet-Nam, the non-existent brotherhood between Arab and Jew, the terrible terror in Ulster, the unease and brinkmanship in Africa, the perils and woes of the Indian Sub-continent; and I think that I could not conclude more appositely than by re-iterating anew those sobering words of this remarkable man to anyone who has eyes to read, and ears to listen:—

“ If there were no wars man would not be called on to stand up to his knees in filthy mud and be torn and lacerated by rough and dirty pieces of shell. It seems a strange and barbarous thing to do, and it is to be hoped that in the course of evolution, mankind will become sufficiently intelligent to find some other way of settling his differences ”.

*Bruce* 1920

Let us hope that Bruce will be proved right again !

### Acknowledgements

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## MAJOR-GENERAL SIR DAVID BRUCE

K.C.B., LL.D., D.Sc., F.R.C.P., F.R.S.

### BIOGRAPHICAL SKETCH

#### Military Promotions

1883—Army Surgeon. 1895—Surgeon Major. 1901—Lieutenant-Colonel (*Special Promotion*). 1903—Brevet Colonel (*Special Promotion*). 1912—Surgeon-General, Army Medical Services (*Special Promotion*).

#### Honours and Awards

1881—M.B., C.M. (*Edinburgh*). 1899—F.R.S. 1901—Cameron Prize (*Edinburgh*). 1904—Royal Medal (*Royal Society*). 1905—C.B. (*Civil Division*), Mary Kingsley Medal (*Liverpool*), D.Sc. (*Dublin*). 1908—Knight Bachelor, LL.D. (*Glasgow*), Stewart Prize (*British Medical Association*). 1911—F.R.C.P. 1914—LL.D. (*Liverpool*). 1915—Leeuwenhoek Gold Medal (*Dutch Academy of Science*). 1915—K.C.B. 1922—Buchanan Medal (*Royal Society*), Medal (*Academie des Sciences Coloniales*). 1923—Manson Medal (*Royal Society of Tropical Medicine and Hygiene*), Albert Medal (*Royal Society of Arts*). 1924—D.Sc. (*Toronto*). 1927—Charles Nicolle 25th Anniversary Medal.

(Note: Medals and Insignias are on view at the Royal Army Medical College)

#### Appointments

1887—Detailed by Government of Malta to investigate Cholera Epidemic. 1889—Assistant Professor of Pathology, Army Medical School, Netley. 1895—Seconded to Nagana Research, Government of Natal and Zululand. 1900—Member, Committee of Enquiry to investigate Enteric Fever and Dysentery in the Field, South Africa. 1902—Member, Army Medical Services Advisory Board, War Office. 1903—Seconded to investigate Sleeping Sickness, Uganda. 1904—Chairman, Advisory Committee to Malta Fever Commission. 1908—Director, Sleeping Sickness Commission, Uganda. 1911—Director, Sleeping Sickness Commission, Nyasaland. 1914—Commandant, Royal Army Medical College, London. Chairman, War Office Committee on Tetanus. Chairman, War Office Committee on Trench Fever. Chairman, War Office Pathology Committee. 1915—Croonian Lecturer, Royal College of Physicians. 1916—Chairman, Governing Body, Lister Institute. 1917—President, Royal Society of Tropical Medicine and Hygiene. 1924—President, British Association Meeting in Toronto. Colonel Commandant, Royal Army Medical Corps.