THE FOUNDATIONS OF VICTORY: THE PACIFIC WAR 1943-1944

MEDICINE AT WAR: THE 'PIVOTAL YEARS' OF 1943 AND 1944 IN THE NEW GUINEA CAMPAIGN

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Medical issues always influence the outcomes of military campaigns. With lime juice and the prevention of scurvy, the Royal Navy conquered the oceans of the world. By contrast, Napoleon failed in his disastrous Moscow campaign of 1812 when his army was more than decimated by typhus and hypothermia. Of the six million casualties of the First World War, combatants and refugees alike, half died from disease.

Thus it was also in the Second World War campaigns in India and Burma, and especially in those of the South West Pacific. Any historical audit of the years of 1943 and 1944, in the New Guinea campaigns, thus needs include an analysis of the medical themes which were of crucial significance to the outcome of that campaign.

Some military historians of the 21st century have referred to the middle years of 1943 and 1944 of the New Guinea campaigns as the 'forgotten years' of the Second World War. Indeed, few Australian youths and young adults know of the Battle of Lae (June 1943), one of the most successful combined amphibious and airborne landings of the entire war. Whereas some 21st century students at least know the names of Buna, Gona and Kokoda, few know of the Finisterres or the victories at Nambariwa and Sio on the Vitiaz Strait.

Nevertheless, from the perspective of 100 years of Australian military medicine, these two years (1943 and 1944) witnessed the two greatest technical advances of the 20th century.[1] The first of these was the first use (in July 1943) of penicillin in the field,[2] and the consequent introduction of antibiotics which revolutionised military medicine. The second was the discovery (in 1944) of the effective prevention of the scourge of malaria which had hitherto incapacitated troops in hyperendemic areas. This was achieved by research on the drugs Atebrin[3] and later (in 1945) on Paludrine.[4] These crucial years, in the chronology of military medicine, also saw the disappearance of a supposed psychiatric condition, 'tropical neurasthenia',[5] or 'troppo' in soldiers' vernacular. This condition, hitherto tacitly accepted as a pseudo-medical 'diagnosis' even as recently as 1942, was finally recognised for what it was—a sociological apologia for alcoholism and the abandonment of former lifestyle mores and personal standards. By 1943 it was accepted that this state of affairs was due to a combination of factors which had no direct medical causes—actors such as boredom, inappropriate posting and deployment policies, and poor leadership. Recurrent malaria with inanition and loss of energy, alcoholism, hysteria, combat fatigue and operational stress neuroses of course occurred among troops in the New Guinea campaigns; but from 1943, 'tropical neurasthenia' did not.[6]

Besides these 'technical' advances in military medicine, the years of 1943 and 1944 saw changes in two health-related paradigms—changes which were to have immense consequences not only for military medicine but for the enduring post-war world of civilian medicine which followed. The first of these centred on Blamey's ruling, in his General Routine Order (September 1944) that the occurrence of malaria, preventible by taking atebrin tablets every day, was not primarily a medical responsibility but one of command.[7] This approach, rigorously implemented, forever changed the responsibility for the maintenance of positive health away from doctors and medics, and finally placed it rightfully upon the individual soldier and those who commanded him. The two most important issues of preventive health in the last decade of the 20th century—self protection against HIV infection and optimal personal diets to prevent cardiac disease—saw their genesis in this paradigm shift traceable to Blamey's and later Mountbatten's rulings.[8]

The second paradigm shift that occurred in 1943 was one of little moment at the time, but one which was to develop crescendo impetus in the decades which followed. It was the decision to accept uniformed women health professionals into the Australian Army Medical Corps. The first woman doctor had been commissioned in the AAMC in September 1940; but it was not until the War Financial Regulations were amended on 1 September 1944, to allow all prospective women officers of the Australian Army Medical Corps, irrespective of their specific health disciplines, that the Army uniformed medical services were truly integrated and thus coordinated. This ruling enabled women health professionals to be paid at the same rates as female officers in the other Services (AANS, AWAS and AAMWS). It meant that female women pharmacists, radiographers and medical scientists could be commissioned in the AAMC, and that female physiotherapists could be recommissioned in their rightful Corps. Female military physiotherapists had had their commissioned status removed on 15 July 1943; and had had their rank reduced to that of non-commissioned officers in the AAMWS. Although all women health professionals, including female medical officers, received less pay than male soldiers of the same rank, qualification and posting, nevertheless the date of 1 September 1944 remains an important one in the chronology of progression towards gender equality of opportunity, albeit a faltering first step.[9] On 1 September 1942, the first woman doctor in the Australian Army (Major Lady Mackenzie) had been promoted to the rank of substantive Major. These several events marked the beginning of gender equality of opportunity for women health professionals in the armed services. With the opportunity both for uniformed professional service and for professional advancement—based, if not on equal pay and conditions, nevertheless for the first time on personal ability rather than gender—those 'pivotal years' were to witness the beginning of another paradigm shift which was eventually to extend into the civilian community.

Many other significant medical events occurred in the middle years of the New Guinea campaigns. However, in this historical analysis, I have chosen these five themes as exemplars of advances that were forever to change the face of service medicine in Australia. For this reason, I have called these crucial years the 'pivotal years' of military medicine, as they define a watershed of both technical and sociological advances that continue to manifest their influence today.

Battle Casualties and Trauma

Surgery in the New Guinea campaigns was transformed by the use of antibacterial agents which had not been available in the First World War. The techniques of war surgery, fine tuned in the carnage of the First World War, had had to be relearned. High energy wounding—bullets, blasts and shrapnel—necessitates a technique known as debridement and delayed primary closure.[10] When high-energy projectiles cause wounding, extensive tissue is devitalised but such is not necessarily immediately obvious to the surgeon's eye. If dead tissue is inadvertently sutured it invariably becomes infected and in some cases gas gangrene ensues. For this reason the surgeon urgently removes all foreign debris and obviously dead tissue from such a wound and packs it without suturing. The wound is re-examined perhaps 24 hours later when any residual dead tissue has become obvious. Such further dead tissue is then surgically excised as a second step; and only then is the wound sutured and re-dressed. Such high-energy wounds had not (and are still not) normally seen in civilian practice in Australia. Indeed, in 2003 the Defence Health Service has made plans for contemporary military surgeons in Australia to obtain experience in gunshot and blast wounds by short-term deployments to Johannesburg. The technique of debridement and delayed primary closure of military wounds had originally been developed in the First World War; but had to be relearnt by military surgeons in the Spanish Civil War (1936) and again in the North African campaigns and in those of Greece and Italy in the early years of the Second World War.

Topical Antiseptics

What was new in the 'pivotal years' of the Second World War was the refinement of chemical antiseptics,[11] applied topically to the exposed tissue of such wounds, inevitably contaminated by shrapnel, metal, fabric, mud or other foreign material. 'Monacrin', as a surgical antiseptic, had been used empirically in the last year of the First World War, and in early 1943 had been

subjected to successful clinical trials at 115 Military Hospital in Heidelberg, Victoria, and later by the clinical research of Sir Hugh Poate—a military surgeon and national Commissioner for the St John Ambulance Brigade in Australia.[12]

The Polish chemist, Gerhard Domagk (1895-1964), had discovered Prontosil, the first of the sulphonamide drugs in 1932. Sulpha drugs, given orally or by injection, had thereafter transformed military surgery in the early years of the Second World War. In 1944, the manufacture of sulphamerazine began in Australia and supplies became adequate for Australian troops in the New Guinea campaigns. It has been said, however, that 'the general excellence of forward surgery in the [New Guinea] island battle zone must be given due praise. Prompt and wise excision of infected or potentially infected tissue was probably of much greater importance in the treatment of wounds received in the contaminated mud of some of these areas.'[13]

Penicillin—Military Significance

It was the discovery of penicillin, however, by Florey in 1940,[14] and its availability to Australian troops in late 1943, which transformed military medicine. A DGMS Technical Instruction (No 92)[15] specified the maximum dose of the precious stocks of penicillin for different types of infection—eg 100,000 units daily for *Streptococcus* infections, and 200,000 units for *Clostridium* infections, the cause of gas gangrene. Penicillin was manufactured in Melbourne by the Commonwealth Serum Laboratories from 1944. Its use was controlled by the DGMS in mainland Australia, and its availability restricted to uniformed service personnel; and in New Guinea by the DDMS. Allan Walker, the Second World War medical historian, wrote:

> Penicillin was a saver of life and of bodily structure and function in many instances. Its harmlessness and potency made it an adjunct to careful [military] surgery, in spite of its limitations and bacterial selectivity it can be said too that the caution impressed on young Australian [military] surgeons, and the encouragement given them in following correct principles in circumstances where rougher methods might easily have been condoned by some, bore fruit when the partial conquest of wound infection became possible.[16]

Accidental Trauma

Accidental trauma was a significant cause of mortality and morbidity in the New Guinea campaigns—as it has always been on operational deployments everywhere. Accidental preventible trauma remained relatively unacknowledged, as a loss of fighting power, in the contemporary medical audits of the Second World War. Nevertheless, death and disability due to accidental trauma are described in every account of every New Guinea campaign. Two examples will suffice here. The deaths and injuries at the Nadzab airborne insertion (June 1943) were due to accidents, not Japanese fire. Of the first 14 troops killed, members of the gallant 2/28th Battalion, who died in the amphibious assault on Lae (9 September 1943), 13 were drowned in the surging Busu River. David Dexter, the official war historian of the New Guinea campaigns, was to write of this tragedy:

> Most Australian soldiers who fought in the South-West Pacific would agree that they would rather face an aroused enemy than an angry Nature. It took a cold and calculated form of courage for the West Australians [2/28th Bn] to walk into the raging Busu on 9th September 1943, particularly because, as in every unit, there were some men who could not swim.[17]

It was an accidental fatal plane crash, off Cairns, on 5th March 1945, which was to take the lives of two of the finest leaders in the Australian Defence Force—Major-General GA Vasey and the Director General of Medical Services (2nd Army), Major-General Rupert Downes.

The discipline of accidental trauma prevention had its genesis in some of the post-war reviews of accidental trauma experienced by troops both during training and on operational service. It however was another 20 years before Haddon began the modern scientific approach to analysis of the factors which led to accidental trauma,[18] and the beginnings of a proper scientific approach to their prevention.

MILITARY PREVENTIVE MEDICINE

The 'pivotal years' of 1943 and 1944 were the golden years of military preventive medicine. The concepts and initial doctrine of preventive medicine had been established by another doctor-soldier, Sir John Pringle (1707-1782), the Physician General to the British Forces during the War of the Austrian Succession (1740-1748). His publications, *Observations on the Nature and Cure of Hospital and Jayl Fevers* (1750) and his *Observations on the Diseases of the Army* (1752), established the discipline of preventive medicine and public health in both the military and civilian domains. In the New Guinea campaigns, two major advances, in the prevention of tropical diseases, were of particular relevance to the Allied fighting troops. The first of these was the control of scrub typhus by the application of mite repellents; and the second was the ultimate conquest, albeit an incomplete one as it transpired, of malaria in the military domain.

Scrub Typhus

Historically, typhus was one of the greatest killers during military campaigns. 'Camp fever', 'ship fever' and 'jayl fever' had for millennia destroyed armies and determined the outcome of campaigns. Epidemic typhus is caused by a microscopic organism called a ricketsia, spread by the body louse. Personal hygiene, including particularly the regular washing of clothes and bed linen, was and remains the most effective way of reducing its predations. The military habit of cutting the hair short—'short back and sides'-dates from the recognition that body lice and in particular 'nits' were one cause of typhus.

A new type of typhus, found particularly in tropical regions and spread by a Trombiculid mite, emerged as a cause of significant morbidity in the first two years of the New Guinea campaigns. It was a particular problem in the Markham and Ramu Valleys. Trials of sulfa drugs and penicillin (from 1944) showed that there was no effective drug treatment for the condition, once a soldier had contracted it. It was not until the discovery of tetracycline in 1948 that the morbidity and mortality of scrub typhus, once contracted, was modified by drug intervention. Clinical management of afflicted soldiers relied particularly on superlative nursing care; and even although drug therapy was ineffective, such nursing care significantly reduced mortality.

The mainstay of management of scrub typhus in the New Guinea campaigns was prevention. Extensive research work on repellents was undertaken by the American Typhus Research Commission in 1942, and by Australian soldier-scientists, such as Womersley, working in New Guinea in 1943. It was found that sulphur powder and DDT were relatively ineffective as repellents; but that di-methylphthalate and particularly di-butylphthalate (DBP) were very effective indeed. Subsequently, work by Captain Ronald Southcott AAMC[19] on the classification of Trombiculid mites[20] enabled the final problem of scrub typhus to be overcome.

Like typhus, dengue also has no known drug treatment and again the mainstay of management is prevention. Fortunately, the extensive use of repellents and the Blamey-enforced 'clothes discipline and repellent discipline' not only reduced malaria but also dengue and scrub typhus. The use of appropriate repellents was of crucial significance, exemplified by the experiences particularly of the 9th Division in the Finisterres. The 2/43rd Battalion, for example had landed 706 men and had received 130 as reinforcements (836 men)—of whom 600 were evacuated sick.[21] Soldiers in the New Guinea campaigns had a particular fear of typhus, probably because of its prolonged convalescence and post-convalescence morbidity, particularly severe depression. One unit diarist of the 9th Division wrote:

> Although this unit is not 'repellent conscious', men are being returned from hospital without the mosquito nets which they took there. Those in authority were finding that it was not sufficient to instruct men to take atebrin, apply anti-mosquito repellent, roll down sleeves and trousers, wear gaiters and sleep under nets; such instructions must be enforced in the same way in which a child is made to take medicine. A side light on this anti-mosquito discipline was that the men had a horror of scrub typhus and never needed supervision when applying repellent in an area containing ticks [or mites].[22]

The control of scrub typhus amongst Australian soldiers in the New Guinea campaigns is shown in the following quarterly returns for typhus in the medical archives of the 1943 and 1944 campaigns:

1943 (Oct- Dec) 859 cases
1944 (Jan-Mar) 402 cases
1944 (Apr-Jun) 102 cases
1944 (Jul-Sept) 56 cases
1944 (Oct-Dec) 13 cases[23]

At the end of the New Guinea Campaigns, mortality from typhus had fallen from 8% to less than 5%, although a proportion of soldiers who had contracted it were left with sub-acute or chronic morbidity. However, by the end of the Wewak-Aitape campaigns (December 1944), the military medical problem of scrub typhus, due to effective repellent use alone, had been overcome.

Malaria

On operations in wet tropical theatres, malaria is responsible for 90% of the sick wastage due to tropical diseases.[24] The conquest of malaria, as it afflicted troops in the field, was one of the most significant determinants of the outcome of the Pacific War. Australian military medical researchers played the pivotal role in this 'scientific front' of the Second World War.[25] Prior to the bombing of Pearl Harbor (7 December 1941), oral quinine had been the mainstay of the management of malaria for those who lived and worked in hyperendemic areas. After Pearl Harbor, it was quickly appreciated by military doctors that a campaign in the Malayan, Indonesian, New Guinea and Pacific Islands would be won or lost by the army best able to protect itself from malaria. In the preceding decade, the world's principal stocks of quinine had been obtained from Cinchona plantations in the Netherlands East Indies, particularly on Java. At the outbreak of the Pacific War, it was appreciated that the loss of such stocks to the Allies would, if alternative drugs could not be found, mean devastation to the Allied forces.[26] In the weeks after the attack on Pearl Harbor, doctors of the AAMC, and in particular Colonel Neil Hamilton Fairley, brought forward urgent, indeed desperate advocacy, concerning what they knew would be devastating consequences to Allied troops, if malarial prophylaxis could not be guaranteed.

When Java fell to the Japanese, one million kilograms (1,000 tons) of quinine was lost to Japan and denied to the Allied forces. The pre-war use of quinine worldwide was 700 tons per year. Although the new synthetic drug, atebrin, had recently been manufactured in the United States and the United Kingdom, it had not been proven as an effective anti-malarial agent under field conditions; and urgent calculations revealed that 200,000 kilograms of atebrin per annum would be needed to replace the one million kilograms of quinine lost through the fall of Java.[27]

Major-General Burston recalled Colonel Fairley urgently from the Middle East in January 1942, and sent him to Java with authorisation for cash payment from the Australia Government, for the purchase of 130,000 kilograms (130 tonnes) of quinine, to be 'rescued' before it was controlled by the advancing Japanese. The huge tonnage was putatively placed on the Dutch ship, the SS *Klang*, bound for Broome. The precious quinine never arrived. By March 1942, the Australian Army held less than 500 kilograms of quinine; with troops in the New Guinea force using 1000 kilograms (one tonne) of the drug every month. An urgent paper published in the *Medical Journal of Australia* exhorted Australian doctors to conserve every gram of quinine in the crisis.[28]

Urgent investigations and calculations showed that 50 tons of atebrin was the total available from combined sources in the United States and in the United Kingdom. It was judged that this might just be sufficient for the unknowable campaigns of 1942 and 1943—noting however that atebrin, unlike quinine, was unproven as an effective treatment for malaria once a soldier had contracted it. Quinine itself was a relatively poor prophylactic against malaria; and atebrin was unproven in the field as a prophylactic agent. The situation, as expounded particularly by Colonel Neil Hamilton Fairley and Colonel Edward Ford (Assistant Director of Pathology of I Corps, 1942-1943)[29] was desperate.

In parallel with these urgent medical developments, there existed a perplexing complacency amongst military planners, concerning the potential effects of malaria on Allied troops operating in hyperendemic areas. It had been known since 1914 in Rabaul, that Australian troops, immunologically naive to the parasite, would be stricken by malaria in any jungle-based campaign. Two forms of malaria occur in the South West Pacific—benign tertian (BT) malaria due to the mosquito-borne protozoan, *Plasmodium vivax*, and malignant tertian (MT) malaria, due to *Plasmodium falciparum*. The first, vivax or BT malaria, does not normally kill by its attacks, but renders the victim acutely ill with recurrent fevers, and then produces a progressive inanition and anaemia. Malignant tertian malaria, or falciparum malaria, is a life-threatening disease and causes cerebral malaria—but if cured, does not continue to recur unless reinfection occurs. If a soldier has clinical malaria, with fevers sometimes in excess of 41°C, and rigors, he is unable to shoot straight, let alone fight.

The Buna and Gona campaigns (1942) retaught the Allied armies that in tropical and sub-tropical countries of the world, malaria is the major determinant of campaigns, if not of battles themselves. The Buna and Gona statistics for malaria, for Australian troops, revealed a rate of 2,900 cases per thousand troops per year. This meant that each soldier was averaging three attacks each year; and with a convalescent period of a month or so after each attack, it meant that stricken battalions were rendered *hors de combat*. By January 1943, 14,011 soldiers had been incapacitated by tropical diseases, and 4,137 by battle casualties, a sick-to-wounded ratio of 4:1.[30]

The US 32nd Infantry Division at Buna in 1942 consisted of 10,000 officers and men. Of these, 8,000 became ill from tropical diseases, half of which were malaria. Although 1,000 of the US troops at Buna were medics (1 in 10 of the entire force), the advice about medical prophylaxis *followed* the campaign, rather than preceded it. The stricken Division had to be reconstituted, but even by March 1943, the Division remained 30% below strength because of malaria.[31]

By June 1943, 25,000 Australian soldiers had contracted malaria, most of them suffering recurrent bouts thereafter.[32]

Providentially, a number of wise and experienced Australian doctors, already in uniform, had both the experience and the wisdom to address this clinical problem. Such included Colonel Keogh (as Director of Pathology), Lieutenant-Colonel Ian Mackerras, Captain Josephine Mackerras, Lieutenant-Colonel R Andrew, Lieutenant-Colonel CRB (later Sir Charles) Blackburn, Lieutenant-Colonel Edward (later Sir Edward) Ford[33] and in particular Colonel (later Brigadier, Sir Neil) Hamilton Fairley. They advised the Director General of Medical Services, Major-General SR Burston, that the problem of malaria, threatening to entrap the entire Allied forces in the New Guinea campaign, could be overcome only by the urgent establishment of a military research unit and the testing of the newly-developed potentially suppressive drugs, particularly atebrin. Major-General Burston advised General Sir Thomas Blamey, in strongest terms, of the urgent need for such a research facility. Blamey's support for and implementation of the consequent Medical Research Unit, as a Unit within and administered by the Australian Army Land Headquarters, was in the audit of history, one of Blamey's most important decisions in his entire military career.

Figure 1: The basalt memorial marker to the Army Medical Unit, Land Headquarters, of the Australian Army in the Second World War. Situated in the grounds of the Cairns North State School, facing Sheridan Street, it records the pivotal work of the Unit at Cairns and at Rocky Creek, on the Atherton Tableland - work which was a major determinant of Allied success in the War. Photograph, John Pearn, September 2002.

Figure 2: The plaque on the Medical Research Unit (LHQ) Memorial, in the grounds of the Cairns North State School, Cairns, Queensland. Photograph, John Pearn, September 2002.

Figure 3: The research staff of the Medical Research Unit (LHQ) at Cairns. These scientists and laboratory workers unravelled the detailed biology of the *Anopholes* mosquito and discovered much of the pathogenesis of both benign tertian (BT) and malignant terian (MT) malaria and documented the protective role of both atebrin and paludrine in the fight against malaria. Captain Josephine Mackerras AAMC (1896-1971) is far left, front row. Photograph, 1944, from the Bancroft-Mackerras family photograph album, courtesy of Mrs Diana Hacker.

The Medical Research Unit of LHQ was established initially in Sheridan Street, Cairns, within 5 Camp Hospital in the grounds of the old North Cairns State School. A simple granite marker, which stands today, records the work of that singular Unit. Sub laboratories were established at Rocky Creek on the Atherton Tableland. Much has been written about the work and the ultimate success of that Unit. In brief:

- Between 1943 and 1946, 1000 Australian soldiers volunteered as research subjects for the work of the Unit;
- The Medical Research Unit (MRU) for the first time established the details of the life-cycle of *Anopheles* mosquitoes, particularly the species which were transmitting malaria in the hyperendemic areas of the South West Pacific;
- Researchers, and in particular Major Josephine Mackerras,[34] established the first experimental breeding colonies of *Anopheles*, anywhere in the world.
- The Medical Research Unit (LHQ) established the natural history of malaria as a clinical disease, in great detail. In particular, the military clinicians and scientists showed that there was no natural immunity to its ravages, at least among troops who had not been exposed to malaria continuously in their childhood. Furthermore, they demonstrated that immediately after a mosquito bites, the sporozoites circulate in the blood for only the ensuing 20 minutes or so.
- In all the human experiments, volunteers were used exclusively for the mosquito biting and human-to-human infected-blood transmission experiments. In all cases, controls who volunteered to suffer inoculation with malaria and then not be treated, were drawn by lot. The formal modern bioethical dictates of human experimentation did not emerge until after the Nuremberg Code (1946), published at the conclusion of the Nuremberg War Crimes Tribunal. Nevertheless, the ethical code of research practice using human volunteers, undertaken at the Medical Research Unit at Cairns and at Rocky Creek, was well in advance of best-practice medical research for decades to come.[35] In a paper published at the conclusion of the war, Sir Neil Hamilton Fairley wrote especially of the 'tribute which is also due to the volunteers for their self-sacrificing co-operation'.[36]

- Quinine, atebrin and (after 1944) paludrine were tested in the drug-suppression trials. It was found that a dose of atebrin, of 0.2 grams daily, suppressed all forms of malaria—both benign tertian (BT) and malignant tertian (MT); and that such a dose also cured the clinical effects of malignant tertian malaria.
- The effects of extreme heat, combined heat and humidity, exertion to exhaustion and hypoxia were studied. It was shown that none of these potential confounding factors compromised the suppressive effects of atebrin, when this latter drug was given in the correct dose.
- Eighteen volunteers, experimentally inoculated with malaria, were flown to Melbourne where they were subjected to high-altitude simulation, with consequent hypoxia, at the No 1 Flying Personnel Research Unit, based at the University of Melbourne.[37]

These scientific results, undertaken with great urgency in 1943 and during the first nine months of 1944, enabled military doctors to advise commanders for the first time, with scientific certainty, about the treatment and cure of malaria; and, most importantly of all, about its prevention.

Tropical Fatigue

The exigencies and special circumstances of operational service can advance medical knowledge in unexpected ways. One such advance of the 'forgotten years' of 1943 and 1944 in the Pacific War, was the final discrediting of one pseudo-medical condition that known as 'tropical neurasthenia', or in soldiers' parlance, 'troppo'.[38]

Whether men and women of European origin could work, or soldiers fight, in the humid tropics, had been an emergent issue of scientific speculation since Federation. The Commonwealth Government established the Commonwealth Institute of Tropical Medicine in Townsville in 1910 to help answer this question.[39] Officially opened on 28 June 1913, three years after its foundation, by the eminent medical governor and former researcher, Sir William MacGregor,[40] its terms of reference specifically included an inquiry into the health,[41] physical adaptation[42] and disease susceptibility[43] of Australians of European descent, working in coastal tropical Australia[44] and New Guinea.[45]

Much of the body's knowledge of the adaptation to humid heat had been learnt from research on cane cutters working in extreme conditions in the north Queensland cane fields prior to the Second World War. John Simpson Kirkpatrick (1892-1915), 'Simpson', the hero of Gallipoli, had tried cane cutting for a week in north Queensland, north of Cairns in 1912, but had found the conditions intolerably hot.[46]

The medical effects of *dry* heat, especially its effects on the manpower efficiency of unacclimatised troops, was well known from the research of KG Hearne in Mesopotamia in the First World War[47] and from the work of Allen[48] and CE Corlette[49] in Australia. Heat stroke and the devastating effects of prickly heat on troops in hot *humid* environments were well known by the time of the first engagements against the Japanese in the Markham Valley (May 1942) and at Salamaua in June 1942.

The history of both civilians and troops deployed to the *humid* as compared to the *dry* tropics had indicated that rates of psychiatric illness, alcoholism and 'moral decay' were increased. However, in medical terms such were known to be due to the effects of family disruption, isolation, cultural loneliness, boredom, physical disease and incomplete heat acclimatisation. Nevertheless, there remained in the military, particularly in outpost deployments to the wet tropics, the 'dangerous label'[50] of 'tropical neurasthenia'.

In Darwin, the first enemy bombings on Australian soil had occurred on 19 February 1942. At that time there existed an element of 'restlessness and discontent' amongst some military units in Darwin.[51] Although there were acknowledged problems of military leadership, and of deployment policy, it was still believed that much of the lack of morale, indeed criminal behaviour (such as looting) which had been exhibited by troops after the bombs fell, was 'as result of the general effects of tropical service'.[52]

The appointment of Lieutenant-General Sir Edmund Herring on 28 March 1942 led to rapid and very effective staff changes in the Northern Territory. This had the immediate effect of reversing the situation of poor morale and any apologia of troops being 'troppo'. After a period of: 'intense training, indoctrination and reconnaissance and of rapid reconstruction, and of detailed organisation in an endeavour to provide for maintenance of the [revitalised] force',[53] the syndrome of tropical neurasthenia disappeared from the Australian mainland. The 1943-44 campaigns of the northern coast of New Guinea, from the Huon Gulf in the east to Vanimo in the west, saw the final disappearance of this syndrome: and 'dangerous labels' such as 'tropical neurasthenia' or even the colloquial 'troppo' are not today found in the index of any reputable book on medicine or psychiatry and certainly not in those of military medicine.

PARADIGM SHIFTS

The 'pivotal years' of 1943 and 1944 saw two paradigm shifts, in the context of military medicine and health, which were to have profound implications not only in the Australian Defence Force but over the succeeding decades in civilian society as well. The first of these was Blamey's shifting of responsibility for preventive medicine from one of reaction by the Medical Corps to one of proactive responsibility in which individual soldiers and the commanders who led them would be responsible for their own health, if effective preventative measures were available.

The second theme, understated and perhaps unrecognised for its importance at the time, related to emergent issues of gender equality. This latter was to have ongoing implications which continue to resonate in the military community today.

Blamey's Health Policies

By August 1944, the medical research into malaria undertaken at the Medical Research Unit of Australian Land Headquarters, based in Cairns, had shown that malaria could be safely prevented by the daily swallowing of two atebrin tablets. As both Commander of the Allied Land Forces in the South West Pacific, and as Commander-in-Chief of the Australian Military Forces, Blamey elected to make the issue of preventible disease a proactive one of command, rather than a reactive medical response to disease once it had occurred. In his famous General Routine Order of September 1944, he issued three statements which were devastatingly powerful:

> 1. Commanding Officers will be held personally responsible [for preventible disease, specifically malaria, occurring amongst troops under their command].
>
> 2. Neglect to comply with such instructions [hereto affixed and more generally promulgated] will be treated as a serious offence.
>
> 3. The occurrence of cases of malaria in a Unit which has been directed to take the dosage of atebrin prescribed in this Order will be regarded as prima facie evidence that the Commanding Officer has failed to ensure the observance of such instructions.[54]

On 14 February 1945, Lord Louis Mountbatten, Supreme Allied Commander of South East Asia Command, issued a similar Order.

Blamey's policy was to be almost completely successful in the preservation of fighting power, at least down to Battalion level. MacArthur's 'coast hopping' and 'island hopping' strategy, by which pockets of Japanese troops were not continuously fought face-to-face, but were denied supply, had one particularly devastating effect on Japanese soldiers. Soldiers can continue to fight with inadequate food but they cannot continue to fight without taking anti-malarial suppressive drugs. The denial of stocks of quinine, by MacArthur's tactics, meant that the Japanese force was devastated by malaria; whereas the Allied forces, following MacArthur's implementation of the proven atebrin preventive measures, produced an enormous imbalance in the opposing forces. Japanese soldiers died in battle and took their own lives, in the face of impending capture or defeat, by suicide. However, although detailed statistics are unavailable, it is thought that of those who died, at least one third perished from tropical diseases, especially dysentery, malaria and hepatitis. The Japanese 18th Army, following its

retreat from and ultimate defeat in the Lae-Finisterre campaigns, suffered a 91% mortality, and a 97% mortality at Battalion level. Such figures had perhaps not been seen since typhus destroyed Napoleon's army in 1812.

Atebrin had one unfortunate side-effect—it stained the skin yellow. Some troops also believed that it caused impotence; this latter belief, erroneous in fact, was one of the many causes of sub-optimal compliance both with medical advice and later with Blamey's General Order of September 1944. Occasional resistance was partly overcome by the daily 'Atebrin Parade' in which troops were given the atebrin tablets to swallow by an NCO or officer, after which they had to drink, swallow and then speak. By the end of 1945, research on the newer anti-malarial suppressive drug, paludrine, had been completed in Cairns. This work was published in 1945 and 1946.[55] Paludrine was shown to be one of the safest drugs known; and a summary of the Australian military research recorded that 'Paludrine is undoubtedly the most potent anti-malarial drug known—its discovery is a triumph for British chemotherapy'.[56]

Gender Equality of Opportunity—First Steps

At the outbreak of the Second World War, no woman doctor in Knox's Medical Directory for Australia listed any Militia or Volunteer appointment in the Australian Army Medical Corps, as part of their self-submitted biographic entries. Prior to the outbreak of the Second World War, it was estimated that there were 5,083 males and 323 female medical practitioners in Australia. Planning for full mobilisation revealed that 1,160 medical officers would be required with reinforcements at the rate of 10% per year in any imagined future conflict.[57]

When war broke out in 1939 the only provision for women to play an active role in the provision of medical services was for them to train in first aid and the elements of hygiene and home nursing by the Order of St John, the Australian Red Cross, or an approved Ambulance Association. In addition to these very limited avenues, consideration was given to the possibility of regarding physiotherapists and some other specialists as a distinct category of voluntary aid, and therefore eligible to serve.

Pearl Harbor and the subsequent New Guinea campaigns were to change this gender restrictive ethos. Twenty-six women doctors (five Majors and 21 Captains) served in the Australian Army Medical Corps in the Second World War. By October 1944, there were 18 women Medical Officers on the active list on fulltime duty, mainly serving as specialists with some carrying out general duties and administration.

Prejudice against women's service in the AAMC reflected the conservative gender restrictive attitudes in the Australian civilian society of the times. In the military domain, however, this ethos extended to all the health disciplines, even more intensely. Whereas a grudging acceptance had finally been accorded to three women doctor-soldier pioneers (Captain Lady MacKenzie, Captain HB Kershaw and Captain Josephine Mackerras), other career professional women continued to be denied entry to the commissioned ranks of the AAMC.

Australia's first military woman pharmacist, Lieutenant Gwyneth Richardson, was not commissioned in the AAMC until September 1944, and then only after a period of four years service to the Army—two years as a civilian pharmacist and two years as a Staff Sergeant in the Australian Army Medical Women's Service (AAMWS). Women physiotherapists had been accepted for a short period (until 15 July 1943) but thereafter had to join the AAMWS.

The War Financial Regulations were amended on 1 September 1944 to allow all perspective women officers of the AAMC, irrespective of their specific health disciplines, to be paid at the same rate as female officers in the other women's services (AANS, AWAS and AAMWS). However, their pay remained less than that for male soldiers of the same rank, qualification and posting. Nevertheless, this bureaucratic change in regulations allowed professional women, skilled in the health professions, finally to transfer to the AAMC for the first time. That date (1 September 1944) was an important milestone in the progression towards gender equality of opportunity, albeit a faltering one.

Two of the women doctor-soldiers in the Australian Army who rendered conspicuous service in the 'pivotal years' of the Second World War deserve special mention in this context. The first of these was the first woman accepted into the AAMC, Captain Lady MacKenzie (1900-1972). The second was Captain Josephine Mackerras (1896-1971).

Figure 4: Major Lady MacKenzie (1900-1972) the first woman-doctor commissioned in the Australian Army Medical Corps. She is shown here in her appointment as Deputy Assistant Director General of Medical Services, in her office at A Branch, Allied Land Headquarters, Victoria Barracks, Melbourne. Photograph 15 November 1944, courtesy of the Australian War Memorial. AWM Photo 030214/12.

Figure 5: Captain Mabel Josephine Mackerras (1896-19711), pioneer woman doctor-soldier of the Australian Army Medical Corps. Photograph, circa February 1942, from a family photograph album, courtesy of Mrs Diana Hacker.

Lady MacKenzie was the widow of Sir William Colin MacKenzie (1877-1938), the Victorian orthopaedic surgeon, comparative anatomist and philanthropist who had written many works including 'Military Orthopaedic Hospitals'[58] and the comprehensive 'Comparative Anatomy of Australian Fauna'. He and Lady MacKenzie gave to the Australian nation the Healesville Sanctuary, part of which was to become the School of Army Health. In 1930, Sir William and Lady MacKenzie moved to Canberra and established the Institute of Anatomy. The couple had no children. Lady MacKenzie applied to join the Australian Army Medical Corps at the outbreak of the Second World War, but was refused. Subsequently, as a civilian, she was allowed to perform full-time voluntary duty at Army Headquarters, from April 1940, undertaking administrative and office duties in the Office of the Deputy Assistant Director of General Medical Services at Army Headquarters in Melbourne. In September 1940 at the age of 40 years, she was commissioned with the rank of Honorary Captain and placed on the Reserve of Officers, whilst still performing these duties. If she had not been titled, if her late husband had not been one of the most powerful medical men in Australia for several decades, if she had not proven herself by voluntary civilian service, if she had not been a widow and if she had not been childless, it is doubtful whether she would have been so accepted. She was commissioned as a full Captain in the Australian Army Medical Corps on 1 November 1940 and formally posted to the Office of the Deputy Assistant Director General Medical Services (DADGMS). Her duties included the maintenance of accurate records of the professional qualifications of the (male) Officers of the AAMC and, in 1943 and 1944, the selection of details of postings of male AAMC members to the New Guinea theatre of operations.[59]

Captain Josephine Mackerras enlisted as an Honorary Captain and was placed on the Reserve of Officers in the Officers in the 2nd Military District on 3 November 1941. She was commissioned as a substantive Captain on 7 February 1942 and posted to 103 Australian General Hospital. After several transfers she was posted (18 January 1944) as the entomologist to the Medical Research Unit (AIF) of Land Headquarters, initially to the Research Laboratories of that Unit in Cairns. She was promoted to the rank of substantive Major on 26 March 1944. It was her meticulous research and her clinical involvement with the more than 1,000 human volunteers in the malaria experiments at Cairns and at Rocky Creek which, with the work of others, led ultimately to the control of clinical malaria in the Allied forces in the Pacific Campaign.

In her laboratories in the MRU (AIF) in Cairns, she was the first person in the world to establish a breeding colony of *Anopheles punctulatus*. In her three years of active military service she handled '233,000 engorged mosquitoes, undertook 38,000 dissections of malarial mosquitoes and supervised more than 20,000 infectious bites on over 1,000 human volunteers, some of them several times'.[60]

Professor Frank Fenner, himself a former doctor-soldier of the AAMC, and one of only two Australian scientists to have been awarded science's highest accolade, the Copley Medal, was to write in 1991:

> Major Mackerras' results were of great importance to the Australian war effort, since they established a scientific basis for chemoprophylaxis that was eventually to transform into a minor problem what had threatened to be a disease that would totally disable the Australian and United States forces in the field in New Guinea ... [this work] ... at the Land Headquarters Medical Research Unit on Malaria was not only of great importance to the war effort, but also contributed greatly to the understanding *of the pathogensis of malaria*.[61]

These two pioneer women doctor-soldiers suffered prejudice within the system not individually, but stereotypically because of their gender. In a summary memorandum of 1944, entitled 'Women Officers—Australian Army Medical Corps', although it was explicitly stated that '[women] Medical Officers receive the same pay and allowances as male Officers', under the entry specifying the conditions for decorations and awards, the draft proposal that 'Women Officers of the AAMC are eligible for all Honours and Awards available to male officers of the AAMC' was struck out in draft by the senior reviewing and drafting AAMC officer.[62]

This prejudice was to have unfortunate and unfair consequences which remain unredressed today. Both Major Lady MacKenzie and Major Josephine Mackerras were recommended on three occasions for a military decoration (an MBE) by Major-General Burston, the Director General of Medical Services. The last of these three serial nominations and recommendations for public recognition included a detailed submission for the End of War List in 1946.[63] Among other summaries of her service, the proposed citation for Major MacKenzie, noted her 'Valuable contribution to the efficiency of the Administration of the Army Medical Services'. In the case of Major Josephine Mackerras, the proposed but rejected citation concluded with the words which encapsulated the perspective of her military service: 'Few women can have made a greater contribution to the Allied war effort.'[64]

Conclusion

It is said that history is a tool for the present, that success may be achieved in the future. The health challenges of those pivotal years, 1943 and 1944, especially those of tropical diseases, threatened to incapacitate the Allied forces in the field. The practical responses to such challenges were indeed one of the most important 'force multipliers' and one of the most successful and significant foundations for the ultimate victory which was achieved in 1945. Such issues remain with military commanders today. In July 2003, on the day this paper was given to the [Australian] Chief of Army's History Conference in Canberra, Australia, Colonel Gaddafi, President of Libya, speaking at the African Union Summit in Maputo, Mozambique, said:

> Don't worry about the tsetse fly and the mosquito. They are God's armies, which will protect us against colonialists. If they come here they will get malaria and sleeping sickness.[65]

Wound surgery and the correct use of antibiotics have to be continuously relearned. Women health professionals, equal in professional status, skills and record of service when compared with their male counterparts, will take their place without gender restrictive stereotyping in the campaigns of the future. The prevention of accidental trauma, malaria and typhus will continue to confront our troops in all tropical theatres in the years ahead. These future threats will be controlled if the successful lessons of these two pivotal years of the New Guinea Campaigns continue to be a force-multiplying guide.

Endnotes

* I thank Mr Roger Lee and Mrs Emma Robertson of the Army History Unit; Ms Margaret Lewis of the Research Centre, Australian War Memorial, and Mrs Lynne Packer of the University of Queensland, all for much encouragement.

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22. Ibid.
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30. Sweeney, *Malaria Frontline*, 18-21.
31. Drea, 'Before Finschhafen', xx.
32. Sweeney, *Malaria Frontline*, 22.
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