

## Review Articles

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# The Price Of Prevention: Drugs, Vaccines and Medications Used to Prevent Disease in the Australian Defence Force<sup>1</sup>

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### Abstract

The Australian Defence Force comprises the healthiest and fittest groups of individuals in Australian society. Pre-selection at recruitment is a major factor that pre-determines this status; but on this basis are built major preventive health and safety policies and programs that promote positive health -both during peacetime and during operational deployments overseas. Health materiel generally, and pharmaceutical items specifically, form a significant link in the preventive medicine chain of Australian servicemen and women. Five groups of pharmaceutical agents in particular, contribute to the maintenance of this positive health. These include vaccines, drugs for malaria prophylaxis, sun protection screens, the oral contraceptive pill and nicotine dermal patches to aid individuals to reduce or cease cigarette smoking. Prior to the Peace Enforcement role in East Timor (Operations Stabilise and Warden) the annual ADF budget for pharmaceutical items was \$11.42 million (financial year 1998- 1999), of which \$4.6 million (40.5%) was spent on vaccines. This ratio far exceeds that of preventive drug costs of any other section of society and highlights the Defence Health Service's role in maintaining the uniformed workforce in optimal health. The use of vaccines, in the military context, has a history in Australia dating from 1804, when the Nation's second Surgeon General, Thomas Jamison RN, published his "General Observations on the Smallpox" in the Sydney Gazette. Today, the use of hepatitis A and B vaccines, as a major preventive intervention, has implications not only for the preservation of manpower but also for the potential use of uniformed service personnel as safe volunteer blood donors during overseas operations in times of emergency. The Defence Health Service Branch also plays a significant role in drug research using volunteer servicemen and women in the Australian Defence Force; and has taken also a proactive, altruistic role sponsoring the re-registration (ARTG Registration No. AUST R63856) of Primaquine, for the use of all Australians (both civilian and military). returning to Australia from malarious areas. This latter has involved the ADF in a direct funding commitment of \$30,000 in the 1997- 1998 financial year; but a practical audit of such expenditure reveals a most beneficial return on this investment, not only in terms of financial saving from (other- wise) loss of person-power. but also in terms of the prevention of human suffering in both The Australian Defence Force and in the more widespread Australian society.

### Introduction

The Australian Defence Force comprises the healthiest and fittest groups of individuals in Australian society. Pre-selection at recruitment is a major factor that pre-determines this desirable state. On this basis of selected fit individuals, free from disease, are built significant preventive health programs. These involve sophisticated safety policies that reduce disease and injury;

and preventive health policies that promote positive health.

Such form essential core doctrines for the Australian Defence Force (ADF) during both peacetime and during operational deployments overseas.

Health materiel generally, and pharmaceutical items specifically, form a most significant link in the preventive health chain which ensures

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optimal health for Australian servicemen and women 1. In this paper we explore the price of such prevention, specifically from the viewpoint of the use of pharmaceutical items to maintain positive health. We include also an audit of the most recent peacetime use of vaccines, drugs for malaria prophylaxis, sun protection screens, the oral contraceptive pill and nicotine dermal patches. These latter aid

individuals to reduce or cease cigarette smoking.

This audit shows that the preventive-to-treatment ratio of the cost of drugs for the Australian Defence Force far exceeds that of any other section of society; and highlights, in expenditure terms, the major commitment of the Defence Health Service in maintaining its uniformed workforce in optimal health.

Therapeutic Class	Total (Units Issued)	Usage %	Total \$	Expenditure %
Preventive Medicine	331,900	17.6	5,049,300	44.2
Skin	233,400	12.4	873,600	7.7
Infections. Infestations	223,500	11.9	896,900	7.9
Analgesia	199,900	10.6	138,600	1.2
Surgical Preparations	164,600	8.7	747,600	6.5
E.N.T. Preparations	146,300	7.8	461,100	4.0
Respiratory System	122,200	6.5	406,900	3.6
Electrolytes, Vitamins, Minerals	96,500	5.1	144,700	1.3
Musculo-skeletal System	67,500	3.6	222,800	2.0
Eye Preparations	63,900	3.4	134,200	1.2
CNS Preparations	59,000	3.1	318,100	2.8
Alimentary	48,800	2.6	535,100	4.7
Allergic Disorders	45,400	2.4	280,000	2.5
Cardiovascular	28,700	1.5	498,900	4.4
Contraceptive Agents	18,600	1.0	181,900	1.6

Table 1: Ranked order of the "top 15" therapeutic classes of pharmaceutical items, by usage and cost. Annual issue data, the Australian Defence Force

**Drug Use and Costs**

Currently, the Australian Defence Force comprises some 52,500 uniformed full-time servicemen and women. Drug use reflects the sequelae of training in both the wet tropical north and throughout much of the dry, hot inland of Australia; and the inescapable complications of physical fitness training and sport which are afforded a high priority for the maintenance of stamina and personal readiness for operational service. The total pharmaceutical costs, by the physiological system or class of drug, are shown in Table 1. The top ten pharmaceutical items used by the Australian Defence Force, by volume usage, are shown in Table 2, and by cost in Table 3.

Item	Indication	Annual Usage	Price Per Unit \$	Annual Expenditure \$
Sunburn preventive stick- lip balm	Sunscreen	93924	0.65	61,051
Doxycycline 100mg SR caps 7s "Doryx"	Antibiotic/anti-malarial	91284	1.20	109,541
Paracetamol tablets 500mg 24s	Analgesic	71611	0.38	27,212
Sunburn preventive cream 50g tube	Sunscreen	54091	1.39	75,186
Codeine phosphate with paracetamol 20s "Panadeine"	Analgesic	50523	0.69	34,861
Cetylpyridinium chloride lozenges "Cepacol"	Antiseptic lozenge	41521	2.00	83,042
Hepatitis A and B vaccine "Twinrix"	Vaccine	37227	34.85	1,297,361
Sunburn preventive lotion 125 ml	Sunscreen	33673	2.39	80,478
Sodium chloride injection 0.9% 10ml amp	Diluent and irrigation	31345	0.20	6,269
Pseudoephedrine HCl 60mg 30s "Sudafed"	Decongestant	30254	1.00	30,381

Table 2: The ranked "top ten" pharmaceutical items used in the Australian Defence Force, by volume usage; with costs and annual expenditure for the financial year 1998-1999. Cumulative bulk purchase data.

### Prevention

The total expenditure on pharmaceutical items by the Australian Defence Force in the financial year of 1998-99 was 1.4 million dollars. An analysis of source data has shown that 46.7% of this expenditure is on pharmaceutical items specifically used to prevent disease. The rank order of such "preventive" pharmaceutical items is shown in Table 4. The biggest single budget item comprises the expenditure on vaccines, which total 4.63 million dollars, or 87% of the total "preventive" pharmaceutical agent cost. This comprises 40.5% of the total annual pharmaceutical expenditure.

#### Specific "Preventive" Pharmaceuticals

The military pioneered the use of vaccines in Australia. In 1804, the Nation's second Surgeon General, Captain Thomas Jamison RN, published

an advocacy letter entitled "General

Observations of the Smallpox" in the Sydney Gazette of that year. Today, vaccine-preventable disease does not occur amongst Australian uniformed servicemen and women, in contrast with such preventable illness that still occurs in the civilian population. Vaccine preventable disease has been reported in the last two years in uniformed servicemen from other armies, notably that of poliomyelitis in the Albanian army in 19983; and hepatitis B still occurs in serving members of the armed forces of some African nations. Today, the use of hepatitis A and B vaccines is a major preventive intervention; and has implications not only for the preservation of manpower but also for the potential use of uniformed service personnel as volunteer blood donors during overseas operations in time of life saving emergency.

Item	Indication	Annual Usage	Price Per Unit \$	Annual Expenditure \$
Japanese Encephalitis vaccine "JEV"	Vaccine	15000	130.00	1,950,000
Hepatitis A and B vaccine "Twinrix"	Vaccine	37227	34.85	1,297,361
Typhoid vaccine "Typhim vi"	Vaccine	13877	30.49	423,110
Hepatitis A vaccine "Havrix 1440"	Vaccine	7735	41.00	317,135
Omeprazole capsules "Losee"	Proton pump inhibitor	3813	64.35	245,367
Loratadine tablet 10s "Claratyne"	Antihistamine	22152	7.77	172,121
Sodium Chloride eye irrigation	Irrigation	29074	4.04	117,459
Doxycycline HCl 100mg SR 7s "Doryx"	Antibiotic/anti-malarial	91284	1.20	109,541
Meningococcal polysaccharide vaccine "Mencevax"	Vaccine	4021	25.00	100,525
Propofol injection "Diprivan"	Anaesthetic	1415	65.52	92,711

Table 3: The ranked "top ten" pharmaceutical items used in the Australian Defence Force, by cost: with annual usage and unit cost. Data from the financial year 1998-1999. Cumulation bulk point-of-issue data.

Any audit of preventive pharmaceutical use has, of necessity, its "expenditure" on the current "left side of the ledger". The right hand side, that of health maintenance, may not see its accrual for years or decades in the future. Such is particularly relevant in the use of sun-screens and in the promotion of smoking cessation campaigns using nicotine patches and gum. Currently, the greatest return on preventive pharmaceutical expenditure is undoubtedly in the area of malaria prophylaxis. Noting that even with optimal diagnosis and treatment of acute cases of malaria, a convalescent soldier cannot return to work for 4 to 5 weeks after diagnosis, and that sub-optimal use of anti-malarial pharmaceutical agents leads to significant "break through" cases, an annual expenditure of \$100,000 for doxycycline prophylaxis is one of the most cost-efficient

expenditures currently employed on operational deployments in malarious areas. Such has applied particularly to UN operations in Western Sahara, Angola, Somalia, Rwanda and Cambodia in the past; and to current operations in Bougainville and East Timor.

#### Drug Research - Preventive Pharmacology

The Australian Defence Force has participated in a number of collaborative drug trials in the last decade - espousing the policy that research spin-off has the potential to benefit preparedness for warfighting and its training. Such potential research is reviewed by the Australian Defence Medical Ethics Committee (ADMEC); and if approved monitored for best practice ethical standards, for the incidence and type of side effects and ultimately for efficacy.

"PREVENTIVE" PHARMACEUTICAL COSTS -	AUSTRALIAN DOLLARS
Vaccines (excluding Japanese B Encephalitis Vaccine]	2 677 000
Vaccine (Japanese B Encephalitis Vaccine)	1 950 000
Sunscreens	256 500
Contraceptives (oral and injectable)	182 000
Nicotine Preparations (smoking cessation)	165 500
Doxycycline (as antimalarial)	100 000
TOTAL "Preventive" Costs (46.7%)	5 331 000

Table 4: Ranked annual expenditure on pharmaceutical items, as a percentage (46.7 percent) of all pharmaceutical expenditure, the Australian Defence Force, financial year 1998-1999.

Examples of current clinical research projects involving Australian volunteer servicemen and women include (a) investigations to determine the optimal route of administration of Japanese B encephalitis vaccine; and to determine its optimal antigenic load; (b) collaborative

studies to quantify the risks of side effects following BCG immunisation; (c) rates and the effects of preventive strategies to reduce skin cancer in troops stationed in northern Australia; and (d) research trials of new insect and arachnid skin repellents, using Army ento-

mologists as volunteer subjects in the wet tropics of Australia.

Preventive pharmaceutical research is also being undertaken as part of collaborative international studies, using both research leaders and volunteer subjects, with some of Australia's neighbours who share cognate terms of reference in keeping our armed forces fit. Examples include (a) drug trials of the new antimalarial drug, tafenaquine (formerly etaquine and also known as WR238605), using Melanesian uniformed volunteers in Manus Province of Papua New Guinea; and (b) a double-blind drug trial of the same antimalarial drug using both Thai and Australian volunteer service personnel.

The Defence Health Service Branch has also taken a proactive, altruistic role sponsoring the re-registration (ARTG Registration No. AUST R63856) of primaquine, for the use of all Australians (both civilian and military), returning to Australia from malarious areas. This latter has involved the ADF in a direct funding commitment of \$30,000 in the 1997-1998 financial year; but a practical audit of such expenditure reveals a most beneficial return on this investment, not only in terms of

financial saving from (otherwise) loss of person-power, but also in terms of the prevention of human suffering in both the Australian Defence Force and in the more widespread Australian society.

### Conclusion

It can be seen that "preventive pharmacy" occupies a central theme in the doctrine and practice of the Defence Health Service Branch. Insofar as vaccine-preventable diseases have not occurred in the ADF since full immunisation-protection has been introduced; and that clinical malaria does not occur on operations even in chloroquine-resistant areas, it can be seen that the preventive drug programs are supremely effective.

The data presented in this paper allow a health auditor to determine the specific drug cost of such positive health outcomes. It can be seen that the total per capita annual drug cost of such optimal health is \$102. It would be difficult to imagine a greater return for the expenditure of any Defence dollar.

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