A Coordinated Healthy Skin Program for the Top End: Feasibility Study Report

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Executive Summary

Background

Preventable skin infections are believed to be a major factor underlying the high morbidity and mortality rates experienced by Indigenous populations of the Northern Territory. The prevalence rate of scabies in some NT Indigenous communities is up to 50%. Rates of group A Streptococcal (GAS) infections have been reported as high as 70% in children. It is commonly believed that GAS infections can lead to serious complications, including blood poisoning and kidney damage. Poor health infrastructure, overcrowding and population mobility between communities are believed to be contributing factors to endemic scabies in the Northern Territory.

Rationale for a proposed healthy skin program

In June 2000, the Cooperative Research Centre for Aboriginal and Tropical Health (CRCATH) identified skin health as a priority area for further investigation. The CRCATH Board approved a six-month feasibility study to:

- consult with Top End communities, key stakeholder organisations and other interested parties about the possibility of implementing a coordinated healthy skin program across the Top End region of the Northern Territory
- assess current scabies reduction strategies
- document past and current interventions

The study became known as the Top End Healthy Skin Feasibility Study.

Healthy Skin Feasibility Study

The feasibility study found that, at present, a broad-based approach to scabies and skin health is not feasible. Unless existing knowledge is applied and more remote communities develop local skin health programs than have so at present, then a broad-based program will not be feasible.

Specifically, the study found that:

- communities that have implemented their own programs have developed skills, community capacity and confidence to identify the advantages of working with neighbouring communities to implement a regional healthy skin program
- communities that had not planned or run their own programs expressed an interested in the program but wanted to gain their own experience before committing to a larger regional program
- there is a clear need for evaluated resource materials and programs to support communities which are planning their own programs
- improved knowledge and management of crusted scabies appears to be highly significant in maintaining lower prevalence rates and preventing re-infection

This report presents the results of the feasibility study and also identifies a number of issues, some of which require further research, to improve our understanding of the best ways to control skin infections and their associated complications. Immediate action is needed to disseminate current scabies knowledge to health service providers and community leaders.

Future research options include:

- an evaluation of healthy skin educational resources
- evaluation of the dissemination and implementation of scabies knowledge
- ongoing crusted scabies research
- a full economic analysis, including cost–benefit analysis, of healthy skin programs
- development of a comprehensive and well coordinated Top End scabies eradication and skin health program

Overview of the Top End Healthy Skin Feasibility Study September 2000–December 2000

Purpose

In June 2000, the discussion paper 'Scabies and Skin Health: A concern for all in the short, medium and long term', was presented to the Cooperative Research Centre for Aboriginal and Tropical Health (CRCATH) Board for consideration. The Board agreed that the coordination of education, prevention, treatment and research initiatives for skin health was a priority area for the CRCATH. The Board supported one of the paper's recommendations: a six-month feasibility study of the implementation of a coordinated community-based approach to achieving healthy skin in Northern Territory Top End communities.

The specific aims of the feasibility study were to:

- consult with Top End communities, key stakeholder organisations and other interested parties about the possibility of implementing a coordinated healthy skin program across the Top End region of the Northern Territory
- assess community interest
- assess current scabies reduction strategies
- document past and current interventions (a literature review)

Study methodology

For the purposes of the study, the Top End area was defined according to the ten proposed health service zones under the Primary Health Care Access program: the zones are Tiwi, Darwin, Top End West, West Arnhem, Maningrida, North-East Arnhem, South-East Arnhem, Katherine East, Katherine West and South-East Top End.[76]

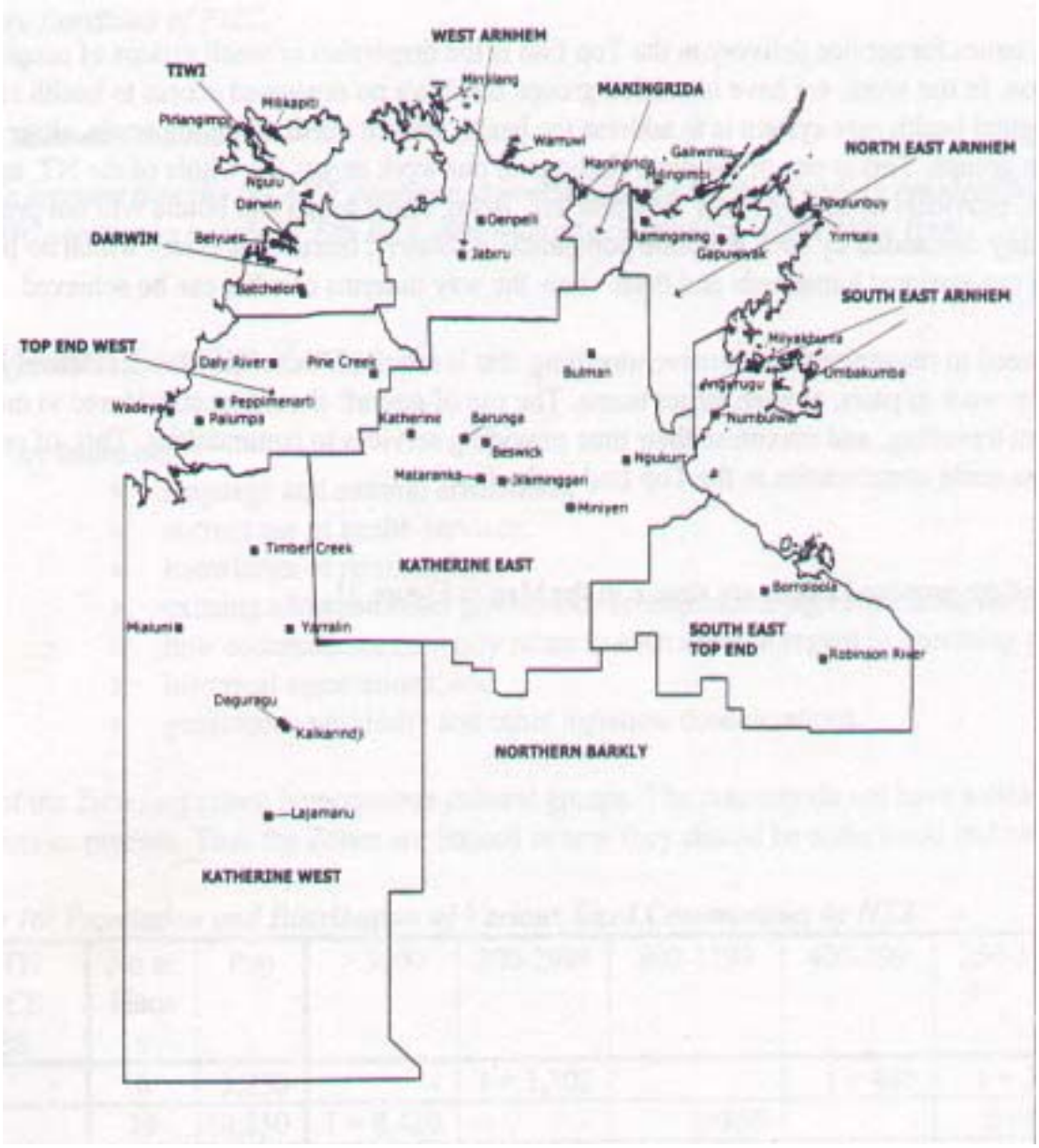

Figure 1. *The area covered by the study, showing the ten zones included (source: Bartlett B, Duncan P. Top End Aboriginal Health Plan. Report to the Top End Regional Indigenous Planning Committee of the Northern Territory Aboriginal Health Forum. Planhealth Pty Ltd, 2000.).*

A literature review of existing reports and articles relevant to healthy skin programs concerning treatment of scabies and skin infections was conducted.

The Top End Healthy Skin Feasibility Study Advisory Group was formed to provide guidance and direction to the project officers and monitor the project. The group were:

Chairperson	Dr Christine Connors
Dr Meredith Arnold	Top End Division of General Practice
Ms Kate Rade	OATSIH
Mr Ken O'Brien	THS Environmental Health
Prof Tony Barnes	CRCATH
Prof Bart Currie	MSHR/THS/Flinders University of SA
Ms Bernie Howes	Danila Dilba (later replaced by Dr Simon Morgan)

Administrative support for the group was provided by the CRCATH.

An assessment of existing resources, policy and procedures on the subject of healthy skin programs was conducted. Then an information package (see appendix one) which provided information about healthy skin programs was developed by the Feasibility Study project officers and distributed to councils, community clinic health staff, community members and interested parties. The information packages were accompanied by written advice of the forthcoming consultation period and process.

Five Aboriginal medical services (primary health care providers for 48.8% of Indigenous peoples living in the Top End), 14 remote communities, three education institutes, 12 organisations and agencies (businesses, local government and non-government organisations) and other interested parties were contacted (see appendix three). Face-to-face interviews with those parties commenced in late October 2000 and key stakeholders were identified.

Focus group presentations, where preferred options were canvassed, were made to:

- Territory Tidy Town Forum (Keep Australia Beautiful Council); participants represented communities from Central Australia and the Top End
- Strong Women, Strong Babies and Strong Culture workshop
- THS Executive
- THS Top End Services Network Executive
- MSHR Grand Rounds (the regular Thursday meeting of MSHR and Flinders University of South Australia Northern Territory Clinical School)
- Batchelor Institute of Indigenous Tertiary Education: School of Health Studies lecturers and Associate Diploma Health students

A questionnaire was developed by the project officers to assist with feedback and evaluation of the consultations (see appendix two).

A field trip to the San Blas Islands of Panama, which received overseas funding, was planned by Menzies School of Health Research prior to the commencement of the feasibility study. One of the feasibility study project officers was invited to assist with field duties in Panama (see appendix four). The purpose of the field trip was to participate in a whole of community treatment program trialling a new scabicide topical lotion similar to permethrin 5%. This opportunity broadened the study to include an international experience of community-based treatment programs and an opportunity to assess an alternative scabies treatment lotion.

Literature Review Findings

The literature review is adapted from Currie BJ, Carapetis JR. Skin infections and infestations in Aboriginal communities in northern Australia. *Australas J Dermatology* 2000; 41(3):139–45.

Introduction to skin infections and infestations in Aboriginal communities in northern Australia

The most important skin infestations and subsequent infections in Aboriginal communities in central and northern Australia are scabies and streptococcal pyoderma (skin sores caused by *Streptococcus* bacteria). While there is evidence that fungal skin infections may have been introduced to coastal communities before British colonisation by Macassan trepangers,[1] streptococcal pyoderma was possibly absent and unsustainable in traditional hunter-gatherer populations.[2–4] Furthermore, it is only over the last several decades that scabies has become endemic in many remote Aboriginal communities.[5–7]

There are many studies in the international literature on the epidemiology of pyoderma and scabies that focus on the importance of poverty and socioeconomic disadvantage. An analysis of specific factors as independent risks for these skin conditions has been problematic because of their interdependence.[8,9] However, it is likely that household crowding,[10,11] access to adequate quantities of water,[8,12] hot weather and humidity,[13,14] education and implementation of personal hygiene[13,15,16] are all important (see figure 7).

Fundamental to addressing the issues of pyoderma and scabies are initiatives addressing social and economic inequities in Aboriginal communities and, in particular, living conditions and overcrowding.[9,17] In addition, specific preventive programs for pyoderma and scabies that are initiated at community level can make a difference.[18,19] Finally, there are standards of care and best-practice guidelines for individuals with specific skin conditions which need to be accessible and for which adequate resources and numbers of health staff need to be in place in remote communities.[20–23]

Scabies

Scabies is currently endemic in many remote Aboriginal communities with prevalence in children up to 50% and in adults up to 25%.[18,24] Molecular typing of scabies mites has shown multiple overlapping epidemic cycles.[25] In some communities individuals with hyper-infestation (crusted or Norwegian scabies) are ‘core-transmitters’.[24,26] Apart from

the individual discomfort caused by scabies, it underlies 50% to 70% of streptococcal pyoderma.[18]

Control of scabies is therefore critical in controlling streptococcal pyoderma and the diseases that can develop from it. A successful model for control of scabies in communities using an application of 5% permethrin cream has been documented in Panama.[27] This program involved treatment of all community members and led to a reduction of prevalence rates for scabies from 33% to low levels that were sustained for three years at 1.5%. Furthermore, without specific interventions using antibiotics, the pyoderma prevalence rate in children decreased from 32% to 2%. This program, using whole community treatment with 5% permethrin cream, has been adapted successfully and separately by several remote Northern Territory communities. In one community, the scabies rate decreased from 29% to below 10% at two years.[18] In addition, without specific antibiotic interventions the prevalence of pyoderma in children was decreased from 69% to around half that rate and the residual pyoderma was documented as significantly less severe using a 'sore score' quantitative assessment. In 1988 in another progam, whole community treatment resulted in a decrease in scabies from 33% to 5% of the population.[19]

Because of the movement of people between communities, treatment of single communities in isolation will result in improvements which are likely to be sustainable only in the short term, with scabies and streptococcal infections reintroduced by people moving into the community from elsewhere. Coordination of programs at a regional level is therefore more likely to result in benefits that are sustainable over a longer period.

A recently developed molecular typing method for scabies mites has shown that the cycles of scabies transmission in dogs and humans do not appear to significantly overlap in Aboriginal communities.[28] Therefore, while *Sarcoptes scabiei* var. *hominis* and *Sarcoptes scabiei* var. *canis* are morphologically indistinguishable, control of the scabies epidemics in Aboriginal communities requires emphasis on treating children and adults rather than resources directed towards dog programs. This is supported by the success of two Northern Territory community-based programs.[18,19]

The availability of 5% permethrin cream means that community-based interventions to control scabies are now possible, provided that there is adequate support for the necessary resources and coordination. Oral ivermectin is being increasingly used for treatment of scabies and is currently the drug of choice for those with crusted scabies,[29,30] although multiple doses are often required for severe disease.[26] If the Therapeutic Goods Administration is satisfied with its safety in younger children and females who may become pregnant, there may be a wider role for

ivermectin in community-based programs in Australia, based on the growing international experience of community scabies programs.[31]

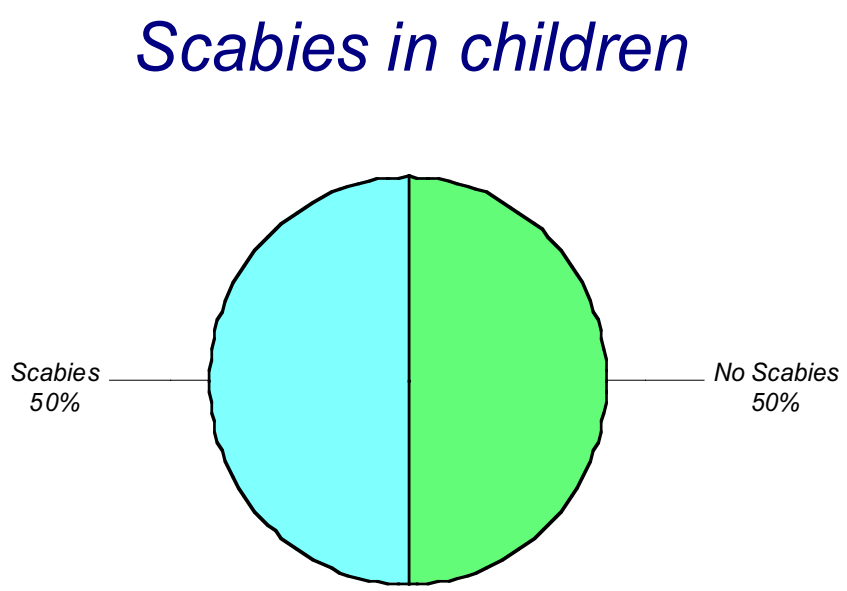

Figure 2. *Scabies prevalence rates in children in the Top End.*[85]

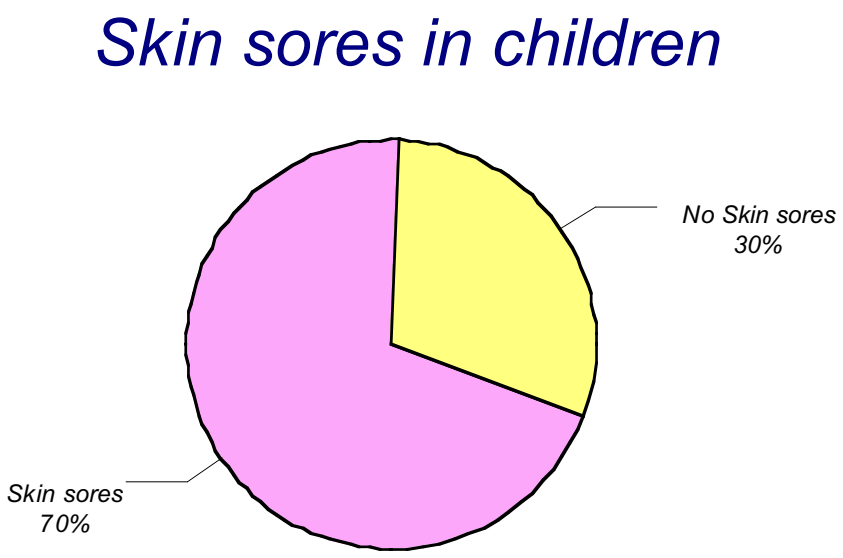

Figure 3. *Skin sore prevalence rates in children in the Top End.*[85]

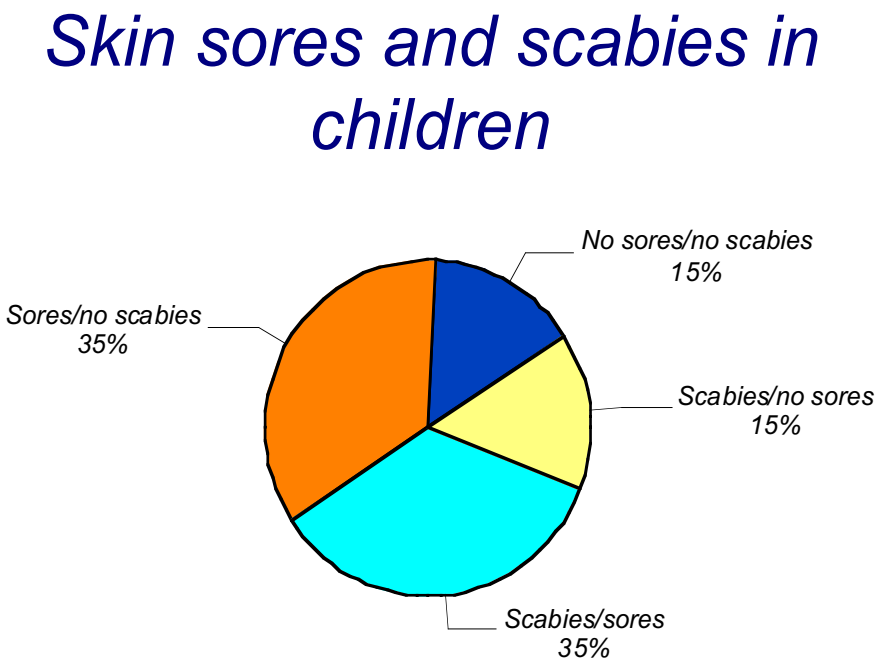

Figure 4. *Skin sores and scabies prevalence rates in children in the Top End.*[85]

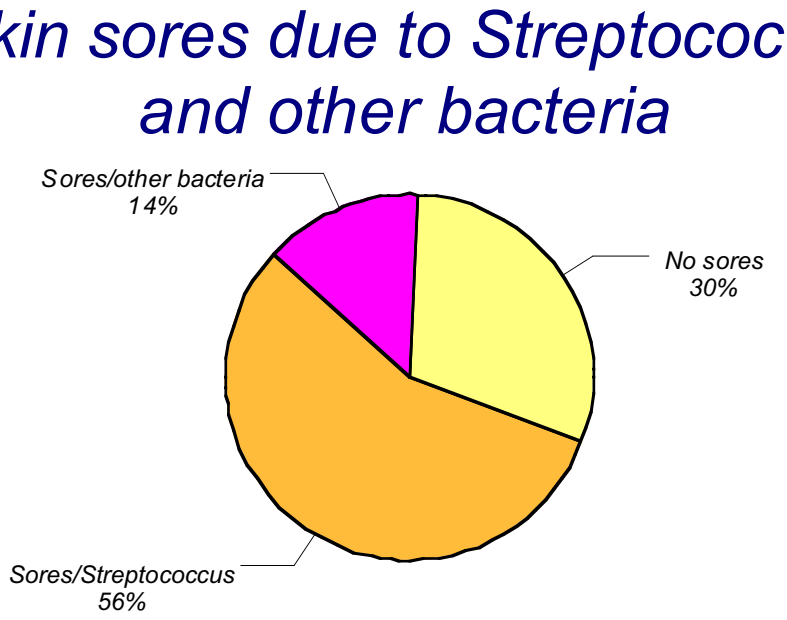

Figure 5: *Skin sore prevalence rates due to streptococcus and other bacteria in chldren in the Top End.*[85]

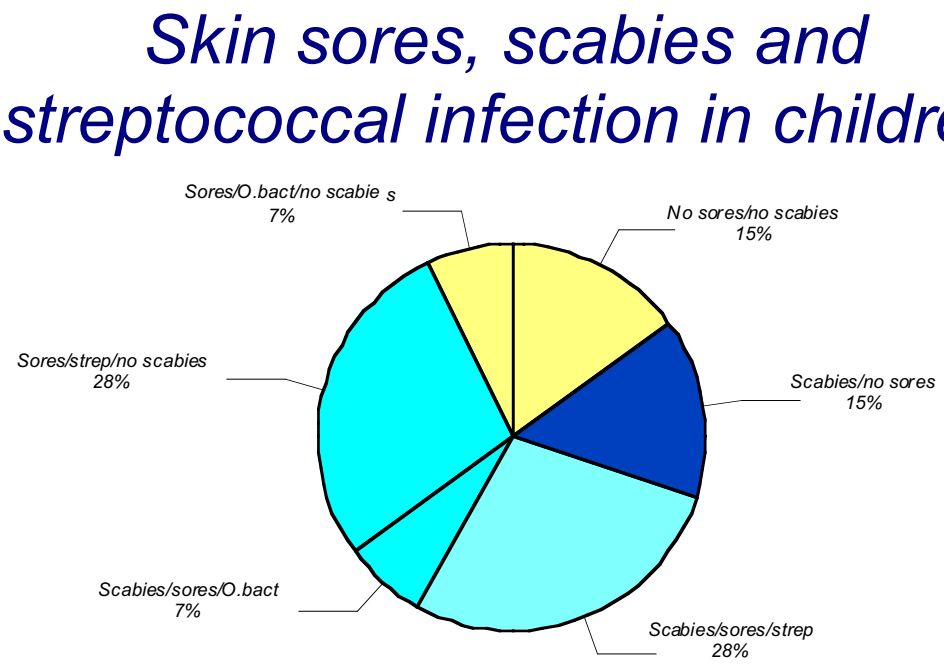

Figure 6. *Skin sores, scabies and streptococcal infection prevalence rates in children in the Top End.*[85]

Crusted scabies

What many health workers called Norwegian scabies—an over-proliferation of scabies mites, sometimes up to thousands—is now referred to as crusted scabies. Crusted scabies occurs in association with underlying predispositioning conditions, including human immunodeficient virus (HIV), hematologic malignancy, immunosuppresive therapy, connective tissue diseases and neurologic illnesses.[26] The condition manifests as generalised scaling and crusting of skin in buttocks, elbows and arms. Often there is no itch and this can make diagnosis difficult. Crusted scabies has a high morbidity and secondary bacterial skin sepsis may result in life-threatening bacterium. Individuals with crusted scabies are highly infectious and require systematic treatment regimens with ivermectin, 5% permethrin and Calmurid.[26] Contacts must all receive treatment with 5% permethrin and have their linen and clothes washed, bedding replaced and household rooms 'bombed' with Raid Exterminator. Once treated, individuals with crusted scabies need to return to a scabies-free environment so that over-proliferation of mites does not re-occur. Such interventions require dedicated teams from health and environmental areas but, more importantly, individual and family members' understanding and compliance.

Pyoderma

Pyoderma (impetigo or skin sores) currently has prevalence rates in children in remote communities in central and northern Australia of 10% to 70%.[18,32–35] As in other tropical areas *Streptococcus pyogenes* (group A streptococcus (GAS)) is usually the primary pathogen.[36–38] *Staphylococcus aureus* is commonly found in pyoderma lesions but is usually a secondary coloniser of wounds.[37] There is some evidence that impetigo in affluent temperate Australian cities may be increasingly due to the primary pathogen *S. aureus*.[39] However, this assumption requires further study and does not appear to be applicable to Aboriginal communities where over 80% of pyoderma lesions may still be GAS-culture positive.[18,35] This is evidenced by the excellent clinical response of impetigo to benzathine penicillin.[21,36,37,40]

GAS is responsible for continuing outbreaks of acute post-streptococcal glomerulonephritis (APSGN) (inflammation of the kidneys) and acute rheumatic fever (ARF) in remote communities.[32,34,41,42] Rates of ARF and, most importantly, prevalence rates of rheumatic heart disease (RHD), which is the result of cumulative valve damage from recurrent ARF, are amongst the highest reported in the world.[43] In the Top End of the Northern Territory the annual incidence of ARF (1989–93) is between two and seven cases for every 1000 children aged five to 14 years, while up to 3% of all people in some remote Aboriginal communities have established rheumatic heart disease.[44] In contrast, the prevalence of rheumatic heart disease in the non-Aboriginal population was 0.014% and no non-Aboriginal child had acute rheumatic fever over the same five-year period. Similar rates have been reported from the Kimberley in Western Australia.[45]

Pyoderma is also the predominant source of GAS-invasive disease in Aboriginal communities. GAS-invasive disease with bacteraemia is five times more common in Aboriginals than in non-Aboriginals in the Top End of the Northern Territory.[46] Skin has been the focus of nearly all severe GAS infections, unlike southern Australia, Europe and North America where there may be prior throat carriage and pharyngitis from GAS.[47–50] Scabies was found to commonly underlie initial GAS infection in those with GAS-invasive disease in the Northern Territory.[46] Molecular typing of GAS isolates (i.e. GAS bacteria grown from skin samples) has shown that there is no dominant strain or clone of GAS responsible for GAS-invasive disease in tropical Australia.[46] This is in contrast to the USA, Europe and southern Australia, where resurgence of GAS-invasive disease has been associated particularly with M serotype 1 or 3.[49–51].

The enormous diversity of GAS isolates in remote communities is demonstrated by the presence of up to 14 genetically distinct strains circulating in 50 isolates from a single community.[35] The most common strain was present in only four of the isolates.[46]

Furthermore, in the Top End study of invasive isolates (i.e. GAS bacteria grown from normally sterile areas, such as blood and joints) there were 32 distinct molecular types.

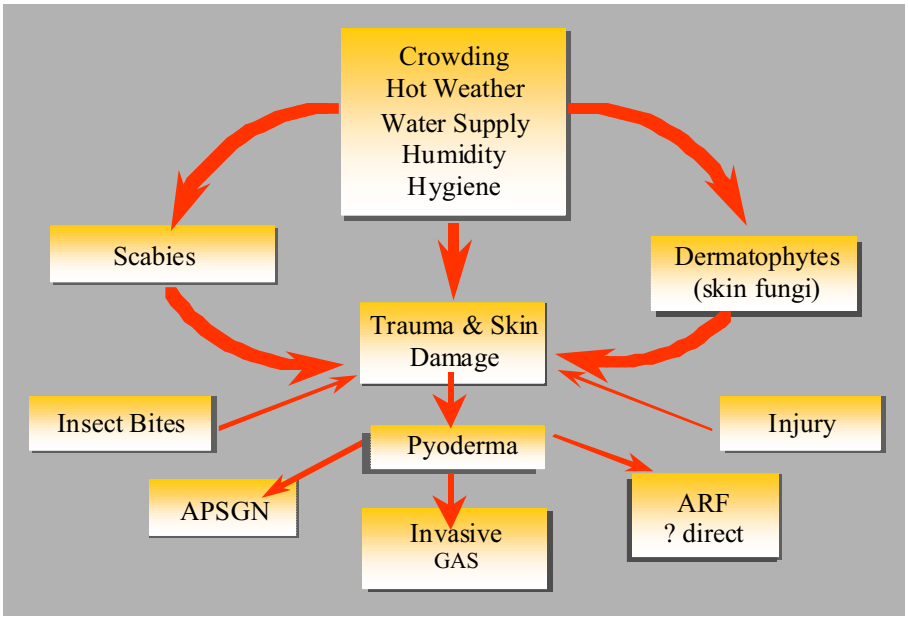

Figure 7. *Factors affecting skin disease in Aboriginal communities (GAS: group A streptococcus, APSGN: acute post-streptococcal glomerulonephritis, ARF: acute rheumatic fever).*

Recent studies have implicated GAS as one factor associated with the high rates of chronic renal failure in Aboriginal communities.[52,53] This is in contrast to some previous studies which suggested that chronic renal disease was unusual following APSGN.[54] It is possible that repeated exposure to a large diversity of GAS isolates is the reason for its postulated association with renal disease.

An important paradox is that despite the high rates of GAS skin carriage and pyoderma in remote communities, there is a much lower rate of GAS throat-carriage. Point prevalence of GAS throat-carriage in remote communities is between 0% to 14%.[18,32,33] While the association of APSGN with GAS in skin sores is well recognised, speculation that ARF may also result directly from GAS in skin, as well as throat, requires further study. However, the overwhelming proportion of GAS present in the skin provides strong support for ARF and RHD control programs to include measures to reduce the reservoir of circulating GAS in skin sores.[55,56]

The prevalence of streptococcal pyoderma in remote communities is also reflected in anti-streptokinase IgG levels (i.e. the level of the body's antibody immune response to GAS). These were 10 to 20 times those in non-Aboriginal populations, with

a functional assay showing streptokinase resistance levels in people from remote communities to be 10 to 15 times those in non-Aboriginal populations.[57] These high streptokinase antibody levels were enough to neutralise a standard streptokinase thrombolytic dose in at least 23% of adult Aboriginals. Concern about the lack of efficacy of streptokinase has led to the recommendation that primary thrombolytic therapy for myocardial infarction in Aboriginals in central and northern Australia should not be with streptokinase, but with the far more expensive tissue plasminogen activator.[57]

Fungal skin infections

The anthropophilic (passed from human to human) dermatophytes (skin parasites that cause disease), *Trichophyton* spp., or ringworms, are ubiquitous in many Aboriginal communities.[58] The granular variant of *T. rubrum*, which causes a grainy rash, predominates in the warmer humid northern communities where it causes extensive skin (tinea corporis) and nail (tinea unguium) disease.[1,59,60] In Central Australia and South Australia other common ringworms are *T. tonsurans,* which frequently causes scalp lesions, and *T. violaceum* which causes tinea corporis.[7,58] Pityriasis versicolor (tinea versicolor), usually called 'white spot' or 'hanky', which is caused by *Malassezia furfur,* is another skin infection common in remote communities.[7,60]

While tinea versicolor usually responds to topical (a direct application to the skin) therapy with selenium sulfide or imidazoles (clotrimazole, miconazole, econazole), skin and nail disease from *T. rubrum* is usually so extensive that topical therapy is useless and prolonged oral therapy is required.[21,61] Traditionally griseofulvin has been used for treatment of tinea corporis and tinea unguium. It is cheap but does not kill the fungus, only prevents it spreading, and daily therapy for three to six months is required for skin disease, and for as long as 12 months for nails. Newer therapy options include daily therapy with oral terbinafine which is fungicidal but expensive[61] and still requires up to three months of therapy for nail disease. The requirement of confirmation of fungal infection for permission to purchase terbinafine under the Pharmaceutical Benefits Scheme disadvantages many communities where health resources are limited. Supervised therapy with fluconazole given orally once a week[62] is currently being assessed in the Northern Territory.

Zoophilic ringworms (passed from animals to humans) appear far less common in remote communities in comparison to southern Australia.[58]

Other skin infections

There are a number of other skin infections that are occasionally seen in Aboriginal communities and are important because appropriate microbiological diagnosis is necessary to enable specific therapy.

Melioidosis is caused by the soil and water bacterium *Burkholderia pseudomallei* and cutaneous (skin) disease may lead to potentially fatal septicaemia, with fulminant, or rapid onset, pneumonia and multi-organ abscesses.[63]

Nocardiosis, caused by a number of bacterial species, is sometimes difficult to culture and requires prolonged therapy, usually with cotrimoxazole in high dose.[64]

Chromobacterium violaceum is another environmental pathogen that can occasionally lead to fatal septicaemia and which is not responsive to commonly used penicillins and cephalosporins (antibiotics similar to penicillins).[65]

Chronic fungal infections which can involve subcutaneous tissue and which can initially be mistaken for tinea include infections caused by various unusual fungi grouped as chromoblastomycosis.[66] Surgery or prolonged antifungal therapy with expensive agents such as itraconazole may be required.

Sporotrichosis is another fungal disease occasionally seen and requiring prolonged therapy with potassium iodide or newer agents such as itraconazole or terbinafine.[67]

New cases of leprosy are now rare in central and northern Australia but an awareness of the possibility of leprosy is important, as skin lesions can be difficult to differentiate from tinea.[68]

Occasional cases of erosive ulcers from *Mycobacterium ulcerans* are seen. Yaws has been eradicated from Australia for many years.

Preventive programs and standards of care and best practice

Guidelines for the community control of scabies and skin sores have been developed and successful community-initiated coordinated programs have occurred in the Northern Territory, as noted above.[22] Guidelines for control of APSGN have also been developed.[69] Where an outbreak of APSGN has been identified, interventions include community education and scabies treatment. As well, in order to break the transmission of the nephritogenic GAS, there is the option of community-wide treatment with an injection of benzathine penicillin for selected contacts and community members.

An RHD education and control program has commenced in the Northern Territory.[44] This program is based on World Health Organization guidelines.[70,71] The emphasis is on identification of individuals at risk of worsening RHD, and prevention of

cumulative valve damage by the use of monthly injections of benzathine penicillin which prevent recurrent ARF. In addition, the program attempts some primary prevention of ARF through scabies and skin sore programs, which aim to decrease the burden of streptococcal carriage and infection.

Standards of care and best practice for individuals with specific infestations and infections have been developed.[20–22]

Unfortunately, despite appeals for improved health resources since early in the twentieth century,[5] the reality for many remote Aboriginal communities is that levels of staffing and resources for nurses, doctors and Aboriginal health workers are often inadequate for implementing appropriate standards of care for individuals who are sick, let alone for the implementation of preventive programs.[72,73]

Northern Territory community-based healthy skin programs

	Nauiyu Nambiyu 1992	Minjilang 1996	Galiwin'ku 1998	Yuendemu 1998	Wadeye 2000	Maningrida 2000	Nguiu 2000
Total population	450	250	1740*	723	2455	2085	1200
Target population screened	–	62	326	189	217	513	94
Scabies prevalence Initial screening	45%	33%	33%	57%	35%	61%	42%
At 6 weeks	10%	8%	5%	–	2.9%	2.5%	30%
At 4 months	24%	5%	–	–	5%	–	–
At 7 months	–	–	29%	29%	4.1%	–	–
At 9 months	–	9%	–	–	2%	–	–
At 12 months	–	–	35.5%	–	–	–	–
At 14 months	–	8%	14%	–	–	–	–
At 21 months	–	6%	–	48%	–	–	–

Table 1. *Scabies prevalence (data collected from community-initiated healthy skin programs evaluation reports (*population treated).*

Successful community programs to control scabies have occurred in several Top End communities.[18,19,23] These programs have recognised the communicability of scabies and have highlighted the need to treat all individuals, whether infected or not, as a means to prevent re-infection. Whole-of-community treatment days have been used as a strategy to overcome the problem of re-infection in the Northern Territory Top End communities listed above and have been found to reduce the prevalence of scabies, in some instances, from 33% to 5%.[1,9] Environmental interventions, such as washing of bed linen and hanging of mattresses in the sun, are encouraged to promote healthy houses. Washing of children is emphasised as a very important aspect of such programs to reduce streptococcal skin infections.

Four of the community-based programs that take a whole-of-community approach to scabies treatment and control are at Minjilang, Galiwin'ku, Maningrida and Wadeye and are outlined below.

1. Minjilang

Objective: To adapt, implement and evaluate a model of scabies control in an Australian Aboriginal community.

Methods: After initial examination of the population, all residents were offered treatment with 5% permethrin cream. Visits were made during the ensuing 25 months to re-screen and to treat new cases of scabies and their contacts.

Results: The prevalence of scabies was reduced from 28% before the program to less than 10% during the entire program (from 33% to less than 10% in children) ($p < 0.01$ for each visit (i.e. statistically there was a 1% chance of finding scabies in the children tested)). The initial prevalence of pyoderma, or skin sores, in children was reduced and maintained at approximately one-half the previous rate during the following 16 months. Residual skin sores in children was significantly less severe and were not related to scabies.

Conclusions: This simple model of scabies control had a substantial effect on scabies prevalence and on pyoderma prevalence and severity, and the effect was sustained for more than two years. The program could prove useful for other communities with high rates of scabies and pyoderma.

2. Galiwin'ku

Aim: To evaluate a community scabies control program in a remote Aboriginal island community using a prevalence study and focus group to measure qualitative and quantitative outcomes.

Methodology: The scabies control program consisted of an education and treatment program. The program treated the entire community simultaneously with 5% permitherin lotion; a clean-up of houses, bedding and linen was requested. Prevalence of scabies was measured before and after the treatment program to determine its effectiveness. Houses were randomly selected, and all occupants screened for scabies. Data collection was by a researcher, a nurse-educator and senior Aboriginal health workers experienced in working with scabies patients. A clinical diagnosis was made using a predetermined case definition. The same methodology was used in pre- and post-treatment screening. The data was analysed using the Statistical Package for the Social Sciences (for Windows 8.0). Focus groups were conducted after the treatment program to evaluate qualitative aspects of the education and treatment programs.

Results: There were 326 individuals from 45 houses screened prior to treatment day**,** and 362 from 49 houses following the treatment program. There was a significant difference in the pre-treatment prevalence of 33%, and post-treatment prevalence of 5% (chi square 83.99; $p<0.001$). There was also a significant association between age group and scabies (chi square, 17.02; $p<.0.05$), with children in the zero to five-year-old age group having the highest prevalence. The results show 39% (pre-treatment) and 59% (post-treatment) of individuals screened had visitors in the same house. There was a significant association between being a visitor and having scabies (chi square 9.18;$P<0.05$). A follow-up prevalence study conducted by the health clinic staff seven months later found prevalence returned to 30%. Focus groups report a positive response to the program, with the community clean-up particularly successful. Suggestions were made for regular clean-up and treatment programs.

Discussion: The community-wide scabies program was very effective in the short term in reducing scabies prevalence in the community, but its sustainability over the longer term is questionable. Cultural factors, overcrowding, and population mobility may have an influence on the sustainability of a reduced prevalence in the longer term.

3. Maningrida

The project implementation was divided into two phases:

Phase 1: Education: A six-week education program for school children

Each class received education in healthy skin and viewed the Scabies Day education video produced by Galiwin'ku community.

A poster competition was held which attracted over 100 entries; prizes were donated by the local community and the posters were displayed at the Women's Centre. A healthy skin community education afternoon was held at the Maningrida Women's

Centre on 18 May 2000, with guest speakers from Galiwin'ku and Minjilang sharing their experiences with an audience of 200 people.

Phase 2: Implementation

Four senior Aboriginal women and a registered nurse were employed to conduct community screening and provide one-on-one education in people's homes. They screened children for scabies and skin sores, offered penicillin to any children with skin sores and permethrin to other household members. School-aged children were screened either at school or in the home.

Three thousand dollars ($3000) was donated to the Women's Centre to make the community washing machines available for free use during the time of the project. The washing of clothing and bedding materials was encouraged during the project.

Results: Four hundred and fifty-three children aged zero to 15 years in Maningrida and a further 50 to 70 children from homelands centres were screened. Sixty per cent of all children within communities were screened, although the percentage screened is believed to be much higher than quoted due to inaccuracies in the population lists which are not regularly updated. Of the children screened, 61% had scabies and/or skin sores; 58% received penicillin and Lyclear.

Follow-up school screening at eight weeks in August 2000 of 200 children found only five cases of scabies and /or skin sores (2.5%). Health clinic staff believed the strength of the program was the involvement of the senior community women and the strong education program that occurred prior to the intervention.

4. Wadeye

The aim of the project at Wadeye was to implement a community-wide scabies eradication program based on the principles of primary health care.

Methods: After three months of community education, children aged five years and under were screened for the presence of scabies. All residents were offered treatment with 5% permethrin cream to coincide with a community clean-up day. Households with children with moderate to severe scabies ('core-infector' houses) were re-treated one week later. The households with children continued to be screened and treated on a monthly basis. Three-month follow-up visits will be made in the ensuing year to re-screen and treat new cases of scabies and their contacts.

Results: The prevalence of scabies, infected scabies and non-pyoderma in children less than and including five years of age before the program were 35%, 12% and 11%

respectively. At six weeks post-intervention these rates were reduced to 3% ($p<0.0001$), 1% $p<0.0001$) and 4% ($p = 0.02$) respectively and these reductions were sustained at four and seven months.

Conclusions: This model of scabies control has been successful because it is based on community empowerment and the principles of primary health care. Regular screening and treatment of the inhabitants of 'core-infector' houses will also be crucial in maintaining a reduction in scabies infection.

Community capacity

All of these healthy skin programs are concrete examples of community people setting priorities, making decisions, planning strategies and implementing programs that have had successful outcomes. The Minjilang, Galiwin'ku, Maningrida and Wadeye community-based programs have demonstrated an ability to draw on existing materials and human resources within the community to enhance local skills and social support, and to develop flexible systems for strengthening community participation. The success of these projects have been a source of community pride, have fostered feelings of true project ownership by the community, with a flow-on effect of increased community morale.[19,75,76]

Overcrowding

Overcrowding in Aboriginal communities is common[9,17,74] and is due to a lack of adequate well designed housing for family groups, and extended family households. Often, visiting family from other communities will live with 'kin' for extended periods of time. These visits are related to ceremony, seasonal variations or recreational leave. Cultural and social factors may predispose Aboriginal communities to higher prevalence rates of scabies as a result of household overcrowding, and the high mobility between dwellings and communities. Recent housing surveys by environmental health officers[74] have highlighted the need for good health hardware to improve living conditions in houses that have a high level of usage by large numbers of inhabitants.

Number in household	Galiwin'ku scabies prevalence, 1998	Yeundemu scabies prevalence, 1998
1–9 people	21.3%	47.7%
10–20 people	24.7%	59%
> 20 people	**30.5%**	**55%**

Table 2. *The relationship between scabies prevalence and household overcrowding.*

Environmental considerations

Diarrhoeal diseases, respiratory infections, skin infections and infestations, eye infections, ear infections and rheumatic fever are known to be related to poor environmental infrastructure, such as inadequate water supply, sanitation and washing facilities, and overcrowding.[80] These environmental conditions have a great impact on the health of Aboriginal children, and the quality of life for many Aboriginal people living in rural and remote Australia.

Over 69% of Indigenous people in the Northern Territory reside in remote rural communities. Each community will vary according to social, economic, cultural and geographic differences. These differences are reflected in infrastructure and health outcomes of communities. Having a home that provides adequate shelter and basic services is a given for most Australians. However, research[74,75] has confirmed two major problems with living conditions for Indigenous peoples:

- an inadequate supply of houses
- poor quality of available housing

A recent survey[75] of Indigenous housing confirmed that many houses lack the facilities to enable people to perform the nine healthy living practices as identified in *Housing for Health*[78] (see figure 8):

- washing of people
- washing of clothes and bedding
- removing waste
- improving nutrition
- reduced crowding
- separating dogs and children
- dust control

- temperature control
- reducing trauma

The role of maintenance is critical in achieving sustainable health hardware and infrastructure.[78] Breakdowns in basic water and waste systems occur frequently in remote housing stocks in the Northern Territory. Seventy per cent of these breakdowns are repair work to fix poor initial specification and construction.[80] Twenty-five per cent of repair work is due to a lack of routine maintenance, and deterioration in the harsh environment.

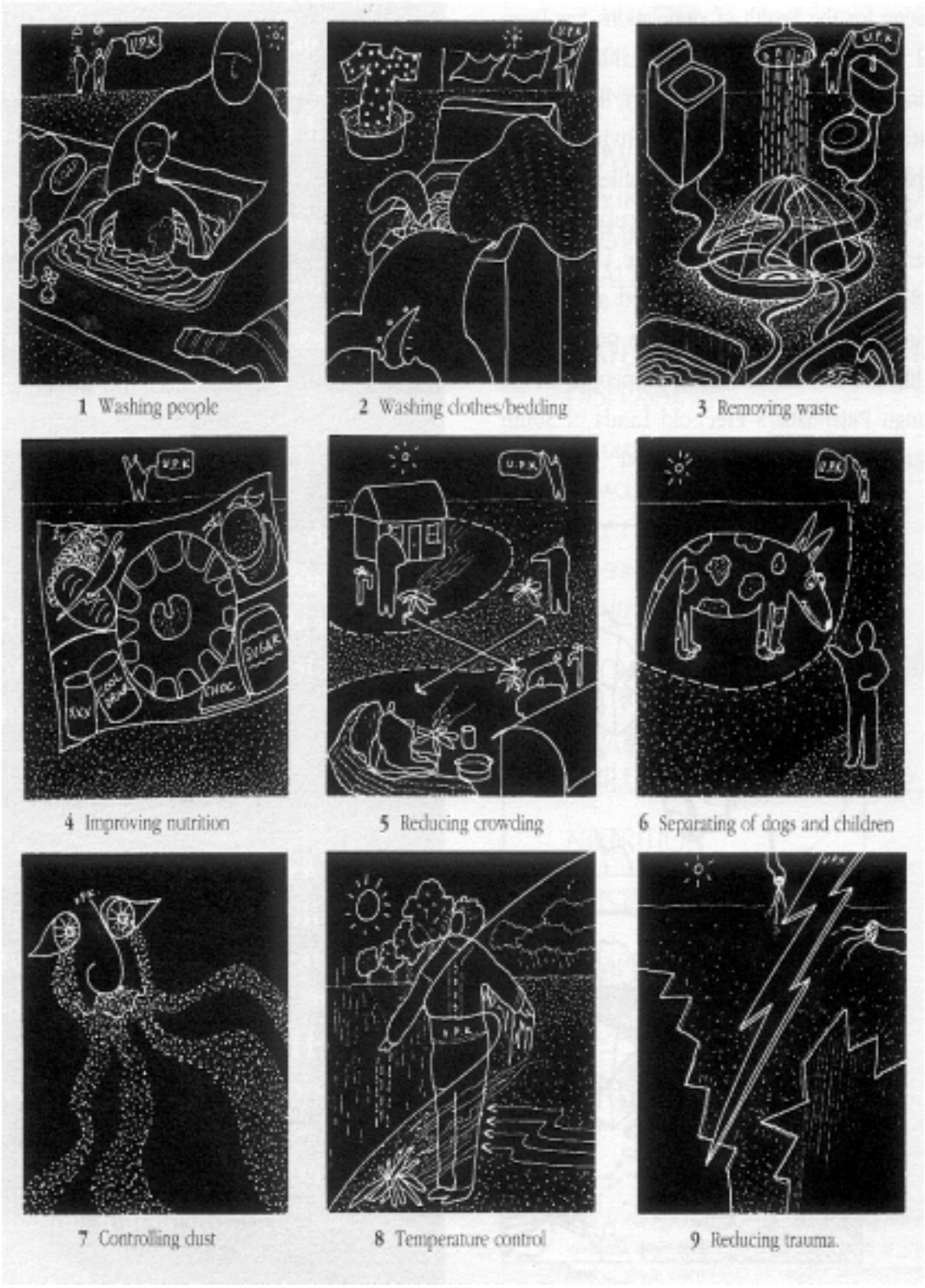

Figure 8. *Nine healthy living practices.*[78]

Community Consultation Findings

The responses from face-to-face interviews, phone interviews and focus group presentations were collated. Sixty questionnaires were sent out to participants during consultations or presentations. The low return rate of 13% (eight) may have been due to the design of the questionnaire itself. The questionnaires were originally designed for consultant project officers to record their findings after each interview. Completion of the questionnaire was voluntary.

Responses to the concept of implementing a coordinated Top End healthy skin program received were supportive, however, the degree of readiness to participate in such a program was dependent on whether communities had previous experience of running healthy skin programs. Respondents fell into two groups: communities who have conducted healthy skin programs; and communities who have not conducted healthy skin programs.

The feasibility study project officer was also able to report on the operation of a whole-of-community program approach operated in the San Blas Islands in Panama, after a three-week field trip in November 2000.

Communities who have conducted healthy skin programs

Many of the communities who have run healthy skin programs used the 'Galiwin'ku Healthy Skin' video for community education. This occurred in a variety of settings, including the health centre, women's centre, childcare centre, family groups and schools. The length and content of the video and the use of a catchy jingle by Manuel Dhurrkay from Saltwater Band were favoured by Aboriginal people and added to its popularity. The video tells the story of why Galiwin'ku became interested in healthy skin programs by relating the community's concerns about serious kidney and heart disease. The video then explores what scabies is and how to get rid of it in your community.

Many communities developed their own resource materials for education and promotion such as videos, posters, local songs in language, T-shirts, often using the Galiwin'ku video as a model. Local development of resources was frequently cited as a positive part of the planning process which increased community involvement.

Community support is seen as paramount to the success of these programs that provided an opportunity for community organisations, such as councils, school and store, to work together in a cooperative and in collaborative manner.

Health workers strongly support the idea of treating everyone simultaneously as they see frequent movements of people between urban and remote communities. Health

workers reported that they would like to see a scabies-free Top End. Both Indigenous and non-Indigenous health workers in communities could see the benefit of simultaneously running community treatment programs, thereby reducing the possibility of re-infection during funeral, ceremonial and family reunion times.

Direct supervision for the application of 5% permethrin is reported as being a preferred option, and this need not be by a health worker. Some Aboriginal communities see the idea of using one identified household member to take responsibility as culturally appropriate.

The model of house-to-house education in family groups was recognised as a successful strategy to increase community support.

Community members from Top End communities that have successfully completed healthy skin programs remarked:

> The process worked; that is, community identifying issues, taking one issue at a time, developing the story with key people and going through both Yolngu and Balanda structures.
>
> Using the old people to tell the story was good.
>
> Everyone had to put their linen in the sun, there was no shame.
>
> The council making a no-work day was really supportive for the scabies day.

In communities where healthy skin programs have been successful, health centre staff and community members felt proud of what they had achieved, and various community organisations had a greater willingness to work together on future projects.[18,19,77]

In one community, the local council successfully applied and received funding for 12 washing machines which were then given as prizes each month for the best healthy houses as assessed by their environmental health workers. The community responded enthusiastically, and were keen to win the washing machines.

Staff concerns

All staff felt that it was important to acknowledge and note that extra demands or expectations should not be placed on essential clinical staff to run healthy skin programs, especially in the current climate of high staff turnover, and the increased demands within health centres. The strength of a healthy skin program is its ability to build capacity within the entire community using community development principles.

Scabies and skin sores are a common problem presenting to health centres, and health staff in remote communities with high workloads reported an inability to focus on preventive programs. Staffing levels are frequently not adequate to meet program demands of chronic disease strategies, Growth Action Assessments, immunisation requirements, sexual health, antenatal care, and on-call rosters.

Many health centres were working on business plans for Territory Health Services but only one community had developed, with the council and community members, a long-term plan to address identified health issues. The health workers at this clinic felt that by identifying issues and allowing planning and evaluation time, they were able to dedicate some time to preventive programs using a house-to-house education model. Education of family groups about prevention measures had been undertaken for three years by a health educator.[12]

Exploration of how a healthy skin program may be incorporated into existing programs occurred during discussions with health staff. All staff could see the relevance of screening for prevalence of scabies during Child Growth Action Assessment screenings, and identified a need for epidemiological support during pre- and post-screening times. Health clinic staff also saw community education as the key to the success of a broad-based healthy skin program. Identifying suitable personnel may make possible a peer education model.

Crusted scabies

Although there has been an increased awareness in remote communities, the current level of knowledge concerning crusted scabies amongst health staff is limited. All staff felt that more information and resources were needed to enable them to correctly identify mild cases of crusted scabies.

Systematic screening, diagnosis and treatment of individuals with mild cases of crusted scabies, treatment of household contacts and cleaning of household, clothes and bedding is required to reduce the re-infection of household contacts and individuals who are susceptible to extreme infestation of the scabies mite.

Promotion

Discussion around the use of the media and the arts to promote a broad-based program were supported as strategies to assist urban communities link with remote areas.

Communities who had not conducted healthy skin programs

Consultations in Darwin with non-government organisations, health providers and other interested parties, found that the majority of those consulted expressed a strong interest in linking up with a coordinated healthy skin program to treat urban dwellers on the same day as remote communities. Unfortunately, Danila Dilba Health Service was unable to contribute to the feasibility study due to time constraints on their staff. Any coordinated program including Darwin would need significant input in planning and implementation from this Aboriginal medical service.

Existing resources were seen as helpful to some communities who felt they were ready to have a healthy skin program in the near future. Communities who had not conducted a healthy skin program were planning to implement a whole community treatment day during 2001 using existing THS's Communicable Diseases Centre (CDC) guidelines.[23]

Bagot Community contacted a feasibility study project officer prior to the commencement of the study to gain information about healthy skin programs.

Staff concerns

Lack of resources and experience in implementing healthy skin programs were identified as impediments to a program's success by both the urban and remote communities that had not conducted a community-based intervention.

Communities without experience of implementing a whole-of-community treatment program stressed that support from public health staff, such as health promotion officers, environmental health officers and CDC staff, would be necessary to affect a successful program.

The strengthening of community capacity would need to be supported for the ability to implement a whole-of-community treatment program, and for an impact on the overall health of the community.

Panama field trip

The feasibility study project officer took part in a field trip the San Blas Islands in Panama, to take part in and observe a whole-of-community scabies treatment program.

The project officer noted that the treatment program was 'owned' by the community, with team members assisting with the implementation of the drug trial determined by the health council and Council of Chiefs.

Participation in the drug trial was determined on the presence of scabies, which was identified by the naked eye and captured with a needle. Consent was obtained

from participants before offering treatment with the trial drug. Co-householders were not offered the lotion being trialled, but were offered an alternative treatment lotion. The trial topical lotion was applied in the evening, left on overnight and washed off next morning, and participants reported to the health clinic in the morning for examinations.

Small gifts were offered to children who participated in the trial.

Analysis of factors which may predict a successful community healthy skin program

Table 3. *The elements of a healthy skin program*

Activities which may lead to program success	Minjilang 1996	Galiwin'ku 1998	Yuendemu 1998	Maningrida 2000	Nguiu 2000	Wadeye 2000	Oenpelli 2000
a. Activities undertaken prior to program implementation							
Program an initiative of the community	x	√	x	√	√	√	√
A lead-in period allowed for training and community education before implementation of whole-of-community treatment days	√	√	√	√	√	√	√
Healthy skin project team:							
• health centre staff and visiting staff	√	√	√	√	√	√	√
• community-identified workers	x	x	√	√	√	√	√
• community volunteers	√	√	x	x	x	√	x
Planning process conducted with healthy skin team and community	√	√	√	√	√	√	√
Health centre activities							
Target group selected	√	√	√	√	√	√	x
Pre-treatment screening conducted and recorded	√	√	√	√	√	√	x

Activities which may lead to program success	Minjilang 1996	Galiwin'ku 1998	Yuendemu 1998	Maningrida 2000	Nguiu 2000	Wadeye 2000	Oenpellie 2000
Community awareness of the importance of skin health, and the link between scabies and skin infections							
Education and training undertaken by:							
• health workers	√	√	√	√	√	√	√
• community-identified healthy skin team members	x	x	√	√	√	√	x
• community volunteers	√	√	x	x	x	√	√
Community education conducted:							
• house to house	x	√	√	x	√	√	x
• outstations	x	√	√	x	x	x	x
• groups/organisations	√	√	√	√	√	√	√
Health promotion strategies used:							
• posters in key public places	√	√	√	√	√	√	√
• school poster competitions	x	√	x	√	x	√	√
• skin health talks with different groups or organisations e.g. schools, council, women's groups, CDEP, church groups	√	√	√	√	√	√ √	√
• promotion using local Broadcasting to Remote Aboriginal Communities Service (BRACS) facilities	x	√	√	x	√	√	x
• resources such as videos, posters, flipcharts, music jingles developed	x	√	√	x	√	√	√

Activities which may lead to program success	Minjilang 1996	Galiwin'ku 1998	Yuendemu 1998	Maningrida 2000	Nguiu 2000	Wadeye 2000	Oenpelli 2000
Internal/external support							
Skin health project supported by local businesses organisations, community groups and agencies from within the community, e.g. council: 'no-work days'; store: food donations; school: healthy skin theme in curriculum	x	√	√	√	√	√	√
Skin health project supported by external agencies, businesses, community groups, e.g. Top End Division of General Practitioners, THS, drug companies, transport, armed services	√	√	√	√	√	√	√
b. Healthy skin treatment day activities							
Healthy skin team to work with outstations of communities on the identified healthy skin day	x	√	x	√	x	√	x
Healthy skin teams visit each household to talk about healthy skin, demonstrate how to apply the scabies medication, reinforce that every member of the household should be treated and give out a tube of Lyclear for each member of the household	√	√	√	√	√	√	√
Community encouraged to: • clean-up households • wash all dirty clothing and bed linen • construct washing lines • air all bedding	 √ √ √ √	 √ √ √ √	 √ √ √ √	 √ √ √ √	 √ √ √ √	 √ √ √ √	 √ √ √ √
Volunteers assist elderly and sick to clean houses and yards	x	x	x	x	x	√	x
Celebrations: Face painting, BBQ, concert with local bands, football game	x	√	x	x	√	√	√

	Minjilang 1996	Galiwin'ku 1998	Yuendemu 1998	Maningrida 2000	Nguiu 2000	Wadeye 2000	Oenpelli 2000
c. Post-treatment activities							
Evaluation of day, including number of participants	√	√	√	√	√	√	x
Follow-up surveillance	√	√	√	√	√	√	x
Sharing the scabies/skin health story to other interested communities	√	√	√	√	√	√	√

Issues Arising from the Study's Findings

The planning of a broad-based healthy skin program would need to consider all issues that impact on a large public health program. A broad-based approach could be an empowering and strengthening experience for all Top End communities, where they select intervention strategies that are best suited to their particular situations and localities. Community participation in the decision-making processes of planning, implementation and evaluation actively integrates, explores and values Aboriginal and Western world views in understanding health issues, especially that of endemic scabies. Community involvement must, therefore, be considered a crucial component if uptake and success of the program is to be achieved.

Towards a regional healthy skin program

During the consultation a number of communities who had conducted their own healthy skin programs expressed a strong interest in working together with neighbouring communities to run regional healthy skin programs. In response to this, the Ngalkanbuy Health Service hosted the Healthy Skin Regional Planning Day workshop on 8 June 2001. Guests from the North-East Arnhem Land communities of Gapuwiyak, Millingimbi, Marngarr, Ramingining, Yirrkala, Maningrida and Kunbarrllanjanja (16.4% of total Top End Indigenous population) were invited. Organisations, including Miwatj Health Corporation, THS and the Top End Division of General Practice, were also invited to the workshop.

The agenda for the regional planning workshop was to:

- nominate the month and date for a regional healthy skin program
- focus on crusted scabies as a source of re-infection
- identify the elements that contribute to a successful program

Coordinated program considerations

The implementation of a broad-based program would require a critical mass of knowledge and experience. This would mean supporting and assisting Individual communities in the preparation, planning, development and implementation of their own programs. Currently, 22% of Indigenous people in the Top End have the experience of implementing their own healthy skin program. Focusing on increasing the number and overall percentage of Top End communities with program implementation experience will be essential if a broad-based coordinated approach is to be successful. It would also

be necessary to determine at what point the critical mass of knowledge and experience is reached to support a coordinated healthy skin program across the Top End of the Northern Territory.

Crusted scabies

Knowledge and awareness of crusted scabies and its importance as a significant cause of re-infection was low amongst both health staff and community members. Resources need to be developed for the education and training of health workers and community members about crusted scabies.

Current treatment protocols for crusted scabies have been mostly developed and trialled in hospital settings for people with severe crusted scabies. It is uncertain how many doses of ivermectin would be required for mild cases. Review of these guidelines is an essential aspect of community education as appropriate treatment is critical for successful outcomes and to minimise the risk of ivermectin resistance.

Ongoing surveillance of children is a critical issue in the maintenance of low prevalence of scabies. Past community experience (refer table 1) has demonstrated that children and community members become re-infected when there are long gaps in surveillance, possibly because of missed opportunities to diagnose mild cases of crusted scabies.

At Minjilang there was one known case of crusted scabies and a young child with persistent scabies. Health staff specifically focused on adequate treatment of these two people and their family members which led to a successful outcome and helped maintain lower prevalence rates. Following the community treatment day at Wadeye, it was recommended that children identified with recurrent scabies during screening should be a signal to staff of the possibility of undiagnosed cases of crusted scabies. Ongoing surveillance by health staff found a clustering of scabies cases around three houses, each with a newly diagnosed case of crusted scabies responsible for re-infection. Subsequently, health staff in some other communities have been alerted to potential crusted scabies by using children with recurrent or persistent scabies as indicators of a missed diagnosis. This method of targeting certain households has led to a significant number of mild crusted scabies cases being diagnosed.

It seems that an increased focus on crusted scabies will improve the sustainability of a healthy skin program.

Consent issues

Communities did not provide strong guidance on the issue of consent, particularly regarding the use and the publishing of community data in public forums.

Capacity-building

Communities that have not had the experience of conducting a healthy skin day would require support to facilitate capacity strengthening throughout the project. A high level of community capacity is acknowledged as a requisite for improvement of health care. For example, evaluation of the Katherine West Coordinated Care Trial[83] highlighted the Pawson and Tilley[81] model, which necessitates the need to identify all existing conditions or contextual factors that impact on the change mechanisms or strategies leading to desired outcomes. This evaluation model and its relevance to the delivery of a healthy skin program could be used successfully if facilitation at a local level is implemented.

Community capacity-building can be described as:[82]

- infrastructure building, that is, having the capacity (resources, skills and minimum health structures) to deliver particular programs in response to identified health issues and concerns
- the capacity to network with other agencies and groups so as to make responses to change programs sustainable
- the ability for a community to strengthen their problem-solving skills through the identification of health issues and appropriate mechanisms to address the issue of concern

Communities that have run healthy skin initiatives have reported that their ability to successfully implement such a program has given them the confidence to identify other health priorities. Community members have also been called upon to share their success stories with other communities in the planning stages of their own skin health programs.

The feasibility study identified a need for basic evaluation techniques to be developed for healthy skin educational resources, as well as the need to develop best-practice principles for communicating health information in Indigenous settings. The documentation and formalising of such evaluation techniques and processes, in collaboration with Indigenous people who are producing educational resources, will help to build or strengthen existing individual capacity as well as increase the organisational capacity of the CRCATH.

Panama field trip

The feasibility study's project officer Norma Benger travelled to the San Blas Islands in Panama to take part in a whole-of-community scabies treatment program. Ms Benger reported back to the feasibility study team and advisory committee about the Panamanian trial methodology and community education, demonstrated how to identify the evidence of scabies and a scabies mite with the naked eye, and provided a sample of the new scabies lotion. It is hoped that this particular identification skill can be included in healthy skin community education and training programs conducted with Aboriginal communities in the near future.

Role of education institutions

The Bob Collins review into Indigenous education[84] made recommendations that health and education work more closely together. The existing Sport, Health and Physical Activity in Schools program has demonstrated how health and education can work together in such programs as Healthy School-Aged Screening. These and other programs, involving sport and recreation, could work with healthy skin programs.

Batchelor Institute of Indigenous Tertiary Education has indicated that a healthy skin program would fit with many of the competencies for environmental worker and health worker education. Batchelor Institute lecturers have shown a strong interest in the potential for a healthy skin project to be included as an assessable project for health worker and environmental health students. Discussions also indicated a potential to work across faculties to include students enrolled in courses offered by the faculties of Local Government, Education, and Media Studies. The rationale for a cross-faculty approach is that:

- students from the same community can work on planning a healthy skin project, bringing with them the different perspectives
- a hands-on experience of teamwork, project planning and project management would be provided
- working in groups will act as a support for individual students in their home environments and at the same time they would receive external support from the training institute

Discussions with Northern Territory Department of Education representatives responsible for Indigenous and health curriculums are willing to include a healthy skin focus in future programs.

The involvement of schools in successful healthy skin programs to date has been beneficial. Examples of how schools have contributed to the success are poster competitions and educational sessions. Early discussions with one school principal during the feasibility study explored the possibility of a healthy skin project being part of curriculums for science, art, English and maths.

Conclusions and Recommendations

Community members and health staff who have already implemented a healthy skin program were enthusiastic about the outcomes and keen to participate in a broader regional program. They clearly saw the advantages of a coordinated effort, citing frequent movement between communities for funerals and ceremonies as a potential source of re-infection. Communities who have not planned or run their own programs expressed interest in the program, but wanted to gain their own local experience before committing to a regional program. Supporting individual communities to plan, implement and evaluate their local community healthy skin program appears to be the most feasible option to extend the program. It is unlikely a coordinated regional program would be effective until the majority of communities have developed their own expertise.

Increasing the focus on diagnosis and effective management of crusted scabies within communities will also have a significant impact on reducing re-infection rates. One of the reasons for successfully maintaining low prevalence rates at Minjilang and Wadeye was identification and successful treatment of cases of crusted scabies. An education campaign for health staff to increase their awareness of the disease and correctly manage this infestation is required, as many cases of crusted scabies are currently misdiagnosed or completely missed. Community education to encourage people to present for effective treatment would be critical to achieving a successful outcome.

The cost of a coordinated Top End program requires further analysis, including a cost–benefit analysis of the impact of a reduction in prevalence of scabies and streptococcal pyoderma. Potentially, a coordinated program could occur across Northern Australia. There has been communication between health staff across Northern Australia as well as discussions between senior management of three state health departments (NT, WA and Queensland).

The feasibility study has identified a number of issues, some of which need further research to improve our understanding of the best ways to control skin infections and their associated complications. There is a clear direction for provision of support to several communities that requested information and assistance to plan their programs.

There are a number of options for progression of this study which are listed under the recommendations which follow. These could be considered independently or as a group.

Recommendations arising from the feasibility study

Recommendations for immediate research transfer and dissemination

It is evident from the work conducted for the Top End Healthy Skin feasibility study that there is a considerable body of information which needs to be rapidly disseminated to service providers. A number of specific dissemination activities which should be implemented in the short term:

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- Revision and updating of current clinical guidelines, such as the *CARPA Standard Treatment Manual* and THS's CDC guidelines for community control of scabies.
- Inclusion of information on scabies, streptococcal infections, crusted scabies, and existing community healthy skin programs in the 'Tropical Health Handbook' currently being produced by the Top End Division of General Practice for remote area GPs.
- Healthy skin seminars and discussions to be conducted throughout the Northern Territory as part of the CRCATH communication, research transfer and dissemination functions. Support for these should be sought from Territory Health Services and relevant non-government health service providers.
- Preparation of this report as a bound hard-copy and in an electronic format on the CRCATH website.
- Preparation of an easy-to-read short report in an appropriate style and format which might be widely distributed to communities which express interest in exploring community-wide approaches to addressing skin health problems and their sequelae.

Recommendations for further research

Research, evaluation and education project

The study concluded that a Top End healthy skin program is not feasible at the present time. However, a longer term research, evaluation and education project has been proposed that will:

- Provide information and technical advice based on existing knowledge for communities undertaking their own healthy skin programs.

- Evaluate new programs to increase clinical and public health knowledge of factors that contribute to, or are barriers to, successful programs.
- Provide training and employment in evaluation for two Indigenous research officers.

The project would be in three phases:

Phase 1	• development of research proposal, duration three months • commenced through CRCATH Director's discretionary funds • research proposal and feasibility study to be considered by the CRCATH Executive and Board in November 2001
Phase 2	• research, duration 12 months • subject to approval by CRCATH Board • funding with CRCATH funds and support from partner agencies, external funding will also be pursued
Phase 3	• coordinated Top End healthy skin program, duration unknown • implementation will depend on outcomes of phase two and available funding

A number of suitable personnel have been identified to commence work on the proposed strategic project. This will avoid long staff recruitment delays which often hinder commencement of projects of this nature. An appropriate project coordinator, Dr Christine Connors, with many of the skills and much of the experience required has been identified and recruited through the CRCATH Director's discretionary funds to commence the planning phase for this project.

Ms Loyla Leysley and Ms Norma Benger, two Indigenous project officers with extensive experience of working on research projects with communities and their health services and with developing and designing health promotional material, are available to work on this project. At the request of a number of Top End communities they have already made some visits to assist in developing local community-initiated skin health activities. It is anticipated that these community visits will continue during a two to three month planning phases.

Ms Liz McDonald, an experienced Top End health professional with qualifications in public and tropical health, and experience and interest in both skin health and evaluation of health programs, has expressed an interest in undertaking a research degree focussing on the evaluation issues arising in skin health programs. She is currently seeking external scholarship support for such a degree.

Ms Danielle Smith, a CRCATH research scholar with experience and knowledge of community development methodologies and practice, has indicated a willingness to advise on community development aspects of this study. More extensive community development input to the project may need to be identified during the initial planning phase.

Phase 1: Planning of healthy skin project proposals

During the first three months of the project, the coordinator would work with Indigenous project officers currently employed by CRCATH and MSHR to:

- Establish an appropriate steering committee which will provide expert guidance and advice during the project's lifetime. This group would include representatives from CRCATH core partners, and include health service managers, service providers, and people with experience in evaluation, education, and community development.
- Develop the 12-month healthy skin project proposal, including the project work plan for phase two (see below). This would be presented to the CRCATH Board in November 2001, along with final report and recommendations from the feasibility study.
- Develop a pilot evaluation proposal and submit to the Top End Ethics Committee.
- Pilot the evaluation plan in one community undertaking the education stage of a healthy skin program. The evaluation would research:

  - factors contributing to success or failure
  - the roles of key people involved in initiating, planning and implementing the program
  - involvement of community organisations and individuals
  - knowledge, attitudes and health-related behaviours of community members and health staff about scabies and streptococcal skin infections
  - epidemiological evaluation of prevalence of skin infections
  - association between health hardware and people's capacity to wash children

  - impact of community involvement and participation in planning and running healthy skin programs on other aspects of health service delivery

- Identify needs and plan implementation of training and support for project officers.
- Prepare project milestones and timeframes.
- In conjunction with the project officers, share existing research knowledge with communities planning healthy skin programs.

Phase 2: Evaluation of research knowledge transfer

This is a proposed 12-month project to evaluate the application of current knowledge and how it is integrated into health service provision. Research activities would include:

- Community evaluation to assess critical factors in development, implementation and sustainability of community programs:

  - evaluate the capacity of communities to plan and implement their own programs
  - assess the effectiveness of different methods of delivering skin health messages
  - develop and evaluate the use of a directory of healthy skin resources, which would: identify the range of current resource materials used in healthy skin programs; document key message, media (video, poster etc.), delivery mode (individual, group, campaign), source/authors, development process, target group, availability and cost; assess each resource against educational criteria to be developed with CRCATH's Indigenous Health and Education Research program; and describe the use of healthy skin resources and their impact on community decision-making

- Evaluation of clinical knowledge:

  - analyse epidemiological data of prevalence of skin sores and scabies
  - evaluate different models of screening and determine how integrated they are in routine health service delivery
  - develop a research proposal to further the knowledge of crusted scabies in the community which would investigate: prevalence and clinical presentation of crusted scabies; association between crusted scabies and recurrent

childhood skin infection; effectiveness of community treatment of crusted scabies; and the impact of crusted scabies on sustainable healthy skin programs

- Training for Indigenous project officers:
  - provide support and training for the projects's project officers in evaluation methods
- Cost–benefit analysis of healthy skin programs:
  - A cost–benefit analysis of healthy skin programs and the impact of scabies and streptococcal pyoderma reduction on acute illness and associated chronic disease would be beneficial in developing the funding proposal for phase three (see below). Modelling of APSGN outbreaks with different disease prevalence and overcrowding would contribute to the analysis. A project officer with health economic knowledge would be required for three months to work collaboratively with a clinical adviser. THS has already indicated interest and the capacity to undertake this work as an in-kind contribution to the CRCATH. A concept paper to further expand this proposal will be developed by the Health Gains Unit of THS.

Phase 3: Develop a funding proposal for a Top End coordinated healthy skin program

Over the next 12 months, the knowledge generated by phases one and two would be used to determine the feasibility of implementing a region-wide Top End healthy skin program. The aim of phase three is to disseminate the research knowledge to a broader group with the potential for significant health gains.

The feasibility study identified that further research is required before a coordinated program is possible. This includes:

- identifying when communities obtain sufficient knowledge, experience and interest of healthy skin programs to enable high participation rates in a coordinated program
- further consultation and analysis of the support required to implement healthy skin programs in urban areas, particularly Darwin, with a high transient population

- how to involve relevant educational organisations, such as the Northern Territory Department of Education, Northern Territory University, Danila Dilba's training centre, Batchelor Institute, and the Centre for Remote Health, to incorporate research knowledge into curriculums and utilise the skills and experience of Indigenous students in contributing to planning
- the most effective strategies for an extensive promotion
- consultation with Central Australian organisations and communities to assess community interest and support for participating in a Northern Territory program
- assessing the potential for involvement of communities across Northern Australia

Supporting projects: Scabies and other skin health related projects in the CRCATH Biomedical Research program

The CRCATH supports ongoing research into scabies, which is largely funded by NHMRC and conducted by MSHR, with a focus on ivermectin resistance of scabies. These research projects are already in-kind contributions to the CRCATH Biomedical Research program. The CRCATH monitors the outcomes of this research to ensure appropriate dissemination and uptake of research findings.

Immediate budget issues

The full budget needs (and sources) to support the project proposals outlined above will not be prepared until the coordinator develops the detailed proposals. At this stage, the immediate budget implications are likely to be along the following lines:

Coordinator position (funded at CRCATH Director's discretion)
Public health physician 0.5 FTE for three months
$16,088 (salary, operational and on-costs) 0.3 FTE
0.2 FTE in-kind support from THS

Indigenous project officers: three months
$6884 (salary, on-costs) CRCATH project officer
in-kind support from MSHR for second project officer
operational costs: $5600 for five community visits for two project officers

Appendixes

Appendix 1: Project introduction letter

Cooperative Research Centre for Aboriginal and Tropical Health

October 5,2000

Dear Chairpersons

"Healthy Skin Top End Coordinated Program"

The Cooperative Research Centre for Aboriginal and Tropical Health (CRCATH) has recently commenced a feasibility study to explore with community members and relevant organisations the possibilities of a broad based community approach to skin health.

Enthusiasm for Healthy Skin Programs has been growing in recent times and a number of larger communities have already run successful programs.

These programs at Galiwin'ku,Maningrida, Yuendemu, Kunbarrllanjanja and Wadeye have all used a community development model of planning and participation to effect a reduction in the rate of scabies infestation. The programs have all had an impact of boosting moral about the ability of communities to intervene with a major health concern.

The Project Officers Norma Benger and Michelle Dowden may be able to travel to your community or organisation to deliver a small presentation about these Healthy Skin Programs. They are looking at what support the Community Health Centres and communities need if they are interested in running similar programs. The information shared during these sessions will include the successful strategies used such as social activities, school poster competitions, community education and "No Work Days".

We look forward to meeting with you either in person or by phone and hope you can find the time consider the possibility of Healthy Skin in the Top End!

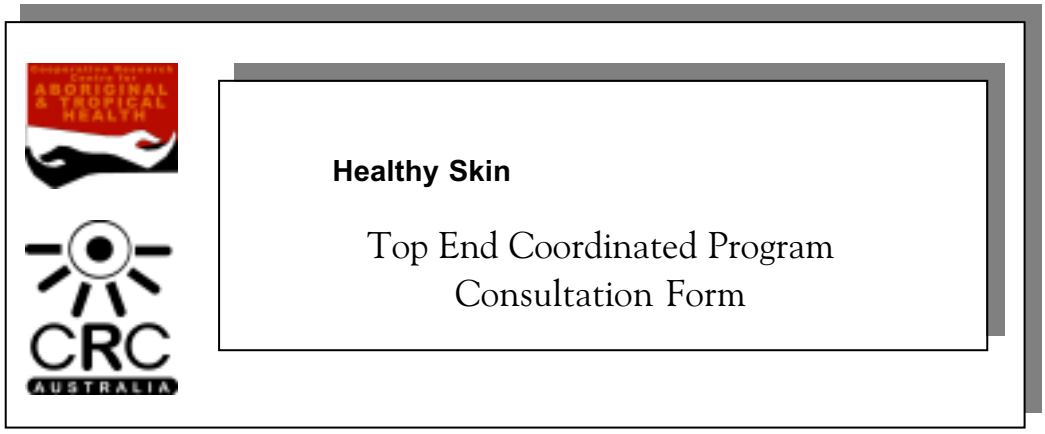
Yours sincerely,

Dr Christine Connors,
Chair Steering Committee, Healthy Skin Advisory Group.
Ms Norma Benger Ms. Michelle Dowden
Healthy Skin Project Officer. Healthy Skin Project Officer.

Cooperative Research Centre for Aboriginal and Tropical Health

PO Box 40196 Casuarina NT 0811

Appendix 2: Top End coordinated program consultation form



Community

Date

Name(s) **Position**

Knowledge of Healthy Skin Programs

1. *Perception of skin health problems and the connection with other health outcomes*

2. *Has the community run any programs similar to the Scabies Eradication days?*

3. *Who helped with the planning process?*

4. *Level of community support,.i.e. what group's etc, can and will work together?*

5. *Consent issues, i.e. does the community have a problem with data from skin health programs being disseminated across the Top End.*

6. *What kind of support would the community need to run a healthy skin program?*

7. *What season or time of year would be the most favourable to run a skin health program?*

8. *Does the community have connections with others? Would the community see any benefit in running a healthy skin program on the same day as another community or the whole Top End?*

9. *Can you envisage any problems with running a broad-based program.*

10. *Does community have any resources on healthy skin that may be able to be used in a community education program?*

11. *View the video and look at flipchart concept.*

12. *Would these be useful?*

13. *Are the health workers aware of any people with crusted scabies living in the community?*

14. *Consultation feedback/ questions*

Thank you for your time

Comments & perceptions

Learnings & Reflections

Appendix 3. Consultations with participating communities, organisations, non-government organisations and other interested parties

Aboriginal medical services **Educational Institutes** Batchelor Institute of Indigenous Tertiary Education Kormilda College Nungalinya College St John's College	**Remote communities** Angurugu Health Centre Barrunga health Centre Batchelor Health Centre Beswick Health Centre Gapuwiyak Health Clinic Jabiru Council Kunbarrllanjanja Health Clinic & Council Manmoi Outstation Marngarr health Centre Millingimbi Health Centre & Council Ngukurr Health Centre & Community Peppimanarti, Community & Health Centre Ramingining Health Centre & Council Tiwi for Life Workers Wadeye Community
Non-government organisations Air North ATSIC Regional Council NT Heart Foundation Imparja Television KAB: Tidy Towns Workshop Strong Women, Strong Babies Workshop Teeba Radio TEDGP	**Government organisations/agencies** East Arnhem Health Development Team THS: Environmental Health East Arnhem CDC Darwin Rural Health Development Team Katherine Remote Health Development Team Rheumatic Heart Disease Control Committee

Appendix 4. A report of an exchange field trip to the San Blas Islands, Panama

By Norma Benger, Project Officer, Menzies School of Health Research, Darwin, December 2000

The exchange was taken in conjunction with the healthy skin feasibility study, undertaken for the Cooperative Research Centre for Aboriginal and Tropical Health in Northern Territory of Australia

Introduction

Scabies is an infestation caused by the mite *Sarcoptes scabiei* that burrows into the skin causing intense itching. These infestations can lead to bacterial skin infections, which can lead to serious complications, including blood poisoning and kidney damage. Infestation can be transmitted easily from person to person by physical contact, often spreading through entire households or whole communities. The treatment for scabies is a topical preparation which kills the mite and eggs. This topical application is used to treat both the infected individual and close family contacts. In spite of providing short-term benefits to Aboriginal people and their communities, in the Northern Territory improvements are difficult to sustain because of socio-economic disadvantage and high population mobility between communities. Whole-of-community treatment programs have proven successful in some Northern Territory communities in significantly reducing the prevalence rates of scabies.

A whole-of-community treatment approach was first conducted in 1991 on the San Blas Islands of Panama by Prof David Taplin of the University of Miami, Florida, and his associates. Their work demonstrated that a whole-of-community treatment program is capable of reducing high rates of endemic scabies. Their approach included an education program followed by treatment of all community members with a single-dose treatment of permethrin cream. All people arriving at the island were met at the airport and offered treatment. This community approach led to a significant and sustained reduction of scabies prevalence until the Panama invasion, when islanders lost access to both health services and medications.

An invitation was extended to Dr Shelley Walton of MSHR by Prof David Taplin to join the field epidemiology survey team (FEST) in the San Blas Islands to assist with the study of the trial of a new scabicide topical application. Dr Walton had previously collaborated with Prof Larry Arlian of Wright University, Ohio, and Prof Taplin. It was

also suggested by the FEST that an Indigenous Australian also attend to broaden the exchange.

My invitation to join the team was based on the fact that I had previously worked with Dr Walton on a scabies project to identify host specificity. Also, my then position as the Healthy Skin Feasibility Study project officer for the Top End was to explore different whole-of-community treatment program strategies.

The Healthy Skin Feasibility Study was funded by the Cooperative Research Centre for Aboriginal and Tropical Health (CRCATH). The purpose of the study was to explore all aspects of a broad-based approach to skin health in the Top End, to:

- determine the extent of interest and community support within Top End communities for a broad-based approach to skin health
- consult with key stakeholders and health staff in remote and urban areas to ascertain the number of Indigenous communities willing and able to support and access a broad-based healthy skin program
- to explore community and participant consent issues
- examine scientific protocols, including prevalence studies and specific treatment choices
- determine and document currently used community education and resource development

Before leaving Australia, the Top End Healthy Skin Feasibility Study team were developing consultation materials for use in Top End Aboriginal communities in the Northern Territory. I was, at that time, touching base with several Indigenous town camps in and around the Darwin area and scheduling meetings with interested people for my return from the Panama field trip.

Upon arrival in Miami, we were met by the team leader Prof David Taplin, a guide and a host. Our orientation as new field study team members included a tour of Miami, where we met previous team members and other research staff of the University of Miami.

The purpose of the exchange field trip to San Blas Islands (Kuna Yala)

The purpose of the trip to the San Blas Island (Kuna Yala) in the Republic of Panama, South America, was to:

- provide experience for the Top End Healthy Skin Feasibility Study of how effectively a community-based model operated during the trialling of a new scabietic treatment
- observe, first hand, another Indigenous culture that allowed a field study team into their community and lives
- observe issues concerning obtaining informed consent, ethics, cultural practices and community responsibility to its people
- observe the unique skills of the Kuna women who can see without any visual aids scabies mites and physically capture live scabies mites; I was extremely interested to learn these skills so that I could apply and teach this technique to Indigenous women living in remote and rural Aboriginal communities as a strategy to help with field diagnoses

Other issues that I wanted to explore included:

- the community's perspective of the study, especially in the area of the protection of culture from visiting influences
- the 'fit' between the study and the community agenda
- the thoughts of visitors to communities in general
- permit requirements and any other similarities that might be in common with rules and regulation for visitors to Top End communities
- negotiation and settlement processes

Of special interest also was the consultation and recruitment process used to engage Kuna people as field study team members and as subjects for the study. I wanted to understand the historical background of the study and relate their story to my work in Australia.

Finally, an important purpose of the trip for myself was to get to know the Kuna people. I was interested and wanted to learn about their land, culture, general health, life expectancy and compliance to medical advice, directions and medication. It was important that this field trip was viewed as an exchange and sharing of skin health and other knowledge. I wished to share with Kuna people some of my culture's history, where we are at present and where we hope to be in the future, especially the skin health of Indigenous Australians.

Objectives

During a meeting with the Top End Feasibility Study project leader, supervisors team members and the CRCATH Director it was agreed that I should focus on, and observe all aspects of the trial, in particular:

- public health care
- consultation processes
- barriers to the trial study
- ethics and informed consent issues

Kuna land, culture and people

Thatched dwellings of Ticantiki on the San Blas Islands.

Kuna Indians live on an archipelago in the San Blas Islands off the coast of Panama. To get there, I had to fly 45 minutes over thick rainforest, landing on a strip that ended just three metres before the sea.

The Island of Ticantiki is a ten-minute *kioka* (canoe) ride from the mainland. The island is roughly 20 hectares with an estimated population of 820 people. There is a 'Congresso' with a hierarchy of three chiefs, which runs the health centre in conjunction with the Panamanian Ministry of Health. The health clinic has one full-time nurse's aid, with the main clinic and the hospital located on a nearby island. Dr Marteneze is the Chief of Health for Kuna Yala health area, of which Ticantiki is a part, and is a local person from Ticantiki.

On arrival at Ticantiki, local community members unloaded all the study equipment and were paid promptly. This provides a source of extra income for the locals and also

provided an opportunity for the local people to be introduced to visiting field staff and to greet old friends and colleagues. The whole village comes out to observe the arrival of visitors.

The San Blas Island (Kuna Yala) study

The aim of the FEST was to evaluate the safety and clinical equivalence of a generic 5% permethrin cream versus 5% Elmite (permethrin) cream for the treatment of scabies. The evaluation was funded by Clay-Park Laboratories Inc./Agis Group of New York.

The principal investigator of the study was Dr Gregorio Martines Tomas, Chief Medical Doctor of Panama's regional health system of Kuna Yala. Dr Tomas is currently one of four Kuna doctors for the whole of the Kuna Yala region.

The study methodology was based on a model[27] which identifies community ownership and participation of the study as key elements for program success. The community-based model demonstrates that the benefits of local community ownership and involvement in the study include:

- the creation of employment opportunities for Kuna women
- free medication for the treatment of scabies to the patient and their family members
- the presence of a doctor in the community (not normally the case)

Local Kuna people recruited subjects for the study for treatment and follow-ups after treatment, and undertook general coordination of workers and study subjects. Consent was gained from participants in both Spanish and the local dialect of Tule.

Recruitment of subjects involved walking around the community (house to house) with Kuna women, talking with mothers about the study, looking for mites and then going over the consent form once a mite was sighted. The mothers were then asked to take the children to the clinic the next day to see the study doctor. If mothers gave their consent, their child was examined and an appropriate time was made for treatment that evening before the subjects went to bed, usually between 6.30 and 7.00 pm.

Gifts were then given to each participating household and child. The gifts consisted of small toys, plates, cups or other items that are not readily available to the village community, and offered an incentive to be a part of the study.

The treatment program

Kuna assistant, FEST supervisor and children: application of the topical scabies lotion.

The treatment involved the whole team working during the night with torches and lamps visiting participants' homes (grass huts) to supervise the treatment. The medication was applied by the local assistants and supervised by the study team. Forty subjects were recruited and treated.

The topical scabicide lotion was applied to the head and the whole body avoiding the facial area. The treatment process had to be quick as other subjects were waiting and some children had to be woken up as they go to sleep as soon as the sun sets. The subject's family and whoever else needed treatment were treated with a non-study medicine of permethrin cream 5%. Every tube of medication, study and non-study, was collected and taken back to the clinic for disposal.

Public health care notes

- Health posters at the clinic were not very clear.
- Full-time nurse's aide.
- Health issues highlighted and discussed by the community health committee.
- Traditional medicine is available but costs are expensive.
- Community people seemed to own the project and managed the consultation process, recruitment process and the treatment schedules.

- Total number of clinics for the Kuna Yala regional health system is 19 to 20.
- The FEST provided assistance with establishing and securing essential equipment and health infrastructure, such as much needed solar lighting in the clinic. They also moved the clinic to a new building and encouraged the formation of a community health committee in 1985.

Ticantiki Island Health Clinic.

Consultation

Consultations were conducted by Kuna field assistants and involved visiting the homes of potential participants to talk about the study. The Kuna assistants provided an explanation of the study to potential participants in Spanish and the local dialect of Tule. Medical checks were conducted at the health clinic by the local Kuna doctor.

Observing the capture of the scabies mite: Kuna women can actually see the mite under the surface of the skin; the mite is then removed with a sterile needle by digging it painlessly out of its burrow.

Ethics and consent issues

Professor Taplin's study was approved by the Panamanian Ethics Review Board. Consent was gained by obtaining approval from the Kuna Yala Ministry of Health. The Health Ministry was also responsible for scrutinising the study to ensure the ethical protection of the study's participants. All study information and details were provided verbally in the people's own language. Both the investigators and community health workers spoke with local people about the study to make sure participants were aware that they could decline to be a part of the study at any time if they so wished. They were encouraged to ask questions. A consent form was filled out at this time by participants and guardians.

I observed the process of gaining consent after a mite was captured: The health worker talked to each person and they understood what the study was trying to achieve and were well informed. All participants presented at the health clinic next morning for their medical examinations.

Inclusion and exclusion in the study

Inclusion or exclusion in the study was based on:

- the guardian and subject had been informed about the study
- a scabies mite had been found on a subject
- participants had to be at least two years of age

- participants agreed to follow-up visits
- participants were healthy at the medical examination
- participants agreed not to use any other medication while participating in the study

Barriers

During the Panama field trip barriers which hindered my ability to work and learn effectively included:

- Language: some people only spoke Tule and some only spoke Spanish, making communication not impossible, but very difficult.
- I was not encouraged to mix with Kuna people after hours.
- I was not allowed to video the study or the Indigenous community except when the community had a parade.
- The use of a camera was also limited.
- Homesickness.
- Constant fear of getting an illness.

Project Officer Norma Benger captures a scabies mite: 'The first time I caught a scabies mite was so exciting that we all cheered when I had it on the end of the needle. For the first time I could actually see the mite with my own eyes, I always believed that the scabies mite could only be seen through the lens of a microscope. I felt that I could now use my new-found skills back in Australia. I could now show Australian people, with reasonable eyesight, the actual mite. This could be a useful tool to help with the education and diagnoses of scabies infestation. This skill and ability is why the Kuna community owned the project: they were the ones catching the mite and leading us from hut to hut.'

Conclusion

I strongly believe that the whole study relied on the skills of the Kuna people who were involved in all aspects of the trial. In the future I can see Kuna people planning and implementing their own trials and securing added benefits for the community by attracting funding for their successful community-based programs.

The trip was very successful, both personally and professionally. I have observed how another Indigenous nation has been involved in a research study. I have witnessed how another Indigenous nation involves the whole community in a research study and how control and ownership remained with community people. As an Aboriginal person working in Indigenous health the positive experience and skills gained from the Panama field trip will be valuable tools that I draw upon and share with Top End Indigenous communities to achieve healthy skin.

In conclusion, I would like to say that this opportunity to participate in an international study will be with me for the rest of my life. Looking at the city of Panama and the Kuna Yala health system has allowed a view from another perspective. It has afforded a glimpse into the lives of other Indigenous people and has allowed me to compare the Kuna culture with my own work with my own people.

It certainly was an eye opener for me to see a community with no real health system in place. I take health care as a human right and probably take it for granted that it will always be free of charge if needed. Our country has good immunisation practices, healthy foods in cities, and a welfare system for those less fortunate. But even with those health systems in place, our people still have poor health outcomes. It gives me hope and takes a little away at the same time.

My new-found skills and experience will not go to waste! As an Aboriginal person working in Indigenous health, all aspects of achieving the goal of decreased prevalence rates of scabies and skin infections in Aboriginal communities will benefit from the positive experience I gained from direct participation in the San Blas Islands (Kuna Yala) field trip exchange.

References

1. Green AC, Kaminski GW. *Trichophyton rubrum* infections in Northern Territory Aborigines. *Aust J Dermatol*. 1973;**14**:101–20.
2. Breinl A, Holmes M. Medical report on the data collected during a journey through some districts of the Northern Territory. *Bull of the Northern Territory*. 1915;**15**:1–8.
3. Hackett C. Boomerang legs and yaws in Australian Aborigines. *Trans Roy Soc Trop Med Hyg*. 1936;**30**:137–50.
4. Currie B. Medicine in tropical Australia. *Med J Aust*. 1993;**158**:609–15.
5. Basedow H. Diseases of the Australian Aborigines. *J Trop Med Hyg*. 1932;**35**:177–85.
6. Ford E. Medical conditions on Bathurst and Melville Islands. *Med J Aust*. 1942;**2**:235–8.
7. Green AC. Australian Aborigines and psoriasis. *Aust J Dermatol*. 1984;**25**:18–24.
8. Porter M. An epidemiological approach to skin disease in the tropics. *Tropical Doctor*. 1977;**7**:59–66.
9. Munoz E, Powers J, Nienhuys T, Mathews J. Social and environmental factors in 10 Aboriginal communities in the Northern Territory: relationship to hospital admissions of children. *Med J Aust*. 1992;**156**:529–33.
10. Harris M, Nako D, Hopkins T, Powell D, Kenny C, Carroll C, Carroll K. Skin infections in Tanna, Vanuatu in 1989. *P N G Med J*. 1992;**35**:137–43.
11. Gibbs S. Skin disease and socioeconomic conditions in rural Africa: Tanzania. *Int J Dermatol*. 1996;**35**:633–9.
12. Bailey R, Downes B, Mabey D. Trachoma and water use: a case-control study in a Gambian village. *Trans Roy Soc Trop Med Hygiene*. 1991;**85**:824–8.
13. Taplin D, Lansdell L, Allen A, Rodriguez R, Cortes A. Prevalence of streptococcal pyoderma in relation to climate and hygiene. *Lancet*. 1973;**1**:501–3.
14. Nelson KE, Bisno AL, Waytz P, Brunt J, Moses VK, Haque R. The epidemiology and natural history of streptococcal pyoderma: an endemic disease of the rural southern United States. *Am J Epidemiol*. 1976;**103**:270–83.
15. Ferrieri P, Dajani A, Wannamaker L, Chapman S. Natural history of impetigo I: Site sequence of acquisition and familial patterns of spread of cutaneous streptococci. *J Clin Invest*. 1972;**51**:2851–62.
16. Mahé A, Prual A, Konaté M, Bobin P. Skin diseases of children in Mali: a public health problem. *Trans Roy Soc Trop Med Hyg*. 1995;**89**:467–70.

17. Gracey M, Williams P, Houston S. Environmental health conditions in remote and rural Aboriginal communities in Western Australia. *Aust NZ J Public Health*. 1997;**21**:511–8.
18. Carapetis JR, Connors C, Yarmirr D, Krause V, Currie BJ. Success of a scabies control program in an Australian Aboriginal community. *Pediatr Infect Dis J*. 1997;**16**:494–9.
19. Dowden M. Scabies eradication day: Galiwinku community. *The Chronicle*. 1999;**2**:1,12.
20. Central Australian Rural Practitioners Association. *CARPA Standard Treatment Manual*. 3rd ed. Alice Springs: Central Australian Rural Practitioners Association; 1997.
21. Writing Group. Skin, muscle and bone infections. In: *Therapeutic Guidelines: Antibiotic*. North Melbourne: Therapeutic Guidelines; 1998:174–96.
22. Guidelines Standards and Audit Team. Remote Area Adult Chronic Disease Management Guidelines. Territory Health Services, Darwin 1998:73–6.
23. Guidelines for community control of scabies and skin sores. *Northern Territory Communicable Diseases Bulletin*. 1997;**4**(3):15–8.
24. Currie B, Huffam S, O'Brien D, Walton S. Ivermectin for scabies. *Lancet*. 1997;**350**:1551.
25. Walton SF, Currie BJ, Kemp DJ. A DNA fingerprinting system for the ectoparasite *Sarcoptes scabiei*. *Mol Biochem Parasitol*. 1997;**85**:187–96.
26. Huffam SE, Currie BJ. Ivermectin for *Sarcoptes scabiei* hyperinfestation. *Int J Infect Dis*. 1998;**2**:152–4.
27. Taplin D, Porcelain SL, Meinking TL, Athey RL, Chen JA, Castillero PM, Sanchez R. Community control of scabies: a model based on use of permethrin cream. *Lancet*. 1991;**337**:1016–8.
28. Walton S, Bonson A, Currie B, Kemp D. Endemic scabies in dogs and people are different. *Northern Territory Communicable Diseases Bulletin*. 1998;**5**(3):15.
29. Meinking TL, Taplin D, Hermida JL, Pardo R, Kerdel FA. The treatment of scabies with ivermectin. *N Engl J Med*. 1995;**333**:26–30.
30. Huffam S, O'Brian D, Currie B. Mangement of patients in hospital with crusted scabies. *Northern Territory Communicable Diseases Bulletin*. 1997;**4**(2):7.
31. Lawrence GW, Sheridan JW, Speare R. We can get rid of scabies: new treatment available soon. *Med J Aust*. 1994;**161**:232.
32. Van Buynder PG, Gaggin JA, Martin D, Pugsley D, Mathews JD. Streptococcal infection and renal disease markers in Australian Aboriginal children. *Med J Aust*. 1992;**156**:537–40.

33. Nimmo G, Tinniswood R, Nuttall N, Baker G, McDonald B. Group A streptococcal infection in an Aboriginal community. *Med J Aust*. 1992;**157**:521–2.
34. Streeton CL, Hanna JN, Messer RD, Merianos A. An epidemic of acute post-streptococcal glomerulonephritis among Aboriginal children. *J Paediatr Child Health*. 1995;**31**:245–8.
35. Gardiner DL, Sriprakash KS. Molecular epidemiology of impetiginous group A streptococcal infections in Aboriginal communities of northern Australia. *J Clin Microbiol*. 1996;**34**:1448–52.
36. Kelly C, Taplin D, Allen A. Streptococcal ecthyma: treatment with benzathine penicillin G. *Arch Dermatol*. 1971;**103**:306–10.
37. Allen A, Taplin D, Twigg L. Cutaneous streptococcal infections in Vietnam. *Arch Dermatol*. 1971;**104**:271–80.
38. Allen A, Taplin D. Skin infection in Eastern Panama: survey of two representative communities. *Am J Trop Med Hyg*. 1974;**23**:950–6.
39. Rogers M, Dorman D, Gapes M, Ly J. A three-year study of impetigo in Sydney. *Med J Aust*. 1987;**147**:63–5.
40. Ferrieri P, Dajani A, Wannamaker L. A controlled study of penicillin prophylaxis against streptococcal impetigo. *J Infect Dis*. 1974;**129**:429–38.
41. Gogna NK, Nossar V, Walker AC. Epidemic of acute poststreptococcal glomerulonephritis in Aboriginal communities. *Med J Aust*. 1983;**1**:64–6.
42. Carapetis J. An outbreak of acute poststreptococcal glomerulonephritis in an Aboriginal community. *Commun Dis Intell*. 1995;**19**:140–2.
43. Carapetis JR, Wolff DR, Currie BJ. Acute rheumatic fever and rheumatic heart disease in the Top End of Australia's Northern Territory. *Med J Aust*. 1996;**164**:146–9.
44. Carapetis JR, Currie BJ. Preventing rheumatic heart disease in Australia. *Med J Aust*. 1998;**168**:428–9.
45. Richmond P, Harris L. Rheumatic fever in the Kimberley region of Western Australia. *J Trop Pediatr*. 1998;**44**:148–52.
46. Carapetis JR, Walker AM, Hibble M, Sriprakash KS, Currie BJ. Clinical and epidemiological features of group A streptococcal bacteraemia in a region with hyperendemic superficial streptococcal infection. *Epidemiol Infect*. 1999;**122**:59–65.
47. Wheeler M, Roe M, Kaplan E, Schlievert P, Todd J. Outbreak of group A streptococcus septicemia in children: clinical, epidemiologic, and micriobiological correlates. *JAMA*. 1991;**266**:533–7.

48. Stevens DL. Invasive group A streptococcus infections. *Clin Infect Dis*. 1992;**14**:2–11.
49. Carapetis J, Robins-Browne R, Martin D, Shelby-James T, Hogg G. Increasing severity of invasive group A streptococcal disease in Australia: clinical and molecular epidemiologic features and identification of a new, virulent M-nontypable strain. *Clin Infect Dis*. 1995;**21**:1220–7.
50. Kiska DL, Thiede B, Caracciolo J, Jordan M, Johnson D, Kaplan EL, Gruninger RP, Lohr JA, Gilligan PH, Denny FW, Jr. Invasive group A streptococcal infections in North Carolina: epidemiology, clinical features, and genetic and serotype analysis of causative organisms. *J Infect Dis*. 1997;**176**:992–1000.
51. Cleary PP, Kaplan EL, Handley JP, Wlazlo A, Kim MH, Hauser AR, Schlievert PM. Clonal basis for resurgence of serious *Streptococcus pyogenes* disease in the 1980s. *Lancet*. 1992;**339**:518–21.
52. Hoy WE, Mathews JD, McCredie DA, *et al.* The multidimensional nature of renal disease: rates and associations of albuminuria in an Australian Aboriginal community. *Kidney Int*. 1998;**54**:1296–304.
53. Goodfellow AM, Hoy WE, Sriprakash KS, Daly MJ, Reeve MP, Mathews JD. Proteinuria is associated with persistence of antibody to streptococcal M protein in Aboriginal Australians. *Epidemiol Infect*. 1999;**122**:67–75.
54. Potter E, Lipschultz S, Abidh S, Poon-King T, Earle D. Twelve to seventeen year follow-up of patients with poststreptococcal acute glomerulonephritis in Trinidad. *N Engl J Med*. 1982;**307**:725–9.
55. Carapetis JR, Currie BJ. Group A streptococcus, pyoderma, and rheumatic fever. *Lancet*. 1996;**347**:1271–2.
56. Carapetis JR, Currie BJ, Kaplan EL. Epidemiology and prevention of group A streptococcal infections: acute respiratory tract infections, skin infections, and their sequelae at the close of the twentieth century. *Clin Infect Dis*. 1999;**28**:205–10.
57. Urdahl KB, Mathews JD, Currie B. Anti-streptokinase antibodies and streptokinase resistance in an Aboriginal population in northern Australia. *Aust NZ J Med*. 1996;**26**:49–53.
58. Green AC, Kaminski GW. Australian Aborigines and their dermatophytes. *Aust J Dermatol*. 1977;**18**:132–6.
59. Jose D, Welch J. Studies of Australian Aboriginal children: streptococcal infection, heart reactive antibody and subclinical rheumatic carditis. *Aust Pediatr J*. 1969;**5**:209–18.

60. Ferson M, Walker A, Withnall K. Skin infections and infections in Aboriginal child inpatients of Royal Darwin Hospital. *Australian Aboriginal Studies*. 1989;**2**:68–70.
61. Ellis D, Watson A. Systemic antifungal agents for cutaneous fungal infections. *Australian Prescriber*. 1996;**19**:72–5.
62. Suchil P, Gei FM, Robles M, Perera-Ramirez A, Welsh O, Male O. Once-weekly oral doses of fluconazole 150 mg in the treatment of tinea corporis/cruris and cutaneous candidiasis. *Clin Exp Dermatol*. 1992;**17**:397–401.
63. Currie B. Melioidosis and the monsoon in tropical Australia. *Commun Dis Intell*. 1996;**20**:63.
64. Georghiou PR, Blacklock ZM. Infection with *Nocardia* species in Queensland. A review of 102 clinical cases. *Med J Aust*. 1992;**156**:692–7.
65. Huffam SE, Nowotny MJ, Currie BJ. Chromobacterium violaceum in tropical northern Australia. *Med J Aust*. 1998;**168**:335–7.
66. Santos LD, Arianayagam S, Dwyer B, Lee K, O'Kane G, Withnall K, Currie B. Chromoblastomycosis: a retrospective study of six cases at the Royal Darwin Hospital from 1989 to 1994. *Pathology*. 1996;**28**:182–7.
67. Pinn TG. Sporotrichosis in a Queensland bushwalker. *Med J Aust*. 1998;**169**:287–8.
68. Huffam S, Krause V, Fong J, Currie B. Six new cases of leprosy diagnosed in the NT in 1996. *Northern Territory Communicable Diseases Bulletin*. 1996;**3**(2):1–3.
69. Guidelines for the control of acute post-streptococcal glomerulonephritis. *Northern Territory Communicable Diseases Bulletin*. 1997;**4**(2):5–6.
70. Rheumatic fever and rheumatic heart disease. Report of a WHO Study Group. *World Health Organ Tech Rep Ser*. 1988;**764**:1–58.
71. WHO Cardiovascular Diseases Unit. WHO programme for the prevention of rheumatic fever/rheumatic heart disease in 16 developing countries: report from Phase I (1986–90). *Bull World Health Organ*. 1992;**70**:213–8.
72. Hart RF, Ring I, Runciman C. Public hospital activity, expenditure and staffing levels for indigenous and nonindigenous settlements in remote Queensland. *Aust J Public Health*. 1993;**17**:325–30.
73. Burns CB, Clough AR, Currie BJ, Thomsen P, Wuridjal R. Resource requirements to develop a large, remote Aboriginal health service: whose responsibility? *Aust NZ J Public Health*. 1998;**22**:133–9.
74. Australian Bureau of Statistics. *Australian Social Trends.* 2000.
75. Runcie M, Balilie R. *Evaluation of Environmental Health survey Data: Indigenous Housing.* Darwin: Menzies School of Health Research, 2000.

76. Bartlett B, Duncan P. Top End Aboriginal Health Plan. Report to the Top End Regional Indigenous Planning Committee of the Northern Territory Aboriginal Health Forum. Planhealth Pty Ltd, 2000.
77. Arnold M, Allen J. Maningrida Strong Skin Project May–June 2000.
78. Pholeros P, Rainow S. Torzillp P. *Housing for Health: towards a healthy living environment for Aboriginal Australia.* Sydney: Bridge Printery, 1993.
79. Mokak H, Sibthorpe B, Condon J, Dowden M. Scabies control program in an Aboriginal community. Unpublished thesis, Master of Applied Epidemiology. Australian National University, 1999.
80. Harris G, ed. *Environmental Health Handbook: A practical manual for remote communities.* Darwin: Menzies School of Health Research, 2000.
81. Pawlson, Tilley. *Realistic Evaluation.* London; Thousand Oaks, California: Sage, 1997.
82. NSW Health. *Indicators to help with CAPACITY BUILDING in Health Promotion.* North Sydney: NSW Health Department State Health Publication, 1999.
83. Local Evaluation Team Katherine West Coordinated Care Trial. *Jintangku Miyrta Katherine West Coordinated Care Trial Local Evaluation Final Report.* Darwin: Menzies School of Health Research, 2000.
84. Collins, R. *Learning Lessons: Independent Review into Aboriginal Education in the Northern Territory.* Darwin: Northern Territory Education Department, 2001.
85. Currie BJ, Carapetis JR. Skin infections and infestations in Aboriginal communities in northern Australia. *Australas J Dermatology* 2000; **41**(3):139–45.