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Medicinal plants of Papua New Guinea's Miu speaking population and a focus on their use of plant–slaked lime mixtures

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ABSTRACT

Ethnopharmacological relevance: Here we present the results of an ethnobotanical survey of the medicinal plants used by the Miu, a virtually unresearched ethnolinguistic group who live in the mountainous interior of Papua New Guinea's West New Britain Province. We compare the findings for those previously reported for the neighbouring inland Kaulong speaking population. Three species, *Trema orientalis*, *Spondias dulcis* and *Ficus botryocarpa* are used in combination with locally prepared slaked lime to produce intensely coloured mixtures which are applied to dermatological infections. Their effects on dermal fibroblast viability with and without slaked lime are examined. The sap of *F. botryocarpa* which is used to treat tropical ulcers was examined further with assays relevant to wound healing.
Materials and methods: Focus groups and semi-structured interviews were used to acquire information on the uses of plants, vouchers of which were collected and identified by comparison with authentic herbarium specimens. LC–MS and NMR were used to identify chemical components. Cell viability assays were used to examine the effects of added slaked lime on dermal fibroblasts. For the sap of *F. botryocarpa*, fibroblast stimulation assays and antibacterial growth inhibition with *Bacillus subtilis* were carried out.
Results: The survey identified 33 plants and one fungal species, and clear differences with the inland Kaulong group despite their close proximity. Added slaked lime does not greatly increase the cytotoxicity of plant material towards dermal fibroblasts. The sap of *F. botryocarpa* contains the alkaloid ficuseptine as a single major component and displays antibacterial activity.
Conclusions: The results demonstrate the potential for variation in medicinal plant use amongst Papua New Guinea's numerous language groups. The addition of slaked lime to plant material does not appear to present a concern for wound healing in the amounts used. The sap of *F. botryocarpa* displays antibacterial activity at concentrations that would occur at the wound surface and could be used as a highly accessible alternative to conventional antiseptics for remote communities in Papua New Guinea.

1. Introduction

New Guinea contains some of the last large areas of continuous tropical forest remaining in the world, possessing biodiverse forests that are relatively little studied botanically and inhabited by diverse ethnolinguistic groups speaking over 1000 different languages (Foley, 2000; Iamo, 2010). In previous work we surveyed the medicinal plants used by the inland Kaulong who live in the mountainous interior of the island of New Britain (Prescott et al., 2012), in the present study we examine the medicinal ethnobotany of the neighbouring Miu speaking population.

The Miu inhabit the foot hills of the Whiteman Range in the Kandrian inland region in Papua New Guinea's West New Britain Province (Fig. 1); 1980s census figures suggest a population of approximately 400 people (Throop and Throop, 1980). The Whiteman Range forms part of the central mountain range that bisects the island of New Britain. There are no detailed ethnographic studies of the Miu; an anthropologist Ann Chowning who lived amongst the neighbouring Kaulong and Sengseng groups in the 1960s describes the Miu at the time as not yet under government control and "pacification" (Chowning, 1985). Archaeological evidence from sites 25 km to the east suggest the interior of New Britain may have been inhabited as early as 35,000 years ago, making it amongst the longest inhabited rainforests in the world (Palvides, 1994). In the southern part of their territory the Miu live in permanent villages situated in relatively flat ground amongst degraded forest. The Miu territory extends further northwards into the Whiteman Range whereupon the terrain gives way to mountainous limestone karst permeated with numerous sinkholes and covered with primary rainforest. Surface water is

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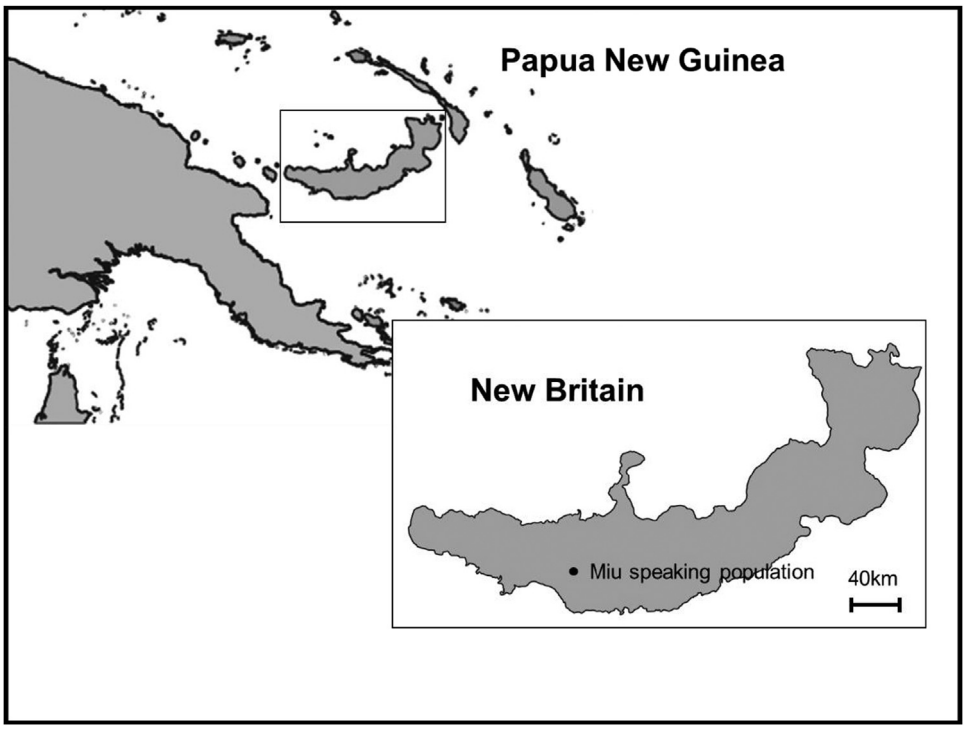

Fig. 1. Location of the Miu speaking population on the island of New Britain.

scarce as rivers run under the ground through limestone caves. In this more rugged terrain, the Miu live in small hamlets or temporary encampments often consisting of single family units. The Miu share certain customs with other groups of the Kandrian inland region, notably the use of blow pipes to hunt small game animals, the practise of blackening their teeth with local mineral deposits and the now outlawed custom of infant head binding which produces a distorted elongated adult head shape (Chowning, 1980; Goodale, 1985). The area receives little attention from the provincial government due to the difficulty in accessing the steep rugged terrain. Apart from a few aid posts in villages to the south, access to government healthcare is extremely limited.

As with the other populations in New Britain, common dermatological infections such as the tropical ulcer and tinea imbricata are widespread. The tropical ulcer is a debilitating condition caused by a polymicrobial infection of spirochaeate and fusiform bacteria (Adriaans, 1988; Falkler et al., 1989). Initial trauma in the form of a scratch develops into a circular lesion which is extremely painful and in some cases may require surgical intervention (Adriaans and Drasar, 1987). Treating tropical ulcers causes a considerable drain on government aid posts with some spending a third of their time and half their budgets treating the condition (Morris et al., 1989). By comparison tinea imbricata is a less debilitating condition, it is characterised by concentric rings of scaly plaques on the skin surface (Satter, 2009). The underlying cause would appear to be the dermatophyte fungus *Trichophyton concentricum* to which there is evidence of a genetically inherited susceptibility (Ravine et al., 1980). Like the tropical ulcer, tinea imbricata consumes a considerable amount of time of government aid posts with some communities experiencing infection rates reaching 30% (Jamison, 2006).

For populations such as the Miu, the inaccessibility of aid posts means that conditions such as the tropical ulcer and tinea imbricata are more likely to have reached a chronic state of infection before treatment is sought. Unlike conventional treatments prescribed in aid posts, plant based medicines are readily available in the surrounding environment. They therefore have a greater potential to treat the early stages of infection than conventional medications located many miles away in primary healthcare centres. Papua New Guinea has developed a national health plan which calls for the integration of effective plant medicines into the national health system with the aim of reducing healthcare costs and preserving traditional knowledge (Mann, 2007). Such medicines need to fall within acceptable parameters of safety. With this in mind we decided to evaluate plant-slaked lime mixtures used by the Miu to evaluate their effects on fibroblasts viability.

2. Materials and methods

2.1. Ethnobotanical data collection

Consent for this study was obtained from local participants and the government of Papua New Guinea prior to commencement. Informal semi-structured interviews and rainforest walks were conducted with key informants in the village of Miupark to establish a preliminary list of plant names with associated uses. A focus group was used to extend the list of names and collect more detailed use descriptions. This information was then verified against information collected in a separate focus group located several km north from which members of the first group were absent. All interviews were conducted in Neo-Melanesian language. As described previously, care was taken not to overly rely on data from any single informant (Etkin, 1993).

2.2. Collection and identification of plant material

Voucher specimens were collected from forest surrounding the village of Miupark in the presence of key informants and preserved in 70% methanol before pressing and drying. Identification of vouchers was carried out by comparison with authentic herbarium specimens at the Royal Botanic Gardens, Kew, UK and the National Herbarium, Lae, PNG where vouchers are lodged. In addition to voucher specimens, plant material for laboratory tests