

# **HEALTH EFFECTS OF HEAVY KAVA USE IN INDIGENOUS AUSTRALIANS**

**Submitted by**

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## STATEMENT OF AUTHORSHIP

Except where reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma.

The papers presented in this thesis consist of work of both joint authorship and sole authorship. In all instances, I am the primary author and have made the most substantial contribution to the work presented. Other authors that have also contributed to the work presented, and their contributions, are detailed here:

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This thesis includes material compiled during two periods of candidature for the PhD at the Northern Territory University. The first was from 1988-1991 and the second from 1999-2003. During the majority of these years, and the intervening years between the periods of candidature, the author lived and worked in the Arnhem Land region in Aboriginal communities where kava was used. The thesis includes observations, information and understandings gleaned during both periods of candidature spanning around 15 years of the short (21 years) history of kava use in Arnhem Land.

Thanks to the community Councils and the Aboriginal community residents in Arnhem Land where the author lived and worked since 1988.

Finally, thanks to A/Prof Ross Bailie who supervised the thesis.

## THESIS ABSTRACT

### Background

The psychoactive constituents of kava (*Piper methysticum* Forst. f.) have been used by humans as mood-altering agents for centuries. Kava's long history of use in Pacific island societies precedes its recent inclusion in western pharmacopoeia from the latter part of the nineteenth century. During the 1990s, the use of kava became more widespread around the world, especially as enthusiasm for herbal remedies in alternative therapies expanded rapidly in western countries.

Aboriginal people living in remote parts of Arnhem Land in the Northern Territory are now involved in the unfolding world history of kava and the international debate that surrounds it. From 1982, with little or no prior knowledge of kava use, some Arnhem Land Aboriginal people began to use dried powdered kava mixed with water. The population of kava using communities in Arnhem Land is small (just 7700 people) with the number of Aboriginal people who ever used it probably numbering no more than around 3100 by the end of the 1990s. Despite these very small numbers, information about kava drinking derived from research in these isolated Arnhem Land groups continues to have a considerable impact on the international debate about the health effects of its use.

Kava's health effects on individuals and communities in Arnhem Land became controversial soon after its introduction. However, there was a dearth of reliable epidemiological data until 1987 when a pilot survey was conducted in one community in eastern Arnhem Land. Kava users in that study were found to have a scaly skin, to be underweight and to have lower body fat. In this first community-based study of kava's effects, users showed biochemical changes in their blood suggesting increased risks of serious infectious disease and liver and kidney dysfunction. Some neurological functions appeared to be different in kava users. The pilot study influenced policy approaches to restrict kava supply in Arnhem Land in the early 1990s.



Kava use by Aboriginal people continued to be a cause for concern during the early 1990s, however, when clinical observations suggested that kava users were over-represented in admissions to hospital for pneumonia. There were also ongoing concerns for the nutritional status of kava users and their families, that some heavy users suffered unusual kinds of ‘fits’ or ‘seizures’ and that the incidence of sudden cardiac events was higher in young Aboriginal sportsmen who used kava.

These concerns paralleled rising concerns about social and economic effects of kava use. A rise in kava use appeared to coincide with emerging community dysfunction from 1982. Community and family life were reported to be disrupted by ‘excessive’ kava use apparently without social controls, and the economic hardships brought about by a vigorous informal, and later illegal, trade in the substance. The debate and commentary that flowed from these concerns influenced policy and helped to engender both legislative attempts by the NT Government (with bi-partisan support) to control kava supply and consumption; the first attempt in 1990, and the second in 1998.

## **Aim**

The main aim of this thesis is to provide information to more thoroughly describe kava’s health effects and to assist policy makers to gauge the health, social and economic effects of regulatory efforts. No epidemiological study has investigated kava’s health effects in Arnhem Land since 1987. In response to continued kava use, regulators have implemented controls on kava supply and distribution in the Northern Territory. However, few data are available to provide precise regulatory guidelines.

## **Methods**

Current patterns of kava consumption are described using data from sample surveys of communities in eastern Arnhem Land (the Miwatj Region). Using participant observation data gathered during 30 months residence in one western Arnhem Land community during 1989-1991, patterns of kava consumption in different social settings are described.

A cross-sectional study was conducted in one community in eastern Arnhem Land in 2000, in order to compare the results of the 1987 pilot study with kava's possible effects in the contemporary situation and to investigate a wide range of physical, biochemical, haematological, neurological, cardiovascular and nutritional indicators.

To assess the independent effect of kava use as a risk factor for pneumonia and ischaemic heart disease, two case-control studies were conducted concurrently. All admissions to hospital of individuals aged over 15 years for pneumonia and ischaemic heart disease from the Miwatj Region's communities for periods during the mid-1990s were studied. These admissions were compared with randomly-selected controls who were not admitted to hospital and matched for age, sex and home community.

Using historical records and information gathered during community consultation processes, a history of the development of the regulatory system now being implemented to control kava supply and distribution is provided. Some parameters useful to monitor the health and social effects of kava's continued use are outlined.

## **Results**

The study found no convincing evidence that kava use is associated with serious irreversible health effects.

In the cross-sectional study, kava users showed a characteristic 'dermopathy' (scaly skin) and increased levels of some liver enzymes and lower lymphocyte counts. These changes were found to be reversible with decreased exposure to kava or with stopping kava use. Markers of cardiovascular risk were increased across the population but were not elevated in kava users. Kava users displayed lipid profiles similar to those observed in *anorexia nervosa*. No evidence for long-term neurological damage was found in those who had, in some cases, used kava continuously for up to 18 years, since 1982 when it was first introduced to Arnhem Land. Average kava consumption reported in this study in 2000 was 118g/week which is considerably less than the average reported in the early 1990s (368g/week) and perhaps one-third the levels

reported in the 1987 pilot survey. The data indicate that in 1999, 53% of males and 27% of females were using kava.

Liver function changes observed in kava drinkers appear to be reversible with no evidence for long-term liver damage. Clinical surveillance in Arnhem Land over 20 years has not documented any fulminant hepatic failure attributable to kava use. This is despite Aboriginal kava drinkers consuming kava's psychoactive constituents in doses from 10-50 times the recommended therapeutic doses for herbal products. Why kava in the form of manufactured extracts could cause liver injury in some populations while there is no evidence for such concerns in Aboriginal kava users who use an aqueous extract of the dried crushed plant materials is not known and requires further research.

No convincing evidence was found that kava users were at an increased risk of ischaemic heart disease. This lack of an association, however, does not rule out the possibility of an increased likelihood of death from a sudden cardiac event in heavy kava users, especially in those who may already have established heart disease.

Similarly, no convincing evidence was found that kava users were at an increased risk of pneumonia. However, for both pneumonia and ischaemic heart disease the direction of non-significant associations suggested possible increased risks among kava users.

Public health concerns about kava use were intense in 1990-91 when in one western Arnhem Land community, around 70% of men and 62% of women were using kava at an average level of 368g/week of kava powder. This represented a dramatic increase from 1989-90 when 46% of men and just 13% of women were using it at an average rate of around 145g/week. This level of use was achieved when the NT Government first tried to regulate kava supply in 1990. The first regulatory system lacked suitable controls negotiated with Aboriginal communities specific to local geographical and social circumstances. Average amount of time/person spent drinking kava doubled between 1989-1990 and 1990-1991 and the proportion of the community's available cash spent on purchasing kava increased markedly. Heaviest consumption levels approached the highest known in Arnhem Land at the time (>610g/week).

## **Discussion**

On its face, this suggests that kava should be banned in Arnhem Land Aboriginal communities. However, people in some Arnhem Land communities decided in 1998 to continue to use kava under a system of controlled supply while others continued to use kava supplied by an illegal trade in kava with no regulation of supply. While this thesis shows no evidence that kava used in the way Aboriginal people have used it has irreversible effects, this is not to say that irreversible effects may emerge if it continues to be used in Arnhem Land. Ongoing monitoring of kava's effects is therefore essential. As a guide, it appears that kava's reversible health effects become more prominent when a community begins to consume it in the range of from 240-425g/week per person on average. The emergence of health effects is likely to accompany social effects and effects on community life with more than two-thirds of the men and more than half the women drinking kava and with around one-fifth of the kava drinkers spending more than 14 hours/week in kava drinking activities and with one-fifth of the available cash in a community used to purchase kava.

## **Summary of recommendations**

While no clear evidence for long-term irreversible effects of kava use by Indigenous Australians emerged in this study, some results are, nonetheless, suggestive of an increased risk in kava users of cardiovascular disease, serious infections and weight loss on a background of poor nutrition. Close monitoring for these potential adverse effects of kava use in Aboriginal communities is recommended in addition to initiatives encouraging moderation in consumption. Policy approaches should ensure that local community control is reinforced over the availability of kava and the profits acquired from any trade in kava.

## **THESIS PRESENTATION**

The thesis is presented as a series of papers including one review of literature pertinent to the topic, one description of the principal methods used, six empirical papers, and two papers and one commentary based on a recently-published editorial discussing policy issues addressing the central theme (see Appendix A for paper details). This is in accordance with the Northern Territory University's "Rules for the presentation of theses submitted for a professional doctorate or higher degree by research" (Appendix B) which provides for published papers to be included as an integral part of a thesis, with appropriate formatting (section 4.4). The Director of Postgraduate studies has recognised that this thesis is predominantly composed of published papers and has approved the thesis presentation (Appendix C).

All of the papers presented in this thesis have been submitted to, published in, or accepted for publication in journals that are listed by MEDLINE or are internationally refereed. To meet the requirement to have the same formatting throughout the thesis with consistent referencing style (Appendix C), it was decided to follow the uniform requirements for manuscripts submitted to biomedical journals, a format which uses the Vancouver referencing system.<sup>1</sup> Several of the papers were published in journals that do not use the Vancouver referencing style or use modifications of it. Therefore, the format of the final version of each paper may differ from the format of the paper presented in each chapter of the thesis.

Where the paper has been published, a copy or reprint is included in Appendix A. Where the paper is 'in press', a copy of the acceptance letter from the journal is contained in Appendix A. Where the paper has been submitted, a copy of the acknowledgment of receipt is contained in Appendix A. Figures and tables are placed in the text closest to the point at which they are first cited, to facilitate reading of the thesis. Also, where reference is made to the author's own published or 'in press' work, and where that work is contained within the thesis, the relevant chapter is cited. Again this is intended to facilitate reading of the thesis. A separate reference section for the discussions and conclusions chapter and for the introduction chapter is presented.

Figures, tables and pages are numbered from the beginning of each chapter. For example, chapter one, figure 1 is 'Figure 1-1' while chapter two, table one is 'Table 2-1' and so forth.

The papers presented here have been written as part of and in accordance with a publication strategy approved by the Postgraduate Studies Committee of the Menzies School of Health Research and which was accepted by the Committee along with the proposal for the thesis. Each paper has been written to form separate parts of a cohesive research study as well as individual or stand alone investigations. Four of the papers in the thesis provided essential information about the epidemiology of kava or about other substance use (Chapter 4, paper #3), exposure to kava use (Chapter 2, paper#1 and Chapter 3, paper#2) and the definition of kava using groups (Chapter 5, paper#4). This information provided the basis for further work of co-investigators concerning the neuropsychological effects of kava. Copies of these additional papers are included at Appendix A. The data available in Chapter 5, paper#4 and paper#5, have been used in an editorial introducing a discussion of kava's possible liver toxicity. This editorial, published with this author as second author, forms the basis for the discussion of the global controversy about kava's hepatic toxicity presented in Chapter 8 (page 8-62), and a copy is included at Appendix A.

The papers that constitute the thesis are presented in an order that will allow the reader to understand the context in which each investigation was undertaken and the inter-relationship between each paper. To assist with this, introductory notes are provided at the beginning of each chapter describing the relationships between the paper(s) in the chapter and those in the preceding chapters. The status of each paper (either published, 'in press' or submitted for publication, for example) is also stated at the beginning of each chapter.

The introduction includes a description of the overall aims and the background to the thesis as well as a general review of some of the pertinent literature. It includes a description of the principal study setting, the eastern Arnhem Land (Miwatj) region, and a general description of its population. While parts of the study contain information collected in, or referring to, other parts of Arnhem Land, the Miwatj region

was where most of the information was collected. The study design is summarised in the introduction and an outline of the thesis is provided. Along with the general discussion chapter, the introduction aims to integrate the material presented in the research papers. In the discussion and conclusions chapter, a summary of findings is presented in regard to the central themes of the thesis, and the implications of the work for future research and policy development.

All of the papers in this thesis resulted from a study of kava's health effects carried out by the Menzies School of Health Research which was funded by the National Health and Medical Research Council of Australia. While each paper provides a description of the protocol and methods used and the inclusion and exclusion criteria employed, the specificity of these descriptions may have been limited by the requirements of the journals to which they were submitted, and in the case of published or 'in press' papers, by revisions made in response to comments received from paper reviewers. Some of the specific studies may have focused on subsets of the whole study population depending upon the aims of the paper. As a result the numbers of subjects and definitions of groups from which data is reported and the reference dates for measuring exposures may vary between papers.

Ethical approvals for the research were provided by both the Joint Institutional Ethics Committee of the Royal Darwin Hospital and the Menzies School of Health Research and the Ethics Committee of the Northern Territory University. A special memorandum of understanding was negotiated with the Aboriginal community in which the cross-sectional study was conducted. A copy of this along with ethics approvals is provided at Appendix D.

## **References:**

1. International Committee of Medical Journal Editors. Uniform requirements for manuscripts submitted to biomedical journals. *Ann Intern Med* 1997;126:36-47.

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