

Symposium

Making the most of Papua New Guinea's biodiversity: Linking ethnomedicinal and botanical survey with pharmacological assessment in "the Land of the Unexpected"

Louis Barrows^a

^a Department of Pharmacology & Toxicology, College of Pharmacy, University of Utah Health Sciences Center, 50 North Medical Drive, Salt Lake City, Utah 84132.

Papua New Guinea (PNG) is characterized by geological, ethnic and biological diversity. It contains approximately 6% of the world's biodiversity in 1% of the world's land area. PNG is also a developing country heavily impacted by infectious diseases. A coordinated International Cooperative Biodiversity Group (ICBG) consisting of the University of Papua New Guinea (UPNG), the Papua New Guinea National Forest Research Institute (FRI), the Smithsonian Institution, Wyeth Research and the University of Utah (UU) links botanical and ethnomedicinal documentation with pharmacological assessment in order to foster conservation, health care and training opportunities in PNG. Legal initiatives supported by the PNG ICBG have been adopted by the Papua New Guinea Department of Environment and Conservation and have institutionalized prior informed consent and benefit sharing protocols for all new research efforts accessing PNG's genetic diversity. As part of the ICBG's research, UPNG and FRI herbaria faculty annually conduct the botanically guided collection of nearly 200 plants native to Papuaasia, each year yielding close to 1,000 fractions of various plant part extracts for pharmacological assessment. Taxonomic analysis of the collections shows that greater than 20% of the plants collected are endemic to Papuaasia. Analysis of the D'Entrecasteux Islands collection alone provided the first report of the genus *Tapeinochilos* there, and potential new species in the Meliaceae (*Chisocheton* sp.), Zingiberaceae (*Riedelia* sp.) and Annonaceae families. Over 1,400 voucher herbarium specimens from ICBG collections have been distributed to international herbaria by FRI. Fractionated extracts from the botanical collections are evaluated at UPNG and UU for anti-malarial, anti-TB, anti-HIV and cytotoxic activity. To date, close to 3,000 fractions have been tested in each of the assays, identifying 66 TB, 21 malaria and 107 HIV active fractions that are not cytotoxic to human T-cells at their effective concentrations. Some of these fractions were derived from large canopy trees such as *Rhus taitensis* (anti-malaria), and *Planchonia papuana* (anti-HIV), providing important non-timber value for these species. Other hits are from species related to plants used as traditional medicines elsewhere, such as *Mimusops elengi* and *Excoecaria agallocha* (anti-HIV), and *Evodia elleryna* (anti-TB and malaria), suggesting similar utility in PNG. Chemical evaluation of active fractions is identifying new chemicals with potential utility, such as several novel exocarpic acid derivatives from *Exocarpus latifolius* being pursued for utility against MDR TB. The PNG ICBG also supports a PNG Ministry of Health traditional medicines initiative to document and validate traditional medicines and to incorporate them into primary health care system. Ethnomedicinal surveys are conducted by trained senior UPNG pharmacy students in their home districts. The information is organized in a proprietary database at UPNG that may be accessed to identify potentially efficacious regional therapies that can be administered by traditional healers. There are currently more than 800 botanical therapies in the data base, the ICBG having supported all the surveys since 2003. The first traditional medicine selected by the Ministry of Health Traditional Medicines Taskforce for potential inclusion in the national formulary is an anti-inflammatory analgesic extract of the lichen *Parmelia* spp. UU scientists have identified several sentinel orsellinic acid compounds by liquid chromatography and mass spectroscopy, suitable for batch to batch verification, and are evaluating the purported activities in animal models. NIH's support of the PNG ICBG is paying big dividends: it is enabling the categorization and evaluation of PNG's biological resources; it is empowering scientist and students at national institutions; it is supporting forward-looking government initiatives; and it is working to improve healthcare for the society.

Selected references

1. Barrows, L.R., Powan, E., Pond, C.D., Matainaho, T. 2007. Anti-TB activity of *Evodia elleryana* bark extract. *Fitoterapia* 78:250–252