Nature's Medicine

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South Africa has a wealthy supply of plants. With about 25 000 known species found here, this country is third only to Brazil and Indonesia as far as biodiversity is concerned. Most people are unaware that a significant percentage of the active ingredients used in modern medicine originated from plants. For example, quinine, until fairly recently the most common treatment for malaria, is derived from the bark of the Cinchona plants while aspirin was developed from willow bark extract.

The goal of our research team is to scientifically explore and test South Africa's indigenous plants and see which of them could possibly provide chemical compounds that could be of benefit to all mankind. South African plants have been scientifically investigated for treating various diseases such as infectious diseases, cancer, skin-hyperpigmentation problems, melasma, periodontal diseases and acne. Steady progress in evaluating potential medicinal plants for product development with dermatological importance has been made.

A significant number of plants with potential inhibitory activity against *Propionibacterium acnes* are undergoing clinical studies. Colonization of this bacteria contribute to the etiology of the disease; 'Acne vulgaris' which is a most common skin disorder. Several agents with application for skin-disorders such as melasma, skin-hyperpigmentation etc. are close to being commercialised . Thus far, there has not been any product for combating these problems thus far from South African plants. We tested a sample, derived from an indigenous plant of South Africa, formulated into a cream by applying it on 25 healthy volunteers for skin-irritation studies at "Future Cosmetics" in Pretoria. The sample did not show any irritation effect, rather a soothing effect was observed. The samples were further subjected to clinical studies and have been recommended for their use for melasma and skin-toning purposes.

Identifying plants with medicinal value

Considering South Africa's immense biodiversity, particular methods are required in order to identify plants that may be of specific medicinal value. One such approach is ethno-botanical selection where the plant using habits of indigenous communities are studied. Indeed, it was the wealth of information that already existed on South Africa's folk medicine that served as the starting point for this kind investigation. First, the team observes which plants a community is using in their food and medicine. Those selected ones are then tested to see if one can validate their medicinal value.

The second approach for selecting appropriate plants is through the study of metabolic compounds that are found in them, or phytochemistry. Already existent knowledge of the chemical substances that are found in plants are used to identify any, that can be used for a specific purpose, such as lowering toxicity in the liver and therefore, as an adjuvant with anti-TB medicine. Once a compound is identified, it is isolated so that trials can begin to determine efficacy.

Using these methods, our research team has found promise in a plant traditionally used by indigenous communities to treat chest pains and the symptoms of TB. This plant has been

proven to reduce the liver toxicity caused by tuberculosis-drugs. If the outcomes of the testing continue to bare affirmative results in clinical studies, then the final step will be to develop a low cost herbal formula for inhibiting the toxic effects of isoniazide in anti-TB drugs. If successful, the results could result into a potentially profound reduction in disease burden. Due to other plants' additional applications in cancer therapy, one can anticipate knock-on effects of decreased morbidity rates and large-scale savings in medical and non-medical treatment costs that go beyond treating TB alone. With one in every 35 South African women diagnosed with cervical cancer, the severe levels of liver-toxicity caused by chemotherapy are a high priority target for our research team. Our aim, however, is not only to develop an adjuvant medicine but a novel, standalone treatment.

The research results have attracted a number of national and international cosmeceutical companies who are willing to commercialise selected South African plant extracts and purified compounds emanated from our research. This is of important economic value, because at present South African companies import pharmaceutical and cosmetic-actives from overseas. The impact of research and development into local plants will therefore have huge spin-offs for both communities, pharmaceutical and cosmetic companies.

South Africa does not make sufficient use of local resources and rather chooses to export these resources. We can therefore, not derive the value benefits third parties add to the resources in turning them into products. The result is that international pharmaceutical companies import final products and South Africa loose local beneficiation, local industry and jobs. The synergism of traditional medicine of South Africa and simultaneously plants' scientific investigation for various health problems may lead to beneficiation of local endemic plant material; infrastructure and upliftment in the community / help to create a local market for community farmers for raw materials; import replacement; job creation in local production; future exports and student training. It is proposed that any Intellectual Property Rights, resulting from or developed during the project be owned jointly and equitably by all the members involved, and the community (Figure 1).

Fig 1: Signing of Benefit sharing agreement with a community at Eastern Cape

Work with indigenous communities? How does this benefit research?

With guidance from the Agricultural Research Council (ARC), a community in Mamelodi, including an indigenous knowledge holder, has been involved in our project from the start. The erection of infrastructure for production is already in process and a group of eight farmers have received basic training on cultivation from the ARC. A green house has been established and our plan is to erect a warehouse and drying facilities at the site in addition to enable the community to beneficiate the plants themselves by drying and packaging. New cultivation technologies developed will be transferred to the farmers and some on site investigations on harvesting, drying and packaging will take place that will capacitate this farmer group further. It is furthermore hoped that this centre in the community may ultimately be an outlet for final products, as well as a place where community branded cosmeceutical and pharmaceutical products may be sold through the farmers.

Fig. 2. Establishment of Green house at the Mamelodi community at Pretoria and medicinal plants grown by the farmers

The key national benefit in this project are the benefits that may be realised in bridging the gap between farmers, researchers and customers. Communities have few opportunities to develop local indigenous crops due to the inability of researchers to transfer their knowledge to market and create a demand for farmer's crops.

To what extent do people understand about the existing contribution of plants to drugs such as aspirin?

There is definitely a need for public outreach activities to inform people about the role and potential benefits of plant based medicine. Through the workshops the traditional doctors should be also made aware of the toxic effect of some plant-based medicines.

Fig. 3. A traditional health practitioner is making aware of the evaluation process of traditional medicine at the University of Pretoria

The most exciting part of what we do is that our students are not only getting a degree; we are actually doing something that could benefit mankind. The communities where we work are always involved and will no doubt benefit from the results once some of these projects become economically viable.