

to find evidence of their benefits with the hope of catching the pharmaceutical industry's attention.

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“Some 137 plants from 48 families that are employed by traditional healers have never been investigated for their presumed antimalarial properties, and a similar picture can be drawn for anticancer plants and plants used against bacterial infections,”

Prof. Ndom notes. “The European pharmaceutical industry decided to focus on synthetic chemistry and high throughput screening (HTS) instead, and it failed.”

The result of this failure and accelerating drug resistance has been a paradigm shift towards natural products, and PLANTMEDS played its part by questioning traditional healers, collecting plants and extracting their most promising compounds by applying chromatographic methods of column chromatography and high performance liquid chromatography (HPLC) assisted by antimalarial / anticancer bioassays.

“Once isolated, pure compounds are subjected to structural characterisation by various spectroscopic methods; bioactivity assays combined with toxicity assessment employing human cell lines are carried out; promising compounds are subjected to semisynthetic reactions coupled with bioassays/toxicity assays to improve molecule properties (higher active, lower toxic); and an assessment of quantitative structure-activity relationships (QSAR) is done to select the identified leads for pharmaceutical pre-formulation and formulation studies.”

The results were promising. Compounds isolated from the stem bark of *Citrus reticulata* led to synergistic effects of

at least two cancers: Significant activity was observed from an extract against the breast cancer cell line MCF7, and a chromatographic fraction displayed extremely low 50% inhibition concentration values against the human lung adenocarcinoma cell line A549; human breast adenocarcinoma cell line MCF7 and human Caucasian prostate adenocarcinoma cell line PC3. “Importantly, assays employing a normal human cell line indicated very low toxicity of this chromatographic fraction,” Prof. Ndom points out.

Although the project was completed at the end of 2016, the team have been continuing their work, notably proceeding with antimalarial tests for parts of *Hannoa ferruginea*. They also have plans to assay mixtures of seven compounds from the active stem bark fraction of *Citrus reticulata*, to identify the composition displaying the highest activity and lowest toxicity. “The most promising compositions will then be combined with current lung, breast and prostate cancer drugs in various mixtures to identify those with highest activity / lowest toxicity *in vitro*. This will be followed by acute / chronic toxicity assessment in animal models for best drug candidates, and, once passing the *in vivo* assessment phase successfully, clinical trials will be considered,” says Prof. Ndom.

PLANTMEDS

- ★ Coordinated by the University of Douala in Cameroon.
- ★ Funded under FP7-PEOPLE.
- ★ <https://cordis.europa.eu/project/rcn/190980>

INTERVIEW

NEW MHEALTH APP HELPS MALAWI MAKE BETTER MEDICAL DECISIONS

The SUPPORTING LIFE project has developed an app that makes compliance with the Community Case Management (CCM) strategy much easier than it was, whilst also helping local health assistants make better medical decisions. The app has been tested in Malawi, where stakeholders were quick to adopt it.

In Malawi, Health Surveillance Assistants (HSAs) are working hard to be the bridge that links the most remote local communities with the national healthcare system – both to make patients' life easier and to prevent hospitals from unnecessarily reaching their saturation point. They are working so hard, in fact, that they are in desperate need of easier processes to follow.

The CCM strategy – a clinical decision tool adopted in many sub-Saharan countries to help HSAs make the right calls – was a step in the right direction. It enables HSAs to promptly identify, from children between two months and five years old, those requiring urgent referral to hospitals



and those who can be treated at the local points-of-care before going back home.

But CCM implementation is not without its shortcomings: the solution is paper-based, and delivering it through a mobile health (mHealth) app is expected to considerably cut the red tape and help them make quicker and better decisions. With their app, the SUPPORTING LIFE (Supporting Low-cost Intervention For disEase control team) project hopes to bring just the solution Malawi is looking for.

★ **Why did you decide to focus on Malawi for this project?**

There are several countries that met the criteria for our project, but Malawi is one of the poorest countries in the world, with a large population, a very limited healthcare infrastructure and a very low quality of care. We felt that a project like SUPPORTING LIFE was going to be really helpful in remedying this situation. There are great opportunities there with ICT.

“The ministry of health in Malawi is pushing quite strongly to establish a health platform for the whole country, based on CCM guidelines. They felt like SUPPORTING LIFE was exactly the model they were looking for.”

★ **What kind of help did you aim to provide to HSAs?**

HSAs have an extremely heavy workload. They are responsible for managing patients in their community across a number of healthcare disciplines.

With this project we targeted HSAs using CCM guidelines, which require a valid register and a long list of paper forms to be filled in. As if that wasn't enough, HSAs have to fill in all these forms whilst also having to make medical decisions: should the child go home, be treated at the local clinic, or go straight to the hospital? This quickly becomes difficult to cope with, especially when you meet a high number of patients every day.

The point of SUPPORTING LIFE was to make HSAs' life easier and assist in their medical decision making. Our app will help them go through the different questions they need to ask the

patient in order to comply with CCM guidelines.

★ **As the project moved forward, did you come to identify other unforeseen needs of HSAs?**

We did come across a number of them. Simple things like transportation are very challenging. Also, as Malawi has a good telecommunication infrastructure, we first thought that we could go with a web-based app so that it's easier to apply updates and new releases. But then we came to realise that network connectivity was a bigger issue than we thought, so we had to redesign the application to be stand-alone and even work offline.

Power was also an issue, so we had to give all HSAs mini solar panels so they could power their phones. Finally, we found out that not all HSAs were familiar with smartphones, so as part of our trial we had to integrate extra sessions for training just to show the HSAs how to use the phone and the app itself.

★ **Speaking of which, how does the app work exactly? What's its added value?**

Some digital solutions existed before SUPPORTING LIFE but they weren't 100% focused on CCM. SUPPORTING LIFE is, and it also integrated with IMCI – the higher-level guidelines for hospital settings. Furthermore, we included sharp training videos within the app, we have the offline mode, the decision support system, the data collection system... All of that is quite unique.

★ **What was the feedback from in-field trials?**

We spoke to all the relevant senior staff within the ministry of health both on the IMCI and CCM sides, as well as on the IT side. We also engaged with district officers, HSAs and community members. The vast majority of people were in favour of the SUPPORTING LIFE app for two reasons: the technology itself, which made patients feel like they were getting better treatment (feel good factor), and the data collection/decision making assistance process.

In addition, the ministry of health in Malawi is pushing quite strongly to establish a health platform for the whole country, based on CCM guidelines. They felt like SUPPORTING LIFE was exactly the model they were looking for.

★ **Apart from this feel-good factor you just mentioned, what are the benefits for patients?**

Initially we were looking at very hard clinical outcomes like mortality rates or serious consequences, but we faced a major challenge: Malawi doesn't store the kind of information that would have allowed for a comparison before/after SUPPORTING LIFE. So what we had to do was change our research focus.

In the end, we looked at whether the children were properly redirected to clinics or hospitals. We designed a process to measure this impact and got a sample of over 7 000 children from different regions in Northern Malawi. We are still evaluating the results, but general feedback was that the amount of unnecessary referrals was reduced and that SUPPORTING LIFE helped improved on-site clinic treatment.

★ **Do all HSAs have access to the app now?**

There are various mHealth projects across Malawi and each of these projects is led by different groups. Certain groups might be using a certain type of smartphone while others would be using a different one and a different app on top of that. So it's all very fragmented, and the ministry of health is well aware of this. Going forward, they will try to create one general platform where all stakeholders can sign up.

★ **Do you have any follow-up plans?**

We are still engaged very closely with the ministry of health by feeding them with reports, presentations and lessons learned for the future.

SUPPORTING LIFE

- ★ Coordinated by the Imperial College of Science, Technology and Medicine in the United Kingdom.
- ★ Funded under FP7-HEALTH.
- ★ <https://cordis.europa.eu/project/rcn/106966>
- ★ Project website: <http://www.supportinglife.eu>