

Medicinal Plants and Sickle Cell Anemia: The experience of Congo, DR

Koto-te-Nyiwa Ngbolua

Department of Biology, University of Kinshasa, DR Congo.

*Corresponding author: Koto-te-Nyiwa Ngbolua, Email: jpngbolua@unikin.ac.cd

Received: September 18, 2018, Accepted: October 27, 2018, Published: October 27, 2018.

ABSTRACT:

The search and development of antisickling herbal drugs constitute a priority agenda in Democratic Republic of the Congo (DRC), where Sickle cell anemia (SCA), one of the major public health problems affecting Africa, is endemic. The aims of our research program were (1) to identify plants traditionally used in folk medicine for managing SCA in DRC, (2) to identify other/new sources of antisickling bioactive secondary metabolites mainly from great apes pharmacopeia, (3) to validate their bioactivity, (4) to identify and elucidate the structures of the bioactive compounds/secondary metabolites and (5) to formulate a polyherbal medicine for managing SCA.

Keyword: *antisickling herbal drugs, Sickle cell anemia, polyherbal medicine,*

Methodology: The plant extracts were screened for antisickling activity using validated bioassays (Emmel test, polymerization of haemoglobin S assay; osmotic fragility assay; anti-hemolytic test; radical scavenging assay and Met-hemoglobin profiling assay). The molecular structures of the active compounds were characterized by combining the chromatographic and spectroscopic methods. The toxicity bioassay of herbal medicine was carried out using the Wistar rats and Guinea pigs as animal models and clinical trial in SCA human patients.

Findings: About 150 plant species from human and great apes pharmacopeia were biologically screened. Anthocyanins, organic acids (betulinic, maslinic, oleanolic and lunularic acids) and butyl stearate displayed antisickling activity. The resulted herbal medicine Drepanoalpha® is safe ($DL_{50} > 4000$ mg/kg, Wistar rat or 16000 mg/kg, Guinea pig). Drepanoalpha® boosts hemoglobin rate in the treated animals and sicklers. Non-recourse to blood transfusion is done for a long period after cessation of medication (four months minimum). The herbal drug does not alter liver (transaminases SGOT and SGPT, total and direct bilirubin) and kidney (urea and creatinine) functions in both animals and treated patients. The chemical analyses of this medicine revealed the presence of total polyphenols, flavonoids, anthocyanins, tannins, glucids, lipids, proteins and micro-nutrients (Zn, Mn, Fe, Mg, Ca, K, and P) as well as the vitamin C. This phytomedicine displayed antibacterial effects (*S. aureus* and *M. tuberculosis*).

Editor's Biography



Dr Koto-te-Nyiwa Ngbolua is Full Professor of Biology at the University of Kinshasa and currently serves as the Chancellor of the University of Gbadolite (Province of Nord-Ubangi) in Democratic Republic of the Congo. He has his expertise in biological evaluation of medicinal plants (Bioguided isolation assays) and derived secondary metabolites for improving the human health and wellbeing. His main diseases of interest are Sickle cell anemia, malaria, diabetes mellitus and cancer. He has published or co-authored close to 300 research publications (including book chapters). His H-index is 24 (Google Scholar)/25 (Researchgate). He received his PhD in Molecular biology (2012) from University of Kinshasa (co-organized by the Malagasy Institute of Applied Research, IMRA Madagascar). Prof Ngbolua is an Alumnus of Unesco-Merck Africa Research Summit (2016 in Addis Ababa: Ethiopia and 2017 in Port Louis: Mauritius); Trend Advanced Open Labware Workshop on 3D printing your own lab equipment (Ibadan: Nigeria); Pan-African-Pan-European workshop on Chemistry and Natural products (2015 in Cotonou: Benin); American Society for Cell Biology Courses on protozoan and bacterial parasites (January 2012 in Bamako: Mali; July 2012 in Accra: Ghana), etc. He received research awards from International Organizations like IFS (Stohkolm, Sweden), TWAS (Trieste, Italy), Belgian Technical Cooperation (Belgium), ARES (Académie de Recherche et d'Enseignement supérieur, Belgium) etc. In collaboration with his colleagues from IMRA/Madagascar, Dr Ngbolua isolated and characterized some secondary metabolites of pharmaceutical relevance for human nutrition and health.

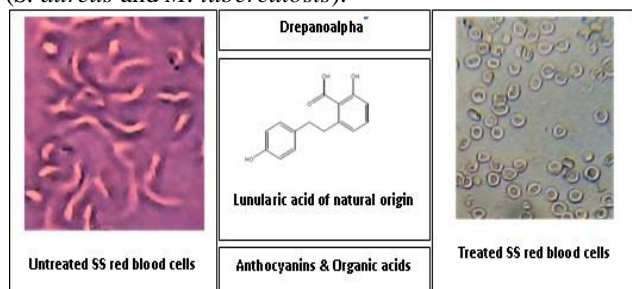


Figure 1: Antisickling effects of the herbal drug and derived secondary metabolites

Conclusion & Significance: The herbal drug Drepanoalpha® contains plant secondary metabolites, macronutrients and minerals of pharmaceutical and nutritional relevancies for managing SCA and could improve the life expectancy of SCA patients. The herbal drug displays the *in vitro* and *in vivo* antisickling effects by various modes of action and is safe for a use in the large scale.

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Citation: Koto-te-Nyiwa Ngbolua (2018). Medicinal Plants and Sickle Cell Anemia: The experience of Congo, DR. J. of Advancement in Medical and Life Sciences. V7I2.03. DOI: 10.5281/zenodo.1478970.

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