Antimalarial plants
Antimalarial plants are a major reason for Africa having any humans living in the continent at all. Malaria is a deadly disease and I have read that until Europeans had access to quinine, they pretty much stayed out of Africa because malaria killed them rapidly.

I searched PubMed for “antimalarial plants” and “malaria and plants”.

These plants are all effective when they are ingested: however, the continent of Africa is filled with plants that are effective antimalarials because they kill mosquitoes, or repel mosquitoes just by sitting and growing (pyrethrum) or when they are burned (orange peels).

My interest in plants repelling mosquitoes came from my association with the Faculty of Pharmacy and the brilliant Nigerian scientist Professor HAB Coker, who cheerfully nurtures medicinal plants that are known to heal or cure or prevent any disease. He has a lovely farm in land at the University of Lagos main campus that gently slopes down into the bay. He has planted around his house plants that repel mosquitoes, snakes, and probably a whole lot of other living creatures that make life uncomfortable or deadly for humans living in Africa. Professor Coker is Nigerian, was trained in Pharmacy at Nigeria’s first school of Pharmacy at the University of Lagos, and has a PhD in pharmaceutics from the University of Strathclyde in Scotland. He was a young full professor, a young Chairman of Pharmacy and a young Deputy Vice Provost of the University of Lagos. Amongst his achievements was setting up a Quality Control laboratory for the state of Lagos; all drugs administered in a state-run hospital or clinic throughout Lagos are tested in his laboratory.

During the 2008 summer in New Jersey, Kenyan Macharia Waruingi, who lived in my house for 7 months, liked to work on his computer in my back garden: citronella candles were not as effective repelling mosquitoes as the incense sticks my daughter lit for him. More than 30 years of burning incense and I never knew they repelled mosquitoes. What else do I not know about repelling mosquitoes, eliminating malaria?


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Extracts of Brucea javanica fruit were tested. Its antimalarial activity results from its quassinoid constituents. Nine of the quassinoids had in vitro IC50 between 0.046-0.0008 microg/mL against the chloroquine resistant Plasmodium falciparum strain (KI). The 2 quassinoid glycosides tested were considerably less active in vitro than the aglycones. Four quassinoids had activity in vivo against Plasmodium berghei infections in mice after oral dosing. All 5 quassinoids tested in vivo had toxicity.


Cedronin was isolated from Simaba cedron Planchon (Simaroubaceae), a species popularly believed in South America to have antimalarial properties. Cedronin was active against chloroquine-sensitive and resistant strain, with an IC50 of 0.25 microg/mL. It was also found to be active in vivo against Plasmodium vinckei with an IC50 of 1.8 mg/kg in the classic 4-day test. Cedronin is in a subgroup of quassinoids with a C19 basic skeleton and has low cytotoxicity against KB cells (IC50 = 4microg/mL) compared with C20 biologically active quassinoids; however its toxic/therapeutic ratio (10/1.8) is lower than chloroquine (10/0.5).


Three quassinoids from the roots of Eurycoma longifolia Jack were evaluated for antimalarial activity against 9 Plasmodium falciparum isolates from patients who had chloroquine-resistant malaria. Eurycomanol, eurycomanol 2-O-beta-D-glucopyranoside, and 13 beta, 18-dihydroeurycomanol had IC50 values of 1.2 to 4.9 microM, 0.4-3.5 microM, and 0.5-2.3 microM, respectively, compared with 0.3-0.8 microM for chloroquine.


Hannoia chlorantha and Hannoia klaineana (Simaroubaceae) are used in traditional medicine of Central African countries for fevers and malaria. Four stem bark extracts from H klaineana and 4 quassinoids from H chlorantha were examined in vitro against Plasmodium falciparum NF 54. The quassinoids IC50: chaparrinone was 0.04 and 15-desacetylundulatone was 0.05 microg/mL. Chaparrinone is 5 times more active than 14-hydroxychaparrinone against P falciparum. Compared with chaparrinone, 14-hydroxychaparrinone has a 7-times higher cytotoxic activity against P-388 cells. 15-Desacetylundulatone was the most active compound, almost totally suppressing the parasitaemias of OF1 mice for 7 days. Both chaparrinone and 14-hydroxychaparrinone were active for 4 days. Quassinoids have ED50 values under 50 mg/kg-body weight day and none had side effects. The keto function at C-2 in 15-desacetylundulatone is apparently of crucial importance for its high activity. 6-alpha-Tigloyloxyglaucaurubol was not active.


Forty-six species collected in the Mosetene ethnia, dwelling in the Andean Piedmont of Bolivia, were screened as antimalarials. Thirty-three extracts were screened in vitro on Plasmodium falciparum chloroquine resistant strain (Indo), and 47 extracts were evaluated in vivo on the rodent malaria P vinckei petteri 279BY. Only 2 plants are specifically used in combination by the Mosetene against malaria attack (Hymenachne donacifolia and Tessera integrigolia); they had no activity in vivo at 1,000 mg/kg. The in vivo most active extracts were Swietenia macrophylla bark, Trema micrantha bark and Triplaris americana bark, not all of them were used for antimalarial purposes by the Mosetene. The following extracts were moderately active: Jacarata digitata inner bark and Momordica charantia aerial part (both traditionally used as febrifuge), Kalanchoe pinnata aerial part (used in inflammatory processes), Lunania parvifolia twig and leaves, Phyllanthus acuminatus (used as piscicide), Tynanthus schumannianus fruit (used against diarrhoea), Triumfetta semitrilobata (used as febrifuge, to alleviate kidney and gynecological pain) and finally Solanum mammosum fruit (used against scabies).

CHAN KL, CHOO CY, ABDULLAH NR, ISMAIL Z. ANTIPLASMODIAL STUDIES OF EURYCOMA LONGIFOLIA JACK USING THE LACTATE DEHYDROGENASE ASSAY OF PLASMODIUM FALCIPARUM. J MjoTA.org

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The roots of Eurycoma longifolia Jack have been used as traditional medicine to treat malaria. A systematic bioactivity-guided fractionation of this plant was conducted involving the determination of the effect of its various extracts and their chemical constituents on the lactate dehydrogenase activity of in vitro chloroquine-resistant Gombak A isolate and chloroquine-sensitive D10 strain of Plasmodium falciparum parasites. Their antiplasmodial activity was also compared with their known in vitro cytotoxicity against KB cells. Four quassinoids, eurycomanone (1), 13,21-dihydroeurycomanone (3), 13 alpha(21)-epoxyeurycomanone (4), eurycomalactone (6) and an alkaloid, 9-methoxycanthin-6-one (7), displayed higher antiplasmodial activity against Gombak A isolate but were less active against the D10 strain when compared with chloroquine. Compounds 1 and 3 had higher selectivity indices for the cytotoxicity to antiplasmodial activity ratio than 14,15 beta-dihydroxylinaline (2), eurycomanol (5), 6 and 7.


The leaves of the Madagascan Simaroubaceae Samadera madagascariensis have 3 C18 quassinoids: 5beta,6-dihydrosamaderine A, 2-chloro samaderine A, and samaderolactone A; a C19 quassinoid: 3,4beta-dihydrosamaderine C, and the known quassinoids samaderine A, samaderolactone A, and cedronin. The compounds isolated had little or no anti-tumour activity.


The limonoid derivative, methyl uguenenoate, the azole, uguenenaazole, and the amide, uguenenamide, together with the known furoquinoline alkaloids flindersiamine and maculosidine, and syringaldehyde have been isolated from the root of the East African Rutaceae Vepris uguenensis. While methyl uguenenoate and the furoquinoline alkaloids displayed mild antimalarial activity, the azole and amide were completely inactive.


Piptadenia pervillei Vatke (Fabaceae) was selected from a screening programme devoted to the search of naturally-occurring antimalarial compounds from plants of Madagascar. Bioassay-guided fractionation of the ethyl acetate extract of the leaves led to the isolation of four phenolic compounds, (+)-catechin (1), (+)-catechin 5-gallate (2), (+)-catechin 3-gallate (3) and ethyl gallate (4). Structures were determined by NMR and mass spectroscopy. Compounds 2 and 3 displayed the highest in vitro activity against the chloroquine-resistant strain FcB1 of Plasmodium falciparum (IC50: 1.2 microM and 1.0 microM, respectively) and were not significantly cytotoxic against the human embryonic lung cells MRC-5 (IC50>75 microM). Five analogues (5 to 9) of (+)-catechin 5-gallate (2) were synthesized and evaluated for their antiplasmodial activity.


Phyllantus amarus Schumach and Thonn is a medicinal plant used to treat malaria in southeastern Nigeria. We report antiplasmodial effects of aqueous extracts of the leaves and stems against Plasmodium berghei infection in Swiss albino mice. The blood schizonticidal activity of the aqueous extract in early infection and in established Plasmodium berghei infection was assessed and compared to the activities of chloroquine and sulfadoxine/pyrimethamine. The repository activity of the extract was also assessed and compared to the activity of pyrimethamine. The LD50 of the aqueous extract of Phyllantus amarus Schumach and Thonn was 650 mg/kg in albino Wistar rats. In early infection, the extract at doses of 108.33 mg/kg, 165 mg/kg and 325 mg/kg significantly and dose-dependently suppressed of P berghei parasites [P<0.05] sulfadoxine/pyrimethamine caused a similar significant suppression of P berghei parasites [P<0.05] while chloroquine at a dose of 5 mg/kg did not cause a significant effect on P berghei parasites. The extract at all doses suppressed P berghei parasites via a repository action, P<0.05. This effect was comparable to the effects of pyrimethamine a standard repository agent. In established infection, the extract at all doses administered, significantly suppressed P berghei parasites after 24 and 72 hours, P<0.05. Sulfadoxine/pyrimethamine caused a similar suppression of the parasites of P berghei but the effects were more sustained over 72 hours.

Udeinya JI, Shu EN, Quakyi I, Ajayi FO. An antimalarial neem leaf extract has both sch-

A crude acetone/water (50:50) extract of neem leaves (IRAB) was evaluated for activity against the asexual (trophozoites/schizonts) and the sexual (gametocytes) forms of the malarial parasite, Plasmodium falciparum in vitro. In separate 72-hour cultures of both asexual parasites and mature gametocytes treated with IRAB (0.5 microg/mL), parasite numbers were less than 50% of the numbers in control cultures, which had 8.0% and 8.5% parasitemia, respectively. In cultures containing 2.5 microg/mL, asexual parasites and mature and immature gametocytes were reduced to 0.1%, 0.2%, and 0% parasitemia, respectively. No parasites remained in the cultures with 5.0 microg/mL.


The antimalarial activity of Eclipta alba leaves extract was evaluated against Plasmodium berghei ANKA strain in mice. A standard inoculum of 1 x 10^6 infected erythrocytes was used. The methanolic leaf extract (250 to 750 mg/kg) produced a dose-dependent chemosupression or schizontocidal effect during early and established infection and high mean survival times particularly in the group administered 750 mg/kg/day of extract. The plant extract also had repository activity.


Goniolthalamus scortechnii, Andrographis paniculata and Aralidium pinnatifidum are plants used as antimalarials screened for antimalarial activity towards Plasmodium falciparum in vitro using the lactate dehydrogenase assay. G scortechnii extracts had the most potent schizonticidal activity compared to the other extracts. It is effective against both the chloroquine resistant isolate, Gombak A and the sensitive strain, D10 of Plasmodium falciparum. A better IC50 value was obtained against the resistant strain, 40 microg/mL. When the crude extract was fractionated into 3, the chloroform fraction yielded the best activity, exhibiting equipotency against both strains of parasite used; IC50 of 23.53 microg/mL against Gombak A and 21.06 microg/mL against D10.


In Comores (Ngazidja), antimalarial activity of 76 vegetable extracts obtained from 17 species traditionally used to treat malaria symptoms, was evaluated in vitro using Plasmodium falciparum chloroquine-resistant strain (W2). Antiproliferative activity was evaluated on human mononcytic THP1 cells and the selectivity index of the plant extracts was calculated. The results showed that 10 plant extracts had a moderate activity (5 < IC50 < 10 microg/ml), and 6 a good in vitro activity with IC50 value < or =5 microg/ml. The highest antiplasmodial activity was found for the MeOH/H(2)O leaves extract of Flueggea viroso (Roxb. Ex Willd.) Voigt subsp. viroso (Euphorbiaceae) (IC50=2 microg/ml), for roots decoction of Flueggea viroso (IC50=3 microg/ml) and for chloromethylenic roots extract of Vernonia colorata (Willd.) Drake subsp. grandis (DC.) C. Jeffrey (Asteraceae) (IC50=3 microg/ml). Extracts with moderate antiplasmodial activity IC50 < 5 microg/ml: Vernonia colorata (aerial part), Piper capense L.f. (Piperaceae), and Leptadenia madagascariensis Decne (Asclepiadaceae) chloromethylenic extracts (IC50=6 microg/ml; 7 microg/mL and 9microg/mL, respectively). All the plants tested displayed a low cytotoxicity on THP1 cells.


Two novel alkaloids with an unprecedented tricyclic skeleton, cassiarins A (1) and B (2), have been isolated from the leaves of Cassia siamea, and the structures were elucidated on the basis of spectroscopic data. Cassiarin A (1) showed a potent antiplasmodial activity.


Methanolic and water extracts of 5 medicinal plant species used to malaria in traditional health systems.
of Kwale people in Kenya were tested for antimalarial activity against *Plasmodium falciparum* and *Plasmodium berghei*, respectively and for their cytotoxic effects. The most active extracts (IC50<10μg/mL) screened against chloroquine (CQ) sensitive (D6) and resistant (W2) P falciparum clones, were the water and methanol extracts of *Maytenus undata* (Thunb.) Blakelock (Celasteraceae), methanol extracts of *Flueggea virosa* (Wild.) Voigt (Euphorbiaceae), *Maytenus putterlickioides* (Loes.) Excell and Mendoca (Celastaceae), and *Warburgia stuhlmannii* Engl. (Canellaceae). These extracts showed various cytotoxic levels on Vero E6 cells with the water extract of *M undata* exhibiting least cytotoxicity. At least 1 plant species extract exhibited a high chemo suppression of parasitaemia >70% in a murine model of *P berghei* infected mice. These results indicate that potential for isolation of a lead compound from the extracts of the 5 plants.


We examined the effect of intermittent preventive treatment in reducing anemia and improving classroom attention and educational achievement in semi-immune schoolchildren in an area of high perennial transmission.

A stratified, cluster-randomised, double-blind, placebo-controlled trial in 30 primary schools in western Kenya. Schools were randomly assigned to sulfadoxine-pyrimethamine plus amodiaquine or dual placebo. Children from 5 to 18 were treated 3 times at 4-month intervals (IPT n=3,535, placebo n=3,223). The primary endpoint was anaemia, defined as a hemoglobin concentration below 110g/L. Anemia was assessed through surveys 12 months after treatment.

2604 children given preventive treatment and 2302 given placebo were included in intention-to-treat analysis of the primary outcome. Prevalence of anaemia at 12 months averaged 6.3% in the preventive treatment group and 12.6% in the placebo group (adjusted risk ratio 0.52, 95% CI 0.29–0.93; p=0.028). Significant improvements were also seen in 2 class-based tests of sustained attention, with a mean increase in code transmission test score of 6.05 (95% CI 2.83–9.27; p=0.0007) and counting sounds test score of 1.80 (0.19–3.41; p=0.03), compared with controls. No effect was shown for inattentive or hyperactive-compulsive behaviours or on educational achievement. The per-protocol analysis yielded similar results. 23 serious adverse events were reported within 28 days of any treatment (preventive treatment: 19; placebo: 4); the main side-effects were problems of balance, dizziness, feeling faint, nausea, or vomiting shortly after treatment.


Leaves and rhizome methanol extracts of *Albertisia delagoensis* tested positive against *Plasmodium falciparum*, with low cytotoxic activity in leaves against the Graham cell line.


Investigation of in vivo antimalarial activity of a traditionally used medicinal plant, *Withania somnifera*, L. Dunal, (Solanaeaceae). Rodent malaria parasite *Plasmodium berghei*, 0.2 ml of x 107 parasites, was inoculated into Swiss albino mice intraperitoneally. Extracts were administered by intragastric tube daily for 4 days starting from the day of parasite inoculation. Negative controls received the same amount of solvent used to suspend the extracts and the positive controls were given chloroquine by the same route. Parasitemia inhibition of *W somnifera* roots and root barks were 50.43% and 29.13% respectively, with 600 mg/kg dose. Inhibition was statistically significant at all doses (p < 0.05), and maximum inhibition was at 600 mg/kg. Extracts of eaves and root barks of *W somnifera* suppressed parasites and protected against packed cell volume drop (at higher doses), both were dose-related.


The dichloromethane extract of the leaves of *Vernonia staehelinaeoides* Harv. (Asteraceae) showed in vitro activity (IC50 approximately 3μg/mL) against the chloroquine-sensitive (D10) and the chloroquine-resistant (K1) strains of *Plasmodium falciparum*. Through conventional chromatographic techniques and bioassay-guided fractionation 2 structurally-related hirsutinolides displaying in vitro
antiplasmodial activity (IC50 approximately 0.2 microg/mL against D10) were isolated and identified by spectroscopic data. Compounds 1, 8 alpha-(2-methylacryloyloxy)-3-oxo-1-desoxy-1,2-dehydrohirsutinolide-13-O-acetate, and 2, 8 alpha-(5'-acetoxyseneioxyloxy)-3-oxo-1-desoxy-1,2-dehydrohirsutinolide-13-O-acetate were found to be cytotoxic to mammalian Chinese Hamster Ovarian (CHO) cells at similar concentrations but were attractive scaffolds for structure-activity relationship studies. Two main privileged substructures, a 2(5H)-furanone unit and a dihydrofuran-4-one unit, were identified as potential pharmacophores which may be responsible for the observed biological activity.

Mucocloric and mucobromic acids were selected as appropriate 2(5H)-furanone substructures. They had comparable activity against the D10 and superior activity against the K1 strains relative to the hirsutinolide natural product. Mucocloric and mucobromic acids have selective cytotoxicity to malaria parasites. These data suggests that the 2(5H)-furanone substructure is key.


The leaves of Piper hostmannianum var. berbicense were extracted with n-hexane: isolated were 4 monoterpene or prenyl-substituted dihydrochalcones (1a, 1b, 2, 3) as well as the known compounds 2',6'-dihydroxy-4'-methoxydihydrochalcone (4), linderatone (5), strobopinin (6), adunctin E (7) and (-)-methylmelleratin (8). Their structures were established on the basis of NMR and X-ray analysis. (-)-Methylmelleratin, linderatone and 2',6'-dihydroxy-4'-methoxydihydrochalcone exhibited the most potent antiplasmodial activity with IC50 values of 5.64, 10.33 and 12.69 microM, respectively against both chloroquine-sensitive and resistant strains of Plasmodium falciparum (F32,FcB1). The activity of (-)-methylmelleratin was confirmed in vivo against Plasmodium vinckei petteri in mice (80% of reduction of parasitemia) at a dose of 20 mg/kg/day.

By SJ Dodgson BSc(Hons), PhD

Plants that prevent, modify and cure diseases have long been a part of the daily foods in malaria-endemic regions. Nigeria’s mega-city Lagos now has daily bread-baking and other prepared flour-foods such as noodles, are aggressively marketed on bill-boards and on television. Diabetes is increasing, as are cardiovascular diseases including hypertension.