

Two specific publications/ research papers relevant to the research work

1. Woori Kim⁺, Mohit Tripathi⁺, Chunhyung Kim, Satyapavan Vardhineni, Young Cha, Shamseer Kulangara Kandi, Melissa Feitosa, Rohit Kholiya, Eric Sah, Anuj Thakur, Yehan Kim, Sunny Manohar, Youngbin Kong, Gagandeep Sindhu, Yoon-Seong Kim, Bruce Cohen, [Diwan S Rawat*](#), Kwang-Soo Kim,* An optimized Nurr1 agonist provides disease-modifying effects in Parkinson's disease models, **Nature Communications 14:4283** (<https://doi.org/10.1038/s41467-023-39970-9>). (2023). **Impact Factor: 17.694**. (*WK and MT contributed equally to this study).

Contribution: Prof Rawat's research group designed, synthesized, and characterized the study.

Patents: ES2899730T3 (2022), CA3175047A1 (2022). 20220008418 (2022); 11026943 (2021); EP2822936B1 (2021), 20170209441 (2017); 9567316 (2017); 20150023930 (2015); Indian Patent No: **IN 283657 (2017)**.

The molecules reported in these papers have shown low nano-molar anti-Parkinson activity with excellent PK parameters. These molecules activate the Nurr1 enzyme that stops the death of dopamine neurons, prevents the aggregation of α -synuclein, and improves autophagy, hence curing the Parkinson in mice model. This study has opened a new dimension of utilizing aminoquinolone-based compounds to treat Parkinson's disease. This work has been licensed to NURRON Pharmaceuticals for development as an anti-Parkinson drug, and currently, it's in Phase I clinical trials.

Media Relation

March 29, 2023

NurrOn entered into co-development agreement with HanAll Biopharma and Daewoong Pharmaceuticals to develop ATH-399A for Parkinson's disease.

<https://www.prnewswire.com/news-releases/hanall-biopharma-and-daewoong-pharmaceutical-enter-into-co-development-agreement-with-nurron-pharmaceuticals-to-develop-therapy-for-parkinsons-disease-301834508.html>

December 1, 2022

NurrOn received the award of the translational pipeline program 2022 for a Phase I trial of ATH-399A from Michael J. Fox Foundation.

<https://www.michaeljfox.org/grant/development-nurr1-activator-novel-therapeutic-parkinsons-disease>



US011026943B2

(12) **United States Patent**
Rawat et al.

(10) **Patent No.:** **US 11,026,943 B2**
(45) **Date of Patent:** ***Jun. 8, 2021**

(54) **AMINOQUINOLINE DERIVATIVES AND
USES THEREOF**

(56) **References Cited**

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(71) Applicants: **UNIVERSITY OF DELHI**, Delhi (IN);
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CORPORATION**, Belmont, MA (US)

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(73) Assignees: **The McLean Hospital Corporation**, Belmont, MA (US); **University of Delhi**, Delhi (IN)

OTHER PUBLICATIONS

2. Sunny Manohar, U. Chinna Rajesh, Shabana I. Khan, Babu L. Tekwani, [Diwan S. Rawat*](#), Novel 4-aminoquinoline-pyrimidine based hybrids with improved *in vitro* and *in vivo* antimalarial activity, **ACS Med. Chem. Lett.** **3**, 555-559 (2012). **Impact factor: 4.345. Citations: 157**

A class of hybrid molecules consisting of 4- aminoquinoline and pyrimidine were synthesized and tested for antimalarial activity against both chloroquine (CQ)-sensitive (D6) and chloroquine (CQ)-resistant (W2) strains of *Plasmodium falciparum* through an *in vitro* assay. Four molecules were more potent (7–8- fold) than CQ in D6 strain, and eight molecules were found to be 5–25-fold more active against resistant strain (W2) without any cytotoxicity up to a high concentration (60 μ M) with high selective index. Two compounds selected for *in vivo* evaluation have shown excellent activity (po) in a mouse model of *Plasmodium berghei* without any apparent toxicity.

Certified that this work has not been part of any of the award.



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