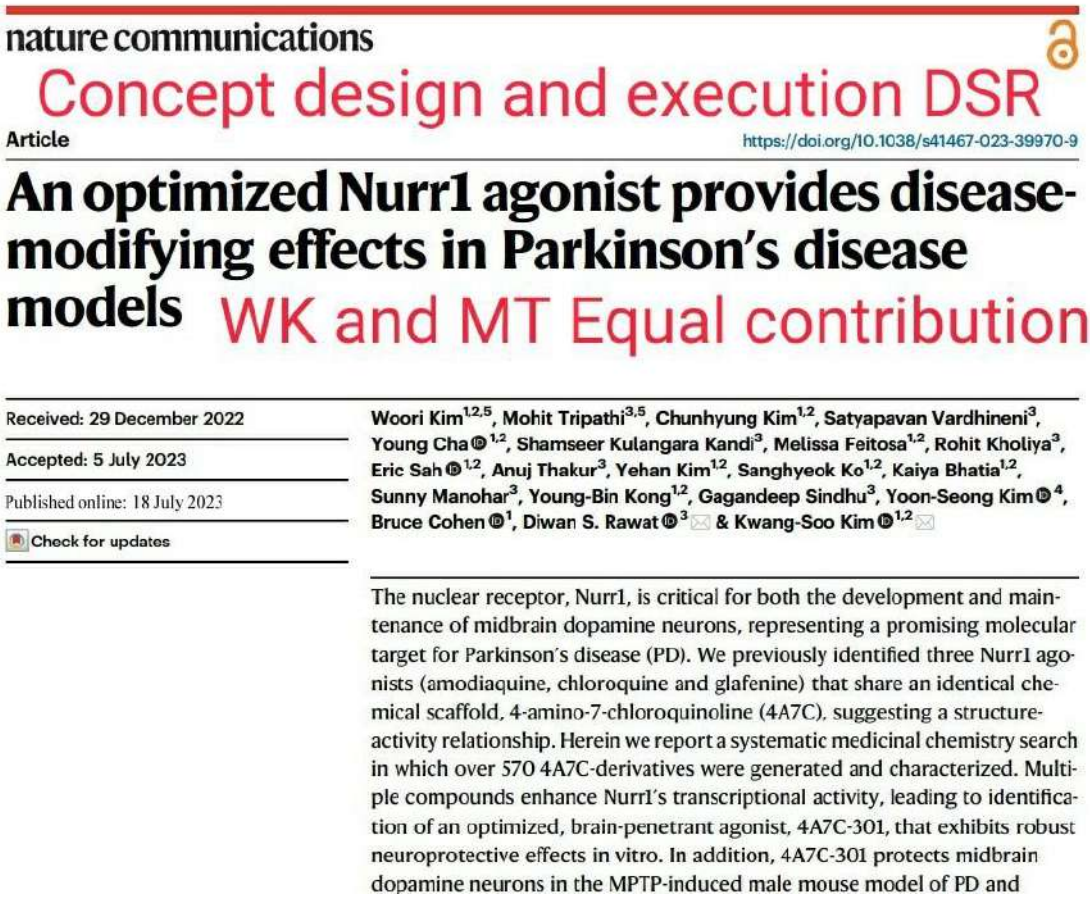
Signed details of the excellence in research work

Prof Rawat research group has been involved in the synthesis of small organic molecules as anti-cancer, anti-malarial, anti-TB and anti-Parkinson agents. This work led to the discovery of many potent molecules which shows low nano-molar anti-malarial activity (**ACS Med Chem Lett 2019, 2012; IN 283657, 2017**). Most of these compounds exhibit low dose in vivo activity with no toxicity. Subsequent studies proved that these hybrids can activate Nurr1 enzyme thus stops the death of dopamine neurons, aggregation of α-synuclein and they also improve the autophagy **[ES2899730T3 (2022); CA3175047A1 (2022); EP3971178A1 (2022); US20170209441A1 (2021); PT2822936T (Portugal, 2021); US9567316B2 (2017); IN 283657 (2017); WO 2013 134047A3 (20213).].** This opened a new dimension in the area of Parkinson drug discovery. **This work has been recently published in Nature Communications 14:4283, 2023 (https://doi.org/10.1038/s41467-023-39970-9)**. The work in an area of medicinal chemistry resulted eight patents and technology has been transferred to NurrOn Pharmaceuticals, a Boston Based pharmaceuticals. Recently, NurrOn entered into co-development agreement with HanAll Biopharma and Daewoong Pharmaceuticals to develop ATH-399A for Parkinson's disease and MJ Fox foundation has funded the phase I clinical trials (https://nurronpharma.com/media-relation). **Phase I human clinical trials began in October 2023.**



nature communications

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An optimized Nurr1 agonist provides disease-modifying effects in Parkinson's disease models

WK and MT Equal contribution

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Check for updates

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The nuclear receptor, Nurr1, is critical for both the development and maintenance of midbrain dopamine neurons, representing a promising molecular target for Parkinson's disease (PD). We previously identified three Nurr1 agonists (amodiaquine, chloroquine and glafenine) that share an identical chemical scaffold, 4-amino-7-chloroquinoline (4A7C), suggesting a structure-activity relationship. Herein we report a systematic medicinal chemistry search in which over 570 4A7C-derivatives were generated and characterized. Multiple compounds enhance Nurr1's transcriptional activity, leading to identification of an optimized, brain-penetrant agonist, 4A7C-301, that exhibits robust neuroprotective effects in vitro. In addition, 4A7C-301 protects midbrain dopamine neurons in the MPTP-induced male mouse model of PD and

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**

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OTHER PUBLICATIONS

We have been working on nano-catalysis with a goal to develop a catalytic system that can be useful in making some of the Active Pharmaceutical Ingredients or industrially important chemicals. During this, we developed a catalytic system which can be used for the C-C bond formation and reduction of nitro compounds. This has resulted many high impact publications (**12 papers in ACS Sus Chem Eng, IF = 9.088, Green Chem, Org. Lett., J. Org. Chem.**).

One of the catalytic systems developed was used for the selective reduction of nitro compounds using hydrazine hydrate as a source of hydrogen and the process is being used for the synthesis of some industrially relevant molecules.

Research work Highlighted in the Cover Page:

- **Tetrahedron Letters** 59 (24), 13 June **2020**
- **Tetrahedron Letters** 59 (24), 13 June **2018**
- **Tetrahedron Letters** 57 (4), 5 October **2016**
- **ACS Sustainable Chemistry and Engineering 3 (1), 2015**

Research work Highlighted by Synfacts:

Green Chemistry 22, 3170 **(2020)**	**SYNFACTS** 2020, 16(08): 0995
Tetrahedron Letters 59, 2341 **(2018)**	**SYNFACTS** 2018, 14(08): 0883
Chemistry - An Asian Journal 12, 785 (**2017**)	**SYNFACTS** 2017, 13(07), 0766
Tetrahedron Letters 57, 4468 **(2016)**	**SYNFACTS** 2016, 12(12), 1314
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