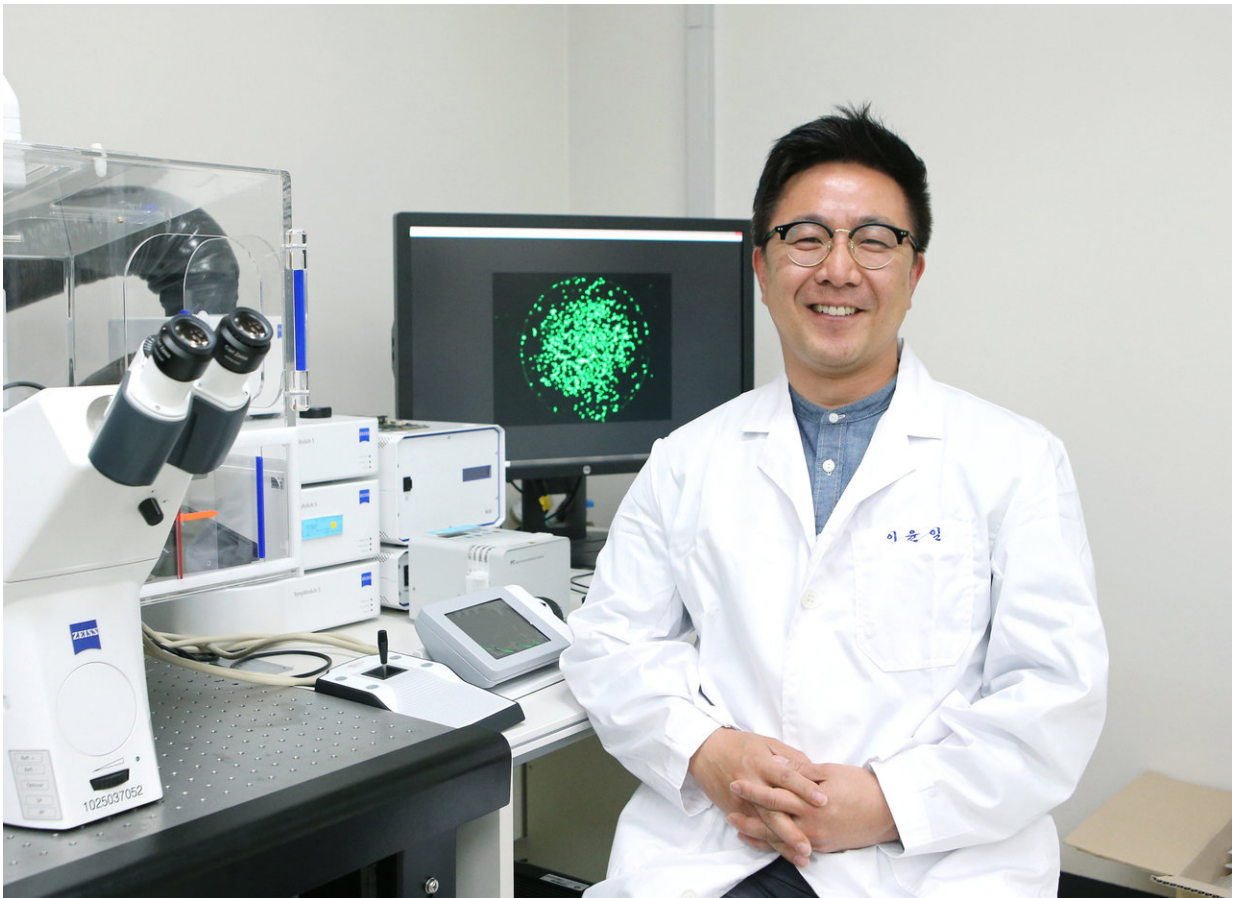


# New possibility to prevent and treat Parkinson's disease with licorice extract

November 9 2017

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Senior researcher Yun-Il Lee of DGIST Well Aging Research Center. Credit: Daegu Gyeongbuk Institute of Science and Technology (DGIST)

DGIST's research team, led by Dr. Yun-Il Lee in Well Aging Research

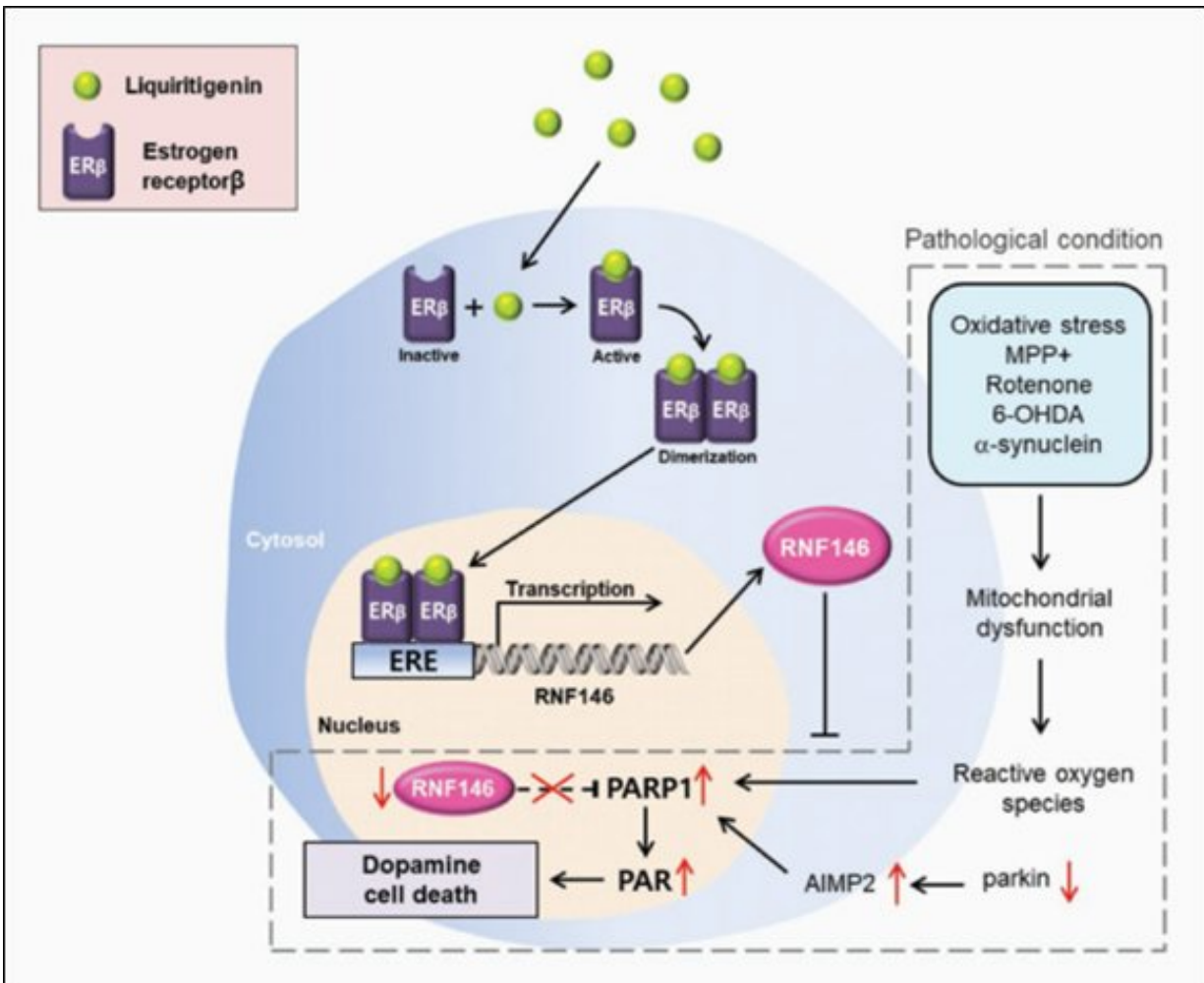
Center, has identified a new mechanism to inhibit dopaminergic neuronal apoptosis, a possible approach for preventing and treating Parkinson's disease (PD).

PD is a typical [degenerative brain disease](#) caused by the death of dopaminergic neurons in the middle cerebral blood. It is a [disease](#) with a higher incidence in people aged 60 or older, presenting symptoms such as tremor, stiffness, slow motion and postural instability.

In particular, as the majority of Parkinson's patients suffer from the [progressive neurodegenerative disease](#), many researchers are focusing on the loss of dopamine-producing neurons. With regard to the cell death process, in vivo cell stress and damages activate PARP-1 (Poly ADP-ribose polymerase-1) and induce excessive accumulation of PAR (Poly ADP-ribose) and those activities activate apoptosis-inducing factor (AIF), which induces cell death and destroys DNA. This new mechanism of cell death (Parthanatos) has recently been identified as the cause of degenerative brain diseases such as Parkinson's disease, stroke, heart attack and diabetes, and the mechanism has been extensively studied in previous research to treat these diseases.

Currently, medications are being used to alleviate symptoms of Parkinson's disease. However, there are no government-approved drugs that can inhibit dopaminergic neuronal cell death. The research teams have now found a candidate in licorice.

Dr. Yun-Il Lee carried out joint research with Professor Joo-Ho Shin and Professor Yunjong Lee from Sungkyunkwan University School of Medicine to study candidate compounds for the treatment of Parkinson's disease. The researchers have identified the mechanism by which cortisol, a stress hormone, promotes dopaminergic neuronal activity by inducing parkin protein expression that inhibits dopamine neuronal cell death.



Mechanism of inhibition of dopamine neuronal cell death by Liquiritigenin :  
 When mitochondrial function is impaired by active oxygen, MPP +, rotenone, 6-OHDA, and  $\alpha$ -synuclein fibril, the activation of PARP1 causes DNA damage. In addition, the accumulation of the substrate AIMP2 of the parkin protein induces hyperactivity of PARP1 and results in cell death of dopaminergic neurons. Liquiritigenin inhibits dopamine neuronal cell death in Parkinson's disease as it binds to the estrogen receptor beta and is transported to the nucleus, stimulates transcription of RNF146 and controls the activation of PARP1.  
 Credit: Daegu Gyeongbuk Institute of Science and Technology (DGIST)

In this study, the research teams found candidate drugs that induce the expression of RNF146 protein involved in the inhibition of neuronal cell death through a high-speed mass screening method using the natural materials library of the Natural Medicine Bank of Korea Foundation. As a result, the study has confirmed that liquiritigenin, a licorice extract, induces the expression of RNF146 protein and removes excessively accumulated PAR binding and modified substrate proteins using the ubiquitin proteasome system and results in inhibition of dopamine [neuronal cell death](#).

In addition, the research teams have been working on identifying the mechanism that induces liquiritigenin's RNF146 protein expression and demonstrated that it regulates transcription through binding and activity with estrogen receptors in cell and animal models. Consequently, it has been scientifically proved that liquiritigenin, a licorice extract, can be used as a treatment for degenerative Parkinson's disease.

Dr. Yun-Il Lee stated "Neuronal [death](#) is involved in a variety of signaling systems in vivo. Therefore, it is essential to identify a new mechanism that is able to control the system comprehensively and we have found additional possibilities in licorice extract." He added, "I would like to contribute to the treatment of degenerative brain diseases such as Parkinson's disease by conducting advanced researches, comprehensive research and clinical studies."

This study has been published in the online edition of *Oncotarget*, international journal of oncology, on October 11.

**More information:** Hyojung Kim et al, Estrogen receptor activation contributes to RNF146 expression and neuroprotection in Parkinson's disease models, *Oncotarget* (2017). [DOI: 10.18632/oncotarget.21828](https://doi.org/10.18632/oncotarget.21828)

Provided by DGIST (Daegu Gyeongbuk Institute of Science and Technology)

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