•Field Exercise Physiology

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Educational Background

■ 2012-2016 Ph.D. Dept. of Physiology, Hallym University College of Medicine

■ 2010-2012 M.S. Dept. of Physiology, Hallym University College of Medicine

■ 2003-2010 B.S. Dept. of Physical Education, Hallym University College of Natural Sciences

Major Careers

■ 2017-present International Soceity for Zinc Biology (Regular member)

■ 2014-present The Korean Society for Brain and Neural Science (Regular member)

■ 2010-present The Society for Neuroscience (Regular member)

■ 2016-2022 Institute of Medical Science, Hallym University College of Medicine (Research Professor)

Research and Book

1. Kang BS, Suh SW, Yang DY, **Choi BY**, Lee WK. Expression and Distribution of Free Zinc in Penile Erectile Tissue. ***The World Journal of Men's Health*** 40:e31. **[SCI급, 공동(교신), 2022]**

2. Choi S, Kang D, Kang J, Hong DK, Kang BS, Kho AR, **Choi BY**, Huh SO, Suh SW. The Role of Zinc in Axon Formation via the mTORC1 Pathway. ***Molecular Neurobiology*** 59(5):3206-3217. **[SCI급, 공동(참여), 2022]**

3. Kho AR, **Choi BY**, Lee SH, Hong DK, Kang BS, Lee SH, Suh SW. Administration of an Acidic Sphingomyelinase (ASMase) Inhibitor, Imipramine, Reduces Hypoglycemia-Induced Hippocampal Neuronal Death. ***Cells*** 11(4):667. **[SCI급, 공동(참여), 2022]**

4. Kim M, Kim J, Moon S, **Choi BY**, Kim S, Jeon HS, Suh SW, Kim Y-M, Choi YK. Korean Red Ginseng Improves Astrocytic Mitochondrial Function by Upregulating HO-1-Mediated AMPKα-PGC-1α-ERRα Circuit after

Traumatic Brain Injury. ***International Journal of Molecular Sciences*** 22(23):13081. **[SCI급, 공동(참여), 2021]**

5. Lee SH, Lee M, Ko DG, **Choi BY**, Suh SW (2021) The Role of NADPH Oxidase in Neuronal Death and Neurogenesis after Acute Neurological Disorders. ***Antioxidants*** 10(5):739. **[SCI급, 공동(참여), 2021]**

6. Sultan MT, **Choi BY**, Ajiteru O, Hong DK, Lee SM, Kim HJ, Ryu JS, Lee JS, Hong H, Lee YJ, Lee H, Suh YJ, Lee OJ, Kim SH, Suh SW, Park CH. Reinforced-hydrogel encapsulated hMSCs towards brain injury treatment by trans-septal approach. ***Biomaterials*** 266:120413. **[SCI급, 제1저자, 2021]**

7. Shin YH, Cho H, **Choi BY**, Kim J, Ha J, Suh SW, Park SB. Phenotypic Discovery of Neuroprotective Agents by Regulation of Tau Proteostasis via Stress-Responsive Activation of PERK Signaling. ***Angew Chem Int Ed Engl***. 60(4):1831-1838. **[SCI급, 공동(참여), 2021]**

8. Choi S, Hong DK, **Choi BY**, Suh SW. Zinc in the Brain: Friend or Foe? ***International Journal of Molecular Sciences*** 21(23):8941. **[SCI급, 공동(참여), 2020]**

9. Kang DH, **Choi BY**, Lee SH, Kho AR, Jeong JH, Hong DK, Kang BS, Park MK, Song HK, Choi HC, Lim MS, Suh SW. Effects of Cerebrolysin on Hippocampal Neuronal Death After Pilocarpine-Induced Seizure. ***Frontiers in Neuroscience*** 14:568813. **[SCI급, 공동(참여), 2020]**

10. Park MK, **Choi BY**, Kho AR, Lee SH, Hong DK, Jeong JH, Kang DH, Kang BS, Suh SW. Effects of Transient Receptor Potential Cation 5 (TRPC5) Inhibitor, NU6027, on Hippocampal Neuronal Death after Traumatic Brain Injury. ***International Journal of Molecular Sciences*** 21(21):8256. **[SCI급, 공동(참여), 2020]**

11. Jeong JH, Lee SH, Kho AR, Hong DK, Kang DH, Kang BS, Park MK, **Choi BY**, Choi HC, Lim MS, Suh SW. The Transient Receptor Potential Melastatin 7 (TRPM7) Inhibitors Suppress Seizure-Induced Neuron Death by Inhibiting Zinc Neurotoxicity. ***International Journal of Molecular Sciences*** 21(21):7897. **[SCI급, 공동(교신), 2020]**

12. Hong DK, Kho AR, Lee SH, Jeong JH, Kang BS, Kang DH, Park MK, Park KH, Lim MS, **Choi BY**, Suh SW. Transient Receptor Potential Melastatin 2 (TRPM2) Inhibition by Antioxidant, N-Acetyl-l-Cysteine, Reduces Global Cerebral Ischemia-Induced Neuronal Death. ***International Journal of Molecular Sciences*** 21(17):6026. **[SCI급, 공동(교신), 2020]**

13. Lee M, Ko DG, Hong DK, Lim MS, **Choi BY**, Suh SW. Role of Excitatory Amino Acid Carrier 1 (EAAC1) in Neuronal Death and Neurogenesis After Ischemic Stroke. ***International Journal of Molecular Sciences*** 21(16):5676. **[SCI급, 공동(교신), 2020]**

14. Kang BS, **Choi BY**, Kho AR, Lee SH, Hong DK, Jeong JH, Kang DH, Park MK, Suh SW. An Inhibitor of the Sodium-Hydrogen Exchanger-1 (NHE-1), Amiloride, Reduced Zinc Accumulation and Hippocampal Neuronal Death after Ischemia. ***International Journal of Molecular Sciences*** 21(12):4232. **[SCI급, 공동(참여), 2020]**

15. **Choi BY**, Jeong JH, Eom JW, Koh JY, Kim YH, Suh SW. A Novel Zinc Chelator, 1H10, Ameliorates Experimental Autoimmune Encephalomyelitis by Modulating Zinc Toxicity and AMPK Activation. ***International Journal of***

Molecular Sciences 21(9):E3375. **[SCI급, 제1저자, 2020]**

16. **Choi BY**, Hong DK, Jeong JH, Lee BE, Koh JY, Suh SW. Zinc Transporter 3 Modulates Cell Proliferation and Neuronal Differentiation in the Adult Hippocampus. ***Stem Cells*** 38(8):994-1006. **[SCI급, 제1저자, 2020]**

17. Jung JS, Kho AR, Lee SH, **Choi BY**, Kang SH, Koh JY, Suh SW, Song DK. Changes in plasma lipoxin A4, resolvins and CD59 levels after ischemic and traumatic brain injuries in rats. ***Korean Journal of Physiology & Pharmacology*** (2):165-171. **[SCI급, 제1저자, 2020]**

18. Cap KC, Jung YJ, **Choi BY**, Hyeon SJ, Kim JG, Min JK, Islam R, Hossain AJ, Chung WS, Suh SW, Ryu H, Park JB. Distinct dual roles of p-Tyr42 RhoA GTPase in tau phosphorylation and ATP citrate lyase activation upon different Aβ concentrations.***Redox Biology*** 32:101446. **[SCI급, 공동(참여), 2020]**

19. **Choi BY**, Lim JG, Lee SD. The Relationship between Self-Directed Exercise, Body Composition and Health-Related Physical Fitness in Female Tertiary Education Students. ***The Korea Journal of Sports Science*** 28(6):1353-1364. **[KCI급, 제1저자, 2019]**

20. Shin J, Kong C, Lee J, **Choi BY**, Sim J, Koh CS, Park M, Na YC, Suh SW, Chang WS, Chang JW. Focused ultrasound-induced blood-brain barrier opening improves adult hippocampal neurogenesis and cognitive function in a cholinergic degeneration dementia rat model.***Alzheimers Research & Therapy*** 11(1):110. **[SCI급, 공동(참여), 2019]**

21. **Choi BY**, Huh S, Kim DJ, Suh SW, Lee SK, Potenza MN. Transitions in Problematic Internet Use: A One-Year Longitudinal Study of Boys. ***Psychiatry Investigation*** (6):433-442. **[SCI급, 제1저자, 2019]**

22. Kho AR, **Choi BY**, Lee SH, Hong DK, Jeong JH, Kang BS, Kang DH, Park KH, Park JB, Suh SW. The Effects of Sodium Dichloroacetate on Mitochondrial Dysfunction and Neuronal Death Following Hypoglycemia-Induced Injury. ***Cells*** 8(5). **[SCI급, 공동(참여), 2019]**

23. **Choi BY**, Lee SH, Choi HC, Lee SK, Yoon HS, Park JB, Chung WS, Suh SW. Alcohol dependence treating agent, acamprosate, prevents traumatic brain injury-induced neuron death through vesicular zinc depletion.***Translational Research*** 207:1-18. **[SCI급, 제1저자, 2019]**

24. Hong DK, **Choi BY**, Kho AR, Lee SH, Jeong JH, Kang BS, Kang DH, Park KH, Suh SW. Carvacrol Attenuates Hippocampal Neuronal Death after Global Cerebral Ischemia via Inhibition of Transient Receptor Potential Melastatin 7.***Cells*** 7(12). **[SCI급, 공동(참여), 2018]**

25. Lee SH, **Choi BY**, Kho AR, Jeong JH, Hong DK, Kang DH, Kang BS, Song HK, Choi HC, Suh SW. Inhibition of NADPH Oxidase Activation by Apocynin Rescues Seizure-Induced Reduction of Adult Hippocampal Neurogenesis.***International Journal of Molecular Sciences*** 19(10). **[SCI급, 공동(참여), 2018]**

26. **Choi BY**, Suh SW. Antimicrotubule Agent-Induced Zinc Neurotoxicity. ***Biol Pharm Bull***. 41(7):1001-1005. **[SCI급, 제1저자, 2018]**

27. Moon MY, Kim HJ, **Choi BY**, Sohn M, Chung TN, Suh SW. Zinc Promotes Adipose-Derived Mesenchymal Stem Cell Proliferation and Differentiation towards a Neuronal Fate. ***Stem Cells Int*** 2018:5736535. **[SCI급, 제1저자, 2018]**

28. Kho AR, **Choi BY**, Lee SH, Hong DK, Lee SH, Jeong JH, Park KH, Song HK, Choi HC, Suh SW. Effects of Protocatechuic Acid (PCA) on Global Cerebral Ischemia-Induced Hippocampal Neuronal Death. ***International Journal of Molecular Sciences*** 19(5):1420. **[SCI급, 공동(참여), 2018]**

29. Kho AR, Kim OJ, Jeong JH, Yu JM, Kim HS, **Choi BY**, Suh SW, Chung TN. Administration of placenta-derived mesenchymal stem cells counteracts a delayed anergic state following a transient induction of endogenous neurogenesis activity after global cerebral ischemia. ***Brain Res*** 1689:63-74. **[SCI급, 공동(참여), 2018]**

30. Hong DK, Kho AR, **Choi BY**, Lee SH, Jeong JH, Lee SH, Park KH, Park JB, Suh SW. Combined Treatment With Dichloroacetic Acid and Pyruvate Reduces Hippocampal Neuronal Death After Transient Cerebral Ischemia. ***Front Neurol*** 9:137. **[SCI급, 공동(참여), 2018]**

31. **Choi BY**, Won SJ, Kim JH, Sohn M, Song HK, Chung TN, Kim TY, Suh SW. EAAC1 gene deletion reduces adult hippocampal neurogenesis after transient cerebral ischemia. ***Scientific Reports*** 8:6903. **[SCI급, 제1저자, 2018]**

32. **Choi BY**, Kim OJ, Min SH, Jeong JH, Suh SW, Chung TN. Human Placenta-Derived Mesenchymal Stem Cells Reduce Mortality and Hematoma Size in a Rat Intracerebral Hemorrhage Model in an Acute Phase. ***Stem Cells Int*** 2018:1658195. **[SCI급, 제1저자, 2018]**

33. Lee SH, **Choi BY**, Kho AR, Jeong JH, Hong DK, Lee SH, Lee SY, Lee MW, Song HK, Choi HC, Suh SW. Protective Effects of Protocatechuic Acid on Seizure-Induced Neuronal Death.***International Journal of Molecular Sciences*** 19(1):187. **[SCI급, 공동(참여), 2018]**

34. Kim JH, **Choi BY**, Kho AR, Lee SH, Jeong JH, Hong DK, Lee SH, Sohn M, Ryu OH, Choi MG, Suh SW. Acetylcholine precursor, citicoline (cytidine 5'-diphosphocholine), reduces hypoglycemia-induced neuronal death in rats. ***J Neuroendocrinology*** 30(1). **[SCI급, 제1저자, 2018]**

35. Lee M, **Choi BY**, Suh SW. Unexpected Effects of Acetylcholine Precursors on Pilocarpine Seizure- Induced Neuronal Death. ***Current Neuropharmacology*** 16(1):51-58. **[SCI급, 제1저자, 2018]**

36. Lee SH, **Choi BY**, Lee SH, Kho AR, Jeong JH, Hong DK, Suh SW. Administration of Protocatechuic Acid Reduces Traumatic Brain Injury-Induced Neuronal Death. ***International Journal of Molecular Sciences*** 18(12):2510. **[SCI급, 공동(참여), 2017]**

37. Jeong JH, **Choi BY**, Kho AR, Lee SH, Hong DK, Lee SH, Lee SY, Song HK, Choi HC, Suh SW. Diverse Effects of an Acetylcholinesterase Inhibitor, Donepezil, on Hippocampal Neuronal Death after Pilocarpine-Induced Seizure.

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38. **Choi BY**, Hong DK, Suh SW. ZnT3 Gene Deletion Reduces Colchicine-Induced Dentate Granule Cell Degeneration. ***International Journal of Molecular Sciences*** 18(10):2189. **[SCI급, 제1저자, 2017]**

39. **Choi BY**, Jung JW, Suh SW. The Emerging Role of Zinc in the Pathogenesis of Multiple Sclerosis. ***International Journal of Molecular Sciences*** 18(10):2070. **[SCI급, 제1저자, 2017]**

40. Lee BE, **Choi BY**, Hong DK, Kim JH, Lee SH, Kho AR, Kim H, Choi HC, Suh SW. The cancer chemotherapeutic agent paclitaxel (Taxol) reduces hippocampal neurogenesis via down-regulation of vesicular zinc. ***Scientific Reports*** 7(1):11667. **[SCI급, 제1저자, 2017]**

41. Chung TN, Kim JH, **Choi BY**, Jeong JY, Chung SP, Kwon SW, Suh SW. Effect of Adipose-Derived Mesenchymal Stem Cell Administration and Mild Hypothermia Induction on Delayed Neuronal Death After Transient Global Cerebral Ischemia. ***Critical Care Medicine*** 45(5):e508-e515. **[SCI급, 공동(참여), 2017]**

42. **Choi BY**, Kim IY, Kim JH, Lee BE, Lee SH, Kho AR, Sohn M, Suh SW. dministration of Zinc plus Cyclo-(His-Pro) Increases Hippocampal Neurogenesis in Rats during the Early Phase of Streptozotocin-Induced Diabetes. ***International Journal of Molecular Sciences*** 18(1):73. **[SCI급, 제1저자, 2017]**

43. Kho AR, **Choi BY**, Kim JH, Lee SH, Hong DK, Lee SH, Jeong JH, Sohn M, Suh SW. Prevention of hypoglycemia-induced hippocampal neuronal death by N-acetyl-L-cysteine (NAC). ***Amino Acids*** 49:367-378. **[SCI급, 공동(참여), 2017]**

44. Lee SH, **Choi BY**, Kim JH, Kho AR, Sohn M, Song HK, Choi HC, Suh SW. Late treatment with choline alfoscerate (l-alpha glycerylphosphorylcholine, alpha-GPC) increases hippocampal neurogenesis and provides protection against seizure-induced neuronal death and cognitive impairment. ***Brain Research*** 1654(Pt A):66-76. **[SCI급, 공동(참여), 2017]**

45. **Choi BY**, Kim IY, Kim JH, Lee BE, Lee SH, Kho AR, Sohn M, Suh SW. Zinc plus cyclo-(his-pro) promotes hippocampal neurogenesis in rats. ***Neuroscience*** 339:634-643. **[SCI급, 제1저자, 2016]**

46. **Choi BY**, Kim IY, Kim JH, Kho AR, Lee SH, Lee BE, Sohn M, Koh JY, Suh SW. Zinc transporter 3 (ZnT3) gene deletion reduces spinal cord white matter damage and motor deficits in a murine MOG-induced multiple sclerosis model. ***Neurobiol Dis*** 94:205-212. **[SCI급, 제1저자, 2016]**

47. **Choi BY**, Sim CK, Cho YS, Sohn M, Kim YJ, Lee MS, Suh SW. 2'-5' oligoadenylate synthetase-like 1 (OASL1) deficiency suppresses central nervous system damage in a murine MOG-induced multiple sclerosis model. ***Neurosci Lett*** 628:78-84. **[SCI급, 제1저자, 2016]**

48. **Choi BY**, Kim IY, Kim JH, Lee BE, Lee SH, Kho AR, Jung HJ, Sohn M, Song HK, Suh SW. Decreased cysteine uptake by EAAC1 gene deletion exacerbates neuronal oxidative stress and neuronal death after traumatic brain injury.

Amino Acids 48:1619-1629. **[SCI급, 제1저자, 2016]**

49. **Choi BY**, Kim JH, Kho AR, Kim IY, Lee SH, Lee BE, Choi E, Sohn M, Stevenson M, Chung TN, Kauppinen TM, Suh SW. Inhibition of NADPH oxidase activation reduces EAE-induced white matter damage in mice. ***J Neuroinflammation*** 12:104. **[SCI급, 제1저자, 2015]**

50. Kim JH, **Choi BY**, Kim HJ, Kim IY, Lee BE, Sohn M, Park HJ, Suh SW. A Water-Ethanol Extract from the Willow Bracket Mushroom, Phellinus igniarius (Higher Basidiomycetes), Reduces Transient Cerebral Ischemia-Induced Neuronal Death. ***Int J Med Mushrooms*** 17(9):879-89. **[SCI급, 공동(참여), 2015]**

51. Kim JH, Yoo BH, Won SJ, **Choi BY**, Lee BE, Kim IY, Kho A, Lee SH, Sohn M, Suh SW. Melatonin Reduces Hypoglycemia-Induced Neuronal Death in Rats. ***Neuroendocrinology*** 102:300-310. **[SCI급, 공동(참여), 2015]**

52. Kim JH, Lee DW, **Choi BY**, Sohn M, Lee SH, Choi HC, Song HK, Suh SW. Cytidine 5'-diphosphocholine (CDP-choline) adversely effects on pilocarpine seizure-induced hippocampal neuronal death. ***Brain Research*** 1595:156-165. **[SCI급, 공동(참여), 2015]**

53. Chung TN, Kim JH, **Choi BY**, Chung SP, Kwon SW, Suh SW. Adipose-derived mesenchymal stem cells reduce neuronal death after transient global cerebral ischemia through prevention of blood-brain barrier disruption and endothelial damage. ***Stem Cells Translational Medicine*** 4(2):178-85. **[SCI급, 공동(참여), 2015]**

54. **Choi BY**, Kim JH, Kim HJ, Lee BE, Kim IY, Sohn M, Suh SW. EAAC1 gene deletion increases neuronal death and blood brain barrier disruption after transient cerebral ischemia in female mice. ***International Journal of Molecular Sciences*** 15(11):19444-19457. **[SCI급, 제1저자, 2014]**

55. **Choi BY**, Kim JH, Kim HJ, Lee BE, Kim IY, Sohn M, Suh SW. Zinc chelation reduces traumatic brain injury-induced neurogenesis in the subgranular zone of the hippocampal dentate gyrus. ***Journal of Trace Elements in Medicine and Biology*** 28(4):474-481. **[SCI급, 제1저자, 2014]**

56. **Choi BY**, Lee BE, Kim JH, Kim HJ, Sohn M, Song HK, Chung TN, Suh SW. Colchicine induced intraneuronal free zinc accumulation and dentate granule cell degeneration. ***Metallomics*** 6(8):1513-20. **[SCI급, 제1저자, 2014]**

57. LiL, WuG, **Choi BY**, Jang BG, Kim JH, Sung GH,Cho JY, Suh SW, Park HJ. A mushroom extract Piwep from Phellinus igniarius ameliorates experimental autoimmune encephalomyelitis by inhibiting immune cell infiltration in the spinal cord ***BioMed Research International*** doi:10.1155/2014/218274. **[SCI급, 공동(참여), 2014]**

58. **Choi BY**, Kim JH, Kim HJ, Yoo JH, Song HK, Sohn M, Won SJ, Suh SW. Pyruvate administration reduces recurrent/moderate hypoglycemia-induced cortical neuron death in diabetic rats. ***PLoS One*** 8(11):e81523. **[SCI급, 제1저자, 2013]**

59. Jang BG, **Choi BY**, Kim JH, Kim MJ, Sohn M, Suh SW. Impairment of autophagic flux promotes glucose reperfusion-induced neuro2A cell death after glucose deprivation. ***PLoS One*** 8(10):e76466. **[SCI급, 공동(참여),**

2013]

60. **Choi BY**, Jang BG, Kim JH, Seo JN, Wu G, Sohn M, Chung TN, Suh SW. Copper/zinc chelation by clioquinol reduces spinal cord white matter damage and behavioral deficits in a murine MOG-induced multiple sclerosis model. ***Neurobiol Dis*** 54, 382-391. **[SCI급, 제1저자, 2013]**

61. Kim JH, Jang BG, **Choi BY**, Kim HS, Sohn M, Chung TN, Choi HC, Song HK, Suh SW. Post-treatment of an NADPH oxidase inhibitor prevents seizure-induced neuronal death. ***Brain Research*** 1499:163-72. **[SCI급, 공동(참여), 2013]**

62. Kim JH, Jang BG, **Choi BY**, Kwon LM, Sohn M, Song HK, Suh SW. Zinc chelation reduces hippocampal neurogenesis after pilocarpine-induced seizure. **PLoS One** 7(10):e48543. **[SCI급, 공동(참여), 2012]**

63. Won SJ, Yoo BH, Kauppinen T, **Choi BY**, Kim JH, Jang BG, Lee MW, Sohn M, Liu J, Swanson RA, Suh SW. Recurrent/moderate hypoglycemia induces hippocampal dendritic injury, microglia activation and cognitive impairment in diabetic rats. ***J Neuroinflammation*** 9:182.1-12. **[SCI급, 공동(참여), 2012]**

64. **Choi BY**, Kim JH, Jang BG, Lee BE, Sohn M, Song HK, Suh SW. Prevention of traumatic brain injury-induced neuronal death by inhibition of NADPH oxidase activation. ***Brain Research*** 1481:49-58. **[SCI급, 제1저자, 2012]**

65. Jang BG, Won SJ, Kim JH, **Choi BY**, Lee MW, Sohn M, Song HK, Suh SW. EAAC1 gene deletion alters zinc homeostasis and enhances cortical neuronal injury after transient cerebral ischemia in mice. ***Journal of Trace Elements in Medicine and Biology*** 26(2-3):85-8. **[SCI급, 공동(참여), 2012]**

66. Won SJ, Jang BG, Yoo BH, Sohn M, Lee MW, **Choi BY**, Kim JH, Song HK, Suh SW. Prevention of acute/severe hypoglycemia-induced neuron death by lactate administration. ***J Cereb Blood Flow Metab*** 32(6):1086-96. **[SCI급, 공동(참여), 2012]**

67. Won SJ, **Choi BY**, Yoo BH, Sohn M, YingW, SwansonRA, Suh SW. Prevention of traumatic brain injury-induced neuron death by intranasal delivery of NAD+. ***J Neurotrauma*** 29(7):1401-9. **[SCI급, 공동(참여), 2012]**

Miscellaneous

HONORS AND AWARDS:

1. Korean Society for Brain and Neural Sciences (KSBNS) Best Presentation Award, 2021
2. Japan Neuroscience Society (JNS) Travel Award, 2017
3. Association of Korean Neuroscientists (AKN) Postdoctoral Award, 2016
4. Gangwon BIO-EXPO Poster Award, 2014

GRANTS: RESEARCH PROJECTS ONGOING OR COMPLETED:

ONGOING

2021-2026	National Research Foundation of Korea (NRF) funded by the Ministry of Science, ICT & Future Planning (NRF-2021R1C1C2012889) Therapeutic effects of AMPK and zinc modulation in multiple sclerosis pathogenesis 566,010,000 won

COMPLETED

2019-2021	National Research Foundation of Korea (NRF) funded by the Ministry of Science, ICT & Future Planning (NRF-2019R1A2C4004912) Effect of GTRAP3-18 gene deletion on adult hippocampal neurogenesis after aging or stroke 200,000,000 won
2017-2019	National Research Foundation of Korea (NRF) funded by the Ministry of Science, ICT & Future Planning (NRF-2017R1C1B1004226) Effect of EAAC1 gene deletion on adult hippocampal neurogenesis after aging or stroke 150,000,000 won

PATENTS:

1. Compositions for promoting neurogenesis including zinc and amino acid derivatives. (2021. Korea. 10-2205053)
2. Compositions for promoting neurogenesis including zinc and NAC. (2021. Korea. 10-2205054)
3. A pharmaceutical composition for preventing or treating nervous system diseases. (2021. Korea. 10-2212637)
4. A pharmaceutical composition for preventing or treating neurological diseases comprising zinc and NAC. (2021. Korea. 10-2279034)
5. Pharmaceutical composition for treating multiple sclerosis based on the inhibition of AMPK and regulation of zinc homeostasis. (2019. Korea. 10-2019-0145625; PCT/KR2020/015932)