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Editorial Open Access

Today in Psychopharmacology and Neuropharmacology

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Psychopharmacology and Neuropharmacology are two rapidly developing branches of pharmacology. Psychopharmacology focuses on the actions and effects of psychoactive drugs that have potential or effective therapy for mental health disorders. Neuropharmacology is the study of how drugs affect nervous system functions from molecular, cellular, synaptic, network and behavioral levels; in turn treating a variety of neurological diseases. Both of these branches are closely associated since they are concerned with the interactions with neurotransmitters, neuropeptides, neuromodulators, enzymes, receptor proteins, second messengers, co-transporters and ion channels in the central and peripheral nervous systems. By studying the interactions of drugs with these targets, scientists are developing numerous new drugs to treat many different neurological diseases. These include pain, psychological disorders, addiction, epilepsy, neurodegenerative diseases, such as Parkinson's disease and Alzheimer's disease, and many others.

In this special issue, I have collected eight articles that include recent advances in psycho and neuron pharmacological research. For example, Dr. Xi's group reported a significant reduction of rat self-administration of cocaine by the antiepileptic drug tiagabine. This result suggests that: 1) elevation of brain GABA levels by tiagabine not only inhibits brain reward function, but also attenuates cocaine's rewarding effects 2) tiagabine, or other GABA transporter inhibitors, may have therapeutic effects in reducing cocaine use, but not in preventing relapse to drug-seeking behavior. Dr. Li's group evaluated the roles of brain-derived neurotrophic factor (BDNF) in risperidone sensitization in adolescent rats. In this research paper, they demonstrated a novel discovery that repeated administration of risperidone increased its inhibition of the PCP-induced hyper locomotion across the five drug test sessions in a dose dependent manner. In the challenge test, under the influence of risperidone (0.5 mg/kg), the previously risperidone-treated group (RIS 1.0+PCP) still exhibited a significantly higher inhibition of the PCP-induced hyper locomotion than the drug naïve group (VEH+PCP). However, they found that BDNF expressions in the PFC, striatum and hippocampus did not show any significant group differences, a finding not paralleled in the behavioral results. Based on these findings, they suggest a limited role of BDNF in risperidone sensitization. In addition to these two research articles in psychopharmacological field, Harrison Stratton et al. summarized recent advances of the endogenous cannabinoid system as a therapeutic target in the treatment of mental health disorders including mood disorders, depression, bipolar disorders, schizophrenia, and anxiety/fear disorders. This review article provides some new insights into the relationship between endogenous cannabinoid system and genesis of mental health disorders, which will promote the development of new drug targets for the treatment of these disorders.

In the neuron pharmacological field, it is very important to identify new targets and reveal new pharmacological mechanisms of drugs for treatment of various neurological disorders including drug addiction, epilepsy and neurodegeneration diseases. In this special issue, I have collected articles that cover these important neuropharmacological studies. Dr. Yang et al. reported their new findings that a smoking-relevant level of nicotine significantly modulated postsynaptic GABAA receptor function in dopamine neurons in the ventral tegmental area (VTA), an important brain reward center. Devin Taylor et al. described a significant effect of nicotine on VTA GABA neuron firing in anesthetized mice, mouse VTA slices, and single GABA neurons freshly isolated from mouse VTA. They found that systemic or local administration of nicotine or α7 nicotine acetylcholine receptor (nAChR) agonists increased VTA GABA neuronal firing. This effect is likely mediated by α7 nAChRs located on glutamatergic terminals/boutons on VTA GABA neurons. These two research articles will help us better understand mechanisms of nicotine reward and reinforcement occurring through the receptors, synapses and neuronal circuits within the VTA. In the field of drug addiction, tobacco and alcohol co-dependence is starting to garner attention since both tobacco and alcohol are the most commonly abused drugs. The nicotine (NIC) in tobacco and the ethanol (EtOH) in alcoholic drinks are responsible for their dependence respectively. The magnitude of tobacco smoking is drastically higher among alcoholics, suggesting a NIC-EtOH co-dependence. Devin Taylor et al. wrote a full- length review article to summarize recent research on NIC-EtOH co-dependence. Interestingly, they propose that nAChRs, especially α6-containing nAChRs, are critical targets that mediate NIC-EtOH co-dependence.

In addition to addiction, Dr. Steffensen evaluated roles of neuronal gap-junctions (connexin 36) in epileptogenesis using connexin 36 knockout mice. This study provides convincing evidence that neuronal gap-junctions play a pivotal role in epileptogenesis, and the targeting of neuronal gap-junctions may be a novel strategy for treatment of epilepsy. Finally, Dr. Zhen's group addressed a very hot topic, the extracellular α-synuclein and its biological significances. In this comprehensive review, they provided detailed lines of evidence and recent advances of α-synuclein biology and its relationship with neurodegenerative diseases, such as Parkinson's disease.

Although this special issue cannot cover all aspects in psycho and neuropharmacological studies, it does focus on several important fields. The articles in this specific issue provide a broad perspective on current advances in psycho and neuropharmacological research. I hope this issue will provide a foundation for future developments in psycho and neuropharmacological study. In particular, I sincerely hope that this specific issue will promote further engagement of scientists in identifying new targets, reveal new pharmacological mechanisms and develop new drugs for the efficient treatment of mental health disorders and neurological diseases.

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