OPINION

Neuropharmacology and its interactions

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DESCRIPTION

The study of how medications alter cellular function in the nervous system, as well as the neurological mechanisms by which they influence behaviour, is known as neuropharmacology. Neuropharmacology is divided into two categories: behavioural and molecular. The study of how drugs affect human behaviour (neuropsychopharmacology), as well as the effects of drug dependency and addiction on the human brain, is the focus of behavioural neuropharmacology. The study of neurons and their neurochemical interactions is referred to as molecular neuropharmacology, and it aims to discover medications that improve brain function. Both domains deal with the interplay of neurotransmitters, neuropeptides, neurohormones, neuromodulators, enzymes, second messengers, co-transporters, ion channels, and receptor proteins in the central and peripheral nervous systems. Researchers are creating medications to treat a number of neurological problems, including pain, neurodegenerative diseases like Parkinson's disease and Alzheimer's disease, psychological disorders, addiction, and many more, by studying these interactions.

Neuropharmacology simply doesn't exist in science until the early twentieth century, when scientists figured out a fundamental knowledge of the nervous system and how nerves communicated with one another. Prior to this discovery, medicines had been discovered that had some effect on the nervous system. In the 1930s, French scientists began experimenting with the chemical phenothiazine in the hopes of developing a malaria-fighting medicine. Though there was little optimism for this drug's usage against malaria-infected people, it was discovered to have sedative effects as well as what appeared to be helpful benefits on Parkinson's disease patients. Until the late 1940s and early 1950s, when scientists were able to identify specific neurotransmitters, such as norepinephrine (involved in the constriction of blood vessels and the increase in heart rate and blood pressure), and dopamine (the chemical whose deficiency is involved in PND), in which an investigator would administer a drug and examine the response without knowing how to relate drug action to patient response, was the main approach to this field. Scientists were also able to better monitor the amounts of various neurochemicals in the body in the 1950s, and thus correlate these levels with behaviour. In 1949, the voltage clamp was invented, allowing researchers to explore ion channels and the nerve action potential. Scientists were able to analyse not only how information is transported from one neuron to another, but also how a neuron processes this information inside itself, according to these two significant historical developments in neuropharmacology. Understanding how human behaviour and thought processes are passed from neuron to neuron and how drugs can affect the chemical foundations of these processes is critical to understanding the possible advancements in medicine that neuropharmacology can provide.

Neurons are called excitable cells because they have a lot of proteins called ion-channels on their surface membrane that allow small charged particles to move in and out of the cell. Chemical information is received by the dendrites of the neuron, propagated through the perikaryon (cell body) and down its axon, and eventually passed on to other neurons *via* the axon terminal. The fast depolarization of the cell is enabled by these voltage-gated ion channels. This depolarization will result in an action potential if it reaches a particular threshold. The action potential will produce an influx of calcium ions into the cell once it reaches the axon terminal. Vesicles, tiny packets filled with neurotransmitters, attach to the cell membrane and release their contents into the synapse as a result of the calcium ions. Once released into the synapse, the neurotransmitter can either attach to receptors on the post-synaptic cell, be actually and stored for further transmission by the pre-synaptic cell, or be broken down by enzymes specific to that neurotransmitter in the synapse. These three effects are the three most important ways that drugs can influence cell transmission. A post-synaptic neuron has two types of receptors with which neurotransmitters interact. LGICs, or ligand-gated ion channels, are the earliest type of receptor. LGIC receptors are the simplest types of chemical-to-electrical signal transducers. When a neurotransmitter attaches to a receptor, a conformational change occurs, allowing ions to flow directly into the cell.

CONCLUSION

G-protein-coupled receptors, or GPCRs, are the second category. Due to the increased number of metabolic events that must occur intracellularly, these are much slower than LGICs. When a neurotransmitter attaches to a GPCR protein, it creates a chain of intracellular events that can affect cellular biochemistry, physiology, and gene expression in a variety of ways. In the study of neuropharmacology, neurotransmitter/receptor interactions are crucial since many medicines currently being developed seek to disrupt this binding process.

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