Melatonin

A collection of my research works

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Preface

Melatonin is a ubiquitous biological molecule. In some cases, the role of melatonin is still controversial. This book is the result of 15 years of my investigations on melatonin, so in the section of my research works; the effects of melatonin on different tissues were studied. I hope the readers will find this book useful and will serve as a comprehensive source of information relevant to the aspects of melatonin.

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Introduction

The pineal gland, also known as the pineal body, conarium or epiphysis cerebri, is a small endocrine gland in the vertebrate brain. It produces melatonin, a serotonin derived hormone, which affects the modulation of sleep patterns in both seasonal and circadian rhythms. Its shape resembles a tiny pine cone (hence its name), and it is located in the epithalamus, near the center of the brain, between the two hemispheres, tucked in a groove where the two halves of the thalamus join. Nearly all vertebrate species possess a pineal gland. The most important exception is the hagfish, which is often thought of as the most primitive extant vertebrate. Even in the hagfish, however, there may be a "pineal equivalent" structure in the dorsal diencephalon. The lancelet Branchiostoma lanceolatum, the nearest existing relative to vertebrates, also lacks a recognizable pineal gland. The lamprey (considered almost as primitive as the hagfish), however, does possess one. A few more developed vertebrates, including the alligator, lack pineal glands because they have been lost over the course of evolution. The results

of various scientific research in evolutionary biology, comparative neuroanatomy and neurophysiology, have explained the phylogeny of the pineal gland in different vertebrate species. From the point of view of biological evolution, the pineal gland represents a kind of atrophied photoreceptor. In the epithalamus of some species of amphibians and reptiles, it is linked to a vestigial organ, known as the parietal eye which is also called the third eye. René Descartes believed the pineal gland to be the "principal seat of the soul" (a mystical concept). Academic philosophy among his contemporaries considered the pineal gland as a neuroanatomical structure without special metaphysical qualities; science studied it as one endocrine gland among many. However, the pineal gland continues to have an exalted status in the realm of pseudoscience.

Anatomy and histology of pineal gland

The pineal gland is the only midline brain structure that is unpaired (azygous). It takes its name from its pine-cone shape. The gland is reddish-gray and about the size of a grain of rice (5–8 mm) in humans. The pineal gland, also called the pineal body, is part of the epithalamus, and lies between the laterally positioned thalamic bodies and behind the habenular commissure. It is located in the quadrigeminal cistern near to the corpora quadrigemina. It is also located behind the third ventricle and is bathed in

cerebrospinal fluid supplied through a small pineal recess of the third ventricle which projects into the stalk of the gland. Unlike most of the mammalian brain, the pineal gland is not isolated from the body by the blood–brain barrier system; it has profuse blood flow, second only to the kidney, supplied from the choroidal branches of the artery. The pineal gland receives a sympathetic innervation from the superior cervical ganglion.

A parasympathetic innervation from the pterygopalatine and otic ganglia is also present. Further, some nerve fibers penetrate into the pineal gland via the pineal stalk (central innervation). Also, neurons in the trigeminal ganglion innervate the gland with nerve fibers containing the neuropeptide PACAP. The pineal body consists in humans of a lobular parenchyma of pinealocytes surrounded by connective tissue spaces. The gland's surface is covered by a pial capsule. The pineal gland consists mainly of pinealocytes, but four other cell types have been identified. As it is quite cellular (in relation to the cortex and white matter), it may be mistaken for a neoplasm.