WHAT IS TETRAHYDRO—CANNABINOL?*

You might not have heard of tetrahydrocannabinol (THC)—it's better known for its famous effects. THC is the main psychoactive cannabinoid responsible for the 'high' that cannabis users experience. And while its europhic effect is commonly associated with the drug's recreational use, a growing body of evidence suggests THC can be used to effectively treat a wide range of medical conditions.

Tetrahydrocannabinol (THC) is one of the two primary cannabinoids found in cannabis; the other is cannabidiol (CBD), which is non-psychoactive. THC can be consumed through the inhalation of vapour and is also available in the form of tinctures, edibles and oils.

Humans have been consuming cannabis for thousands of years, but it wasn't until 1964 that THC's chemical structure was isolated and understood. THC has the same molecular structure as cannabidiol (CBD): 21 carbon atoms, two oxygen atoms, and 30 hydrogen atoms. Despite CBD and THC having similar chemical structures, subtle differences in the arrangement of atoms in THC and CBD result in profoundly different physiological effects on users; e.g. the psychoactive effects caused by THC.

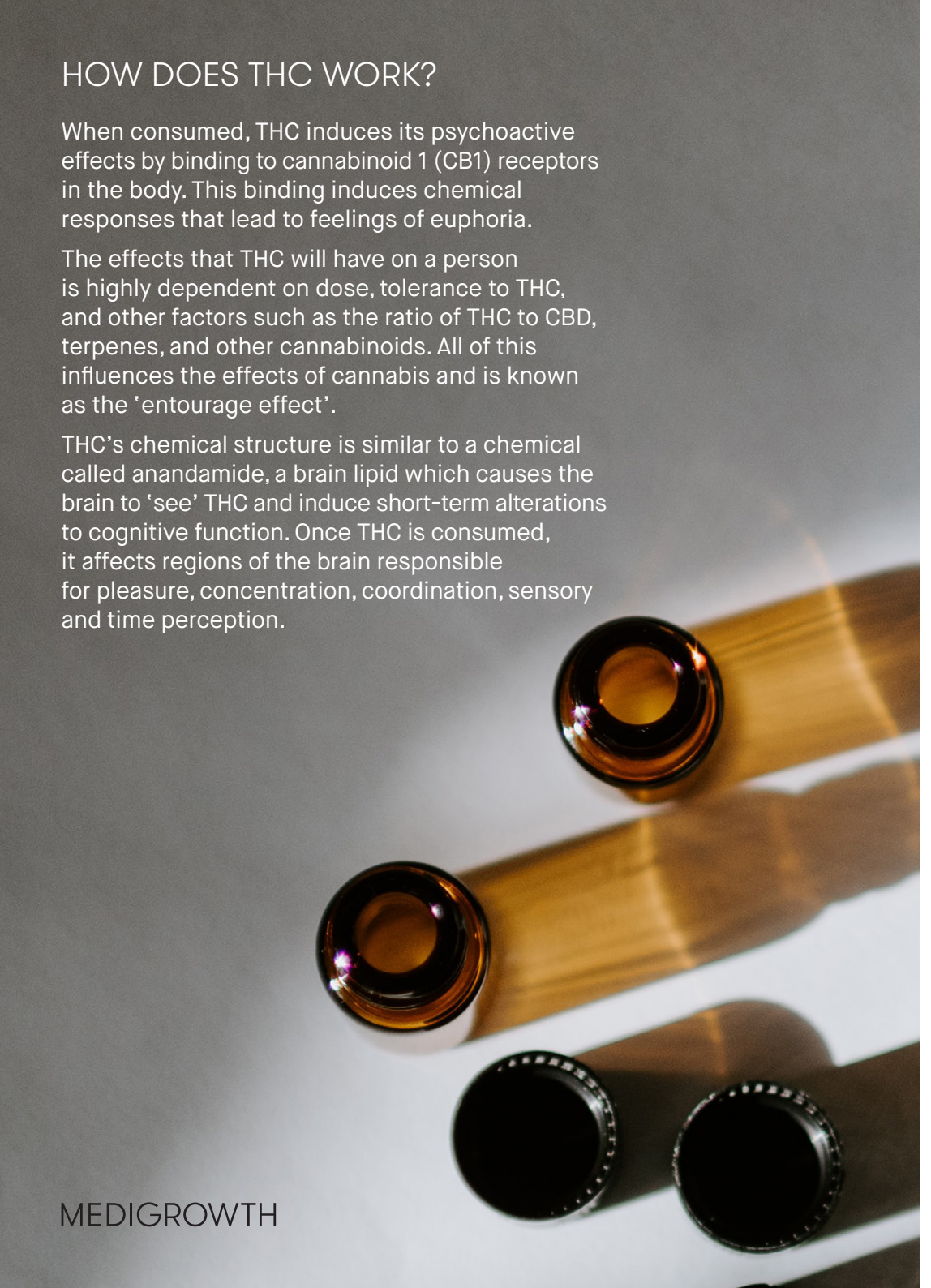
In this e-book, we cover the basics of THC, how it works in the brain and what research is showing about THC's potential medicinal benefits and safety profile.

HOW DOES THC WORK?

When consumed, THC induces its psychoactive effects by binding to cannabinoid 1 (CB1) receptors in the body. This binding induces chemical responses that lead to feelings of euphoria.

The effects that THC will have on a person is highly dependent on dose, tolerance to THC, and other factors such as the ratio of THC to CBD, terpenes, and other cannabinoids. All of this influences the effects of cannabis and is known as the 'entourage effect'.

THC's chemical structure is similar to a chemical called anandamide, a brain lipid which causes the brain to 'see' THC and induce short-term alterations to cognitive function. Once THC is consumed, it affects regions of the brain responsible for pleasure, concentration, coordination, sensory and time perception.



The way THC is consumed matters

How THC is consumed is important in determining the strength of a THC high, how long the onset takes and how many hours the effects will last.

For example, consuming THC through inhalation (via vapour) causes near-immediate effects, as THC can cross the blood-brain barrier rapidly. When consuming cannabis orally (through an edible), effects of THC can take 30–45 minutes or up to 90 minutes to register due to the time it takes for THC to make its way through the digestive system and into the bloodstream. THC consumed through edibles or oils also can cause stronger psychoactive effects due to the way that THC is metabolised when orally consumed.

Both methods of consumption of cannabis provide the body with THC. According to research, when THC is consumed orally, a higher proportion of Delta-9-THC makes its way to the liver. In the liver, Delta-9-THC turns into 11-hydroxy-THC, which is a stronger psychoactive compound, and is produced in a higher proportion through edibles in comparison to smoking and vaping.

THE MEDICAL BENEFITS OF THC

While THC's reputation may be built largely on its psychoactive effects, there is a growing body of research indicating that THC has significant therapeutic properties. THC is used to treat conditions such as pain, glaucoma, insomnia, low appetite (and anorexia), nausea, and anxiety, among other conditions.

THC is even available in Australia through TGA registered prescription medicine in the form of Sativex. Sativex is used as an add-on treatment for patients with multiple sclerosis suffering from spasticity. The TGA has also approved a wide range of indications for treatment with THC products including oils and dried cannabis flower via Special Access Scheme and Authorised prescriber pathways.

THC may help ease chronic pain

Supporters of legal THC often tout its ability to ease chronic pain as one of its most significant therapeutic effects. Aside from anecdotal evidence, there is research to indicate that THC may act on pain systems.

One study published in *Behavioural Pharmacology* in 2012 explored how THC helps manage pain caused by cancer via the activation of CB1 and CB2 receptors. Interestingly, researchers found that the activation of these receptors due to THC caused an analgesic (pain-relieving) effect comparable to morphine.

THC can curb nausea and vomiting

Research shows that THC may also act as an antiemetic, meaning it helps to curb nausea and vomiting. THC's antiemetic effects occur thanks to its interaction with the 5-hydroxytryptamine 3 (5hHT3) receptor. The 5HT3 receptor has a demonstrated ability to increase GABA release. GABA is a neurotransmitter important for health but in excess can cause vomiting.

CB1 and 5-HT3 receptors are located on gamma-aminobutyric acid (GABA neurons) and thus may have an opposing effect on GABA release, resulting in reduced nausea. It is thought that THC's activation of CB1 receptors may neutralise nausea caused by a 5-HT3-mediated GABA increase.

THC promotes sleepiness

Drowsiness is a stereotypical trait of cannabis consumers, and it seems that THC may be responsible for this. THC's potential sedative effects can be extremely helpful for patients suffering from insomnia and other sleep disorders. Low doses of THC (15mg) have been shown to have a sedative effect, which leads to an increase in sleep activity.

THC increases appetite

Colloquially known as the 'munchies', THC increases appetite, which may be good for those suffering from a decreased appetite due to diseases such as cancer or conditions such as anorexia and other eating disorders.

Researchers believe this increase in appetite is caused by THC's interaction with CB1 receptors. CB1 receptors can be found in the lateral hypothalamus region of the brain. Their activation causes interactions with dopaminergic neurons which play a key role in the regulation of food reward.

THC may reduce tumor growth (at least in animals)

Some preliminary studies show that THC may also reduce tumour growth, at least in animal models. Animal studies have shown that activating cannabinoid receptors can impair cancer cell development. This is an exciting finding, but it's important to keep in mind that research on cannabis and cancer is very much in its infancy. There is much more research to be done before claims can be made about THC's effectiveness for treating cancer.

THC could eventually be regarded as an effective treatment for cancer, but not necessarily because it directly inhibits tumour growth. THC seems to be helpful for easing symptoms of cancer treatment such as pain and nausea, and without causing other adverse effects that many other prescription medications cause.

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