

cannabinoids and appetite

what are ‘the munchies’?

The feeling of increased appetite following cannabis intoxication has been documented for hundreds of years¹. Popular culture has termed the sensation ‘the munchies’. Unfortunately the phenomenon has been so widely accepted on anecdotal evidence alone that it has only recently been subject to scientific research.

The first human study confirming the anecdotal reports was conducted in 1971 by Hollister and colleagues². This research identified that sweet foods were more palatable to those who were administered oral cannabis and paved the way for further study.

A more detailed study followed in 1976, conducted by Greenberg and colleagues³. This research surveyed the energy intake and weight changes of participants under observation for one month. Participants who smoked supplied cannabis showed an increased body weight which decreased promptly after cannabis was no longer supplied. Energy intake also increased over the first few days and then decreased to an average slightly higher than levels recorded prior to cannabis administration.

Following on from this study, Foltin and colleagues conducted even more systematic research in 1986⁴. Foltin also kept participants under observation for approximately one month but placed participants in one of three activities; in private work, conducting a performance task, or in a social situation. Participants tended to increase their daily energy intake, most notably in periods of social activity while snacking on foods, in addition to the meals normally provided. Continuing his research, Foltin later analysed participant snack choices and found sweet solid snacks such as cookies, candy bars and cakes were preferable over savory solid snacks or sweet drinks⁵. This finding has been confirmed by several other studies⁶.

is there potential for cannabis to be used for weight control?

As participants gained weight and experienced an increased appetite during the research, potential therapeutic properties were highlighted. These therapeutic uses however, mostly predate any specific knowledge of cannabinoids and the mechanisms at play. As such, with further research, it is likely that the therapeutic benefits of cannabinoids for weight control can be even better understood and controlled.

how does using cannabis increase appetite?

The animal research technology available today has made it possible to gain a better understanding of how cannabis alters appetite by studying the actual chemical pathways involved within our body. It was not until the last decade that the mechanisms involved were even identified.

Like opiates, cannabinoids exert their effect by interacting with specific receptors, located within different parts of our brains and peripheral nerves. Today it is known that we have receptors within us that respond to ingested cannabis as well as cannabinoid-like substances that exist inside us, 'endogenous cannabinoids'. The particular receptor linked to cannabis use and appetite regulation is termed CB₁⁷. To date, the CB₁ receptor has been found to be active in several areas of the body known to stimulate eating behavior. These are as follows:

- the sections of the hypothalamus and hind brain that regulate food intake^{8,9}
- the reward centre of the brain – helping food make us feel better¹⁰
- from within stomach and intestinal tissue – helping us know when we are hungry¹¹⁻¹³
- the limbic forebrain – helping food seem more palatable^{14,15}

Other hormones, such as leptin and insulin, are also known to regulate food intake and have been found to share functional relationships with cannabinoids and possibly even be responsible for their synthesis^{7,16-18}.

Interestingly, endogenous cannabinoids have recently been discovered in foods such as chocolate and human and bovine milk^{19,20}. Interestingly, the neonatal survival of many species is largely dependent on their suckling behaviour, or appetite for breast milk. Research responding to this curious link has since identified the endogenous cannabinoid system to be the first neural system to display complete control over milk ingestion and neonatal survival²¹. Thus, it may be that cannabinoid receptors in our body interact with the cannabinoids in milk to stimulate a suckling response in newborns so as to prevent growth failure.

references

- 1 **Mechoulam, R.** (1984). *Cannabinoids as therapeutic agents*. Boca Raton, FL: CRC Press.
- 2 **Hollister, L.E.** (1971). Hunger and appetite after single doses of marijuana, alcohol and dextroamphetamine. *Clinical Pharmacology and Therapeutics* 12, 45–49.
- 3 **Greenberg, I., Kuehnle, J., Mendelson, J.H., & Bernstein, J.G.** (1976). Effects of marijuana use on body weight and energy intake in humans. *Psychopharmacology* 49, 79–84.
- 4 **Foltin, R.W., Brady, J.V. & Fischman, M.W.** (1986). Behavioral analysis of marijuana effects on food intake in humans. *Pharmacology Biochemistry and Behavior* 25, 577–582.
- 5 **Foltin, R.W., Fischman, M.W. & Byrne, M.F.** (1988). Effects of smoked marijuana on food intake and body weight of humans living in a residential laboratory. *Appetite* 11, 1–14.
- 6 **Mattes, R.D., Engelman, K., Shaw, L.M., & Elsohly, M.A.** (1994). Cannabinoids and appetite stimulation. *Pharmacology Biochemistry and Behavior* 49, 187–195.
- 7 **Di Marzo, V., Goparaju, S.K., Wang, L., Liu, J., Batkai, S., Jarai, Z., Fezza, F., Miura, G.I., Palmiter, R.D., Sugiura, T., & Kunos, G.** (2001). Leptin-regulated endocannabinoids are involved in maintaining food intake. *Nature* 410, 822–825.
- 8 **Friedman, J.M.** (2000). Obesity in the new millennium. *Nature* 404, 632–634.
- 9 **Derbenev, A.V., Stuart, T.C. & Smith, B.N.** (2004). Cannabinoids suppress synaptic input to neurones of the rat dorsal motor nucleus of the vagus nerve. *Journal of Physiology* 559, 923–938.
- 10 **Kirkham, T.C.** (1991). Opioids and feeding reward. *Appetite* 17, 74–75.
- 11 **Tucci, S.A., Rogers, E.K., Korbonits, M., & Kirkham, T.C.** (2004). The cannabinoid CB₁ receptor antagonist SR141716 blocks the orexigenic effects of intrahypothalamic ghrelin. *British Journal of Pharmacology* 143, 520–523.
- 12 **Pinto, L., Capasso, R., Di Carlo, G., & Izzo, A.A.** (2002). Endocannabinoids and the gut. *Prostaglandins Leukot Essent Fatty Acids* 66, 333–341.
- 13 **Di Carlo, G. & Izzo, A.A.** (2003). Cannabinoids for gastrointestinal diseases: Potential therapeutic applications. *Expert Opinion on Investigational Drugs* 12, 39–49.

- 14 **Jamshidi, N. & Taylor, D.A.** (2001). Anandamide administration into the ventromedial hypothalamus stimulates appetite in rats. *British Journal of Pharmacology* 134, 1151–1154.
- 15 **Kirkham, T.C., Williams, C.M., Fezza, F., & Di Marzo, V.** (2002). Endocannabinoid levels in rat limbic forebrain and hypothalamus in relation to fasting, feeding and satiation: Stimulation of eating by 2-arachidonoyl glycerol. *British Journal of Pharmacology* 136, 550–557.
- 16 **Mechoulam, R. & Fride, E.** (2001). Physiology. A hunger for cannabinoids. *Nature* 410, 763–765.
- 17 **Schwartz, M.W., Woods, S.C., Porte, D. Jr., Seeley, R.J., & Baskin, D.G.** (2000). Central nervous system control of food intake. *Nature* 404, 661–671.
- 18 **Lawrence, C.B., Turnbull, A.V. & Rothwell, N.J.** (1999). Hypothalamic control of feeding. *Current Opinions on Neurobiology* 9, 778–783.
- 19 **Di Marzo, V., Sepe, N., De Petrocellis, L., Berger, A., Crozier, G., Fride, E., & Mechoulam, R.** (1998). Trick or treat from food endocannabinoids? *Nature* 396, 636.
- 20 **Di Tomaso, E., Beltramo, M. & Piomelli, D.** (1996). Brain cannabinoids in chocolate. *Nature* 382, 677–678.
- 21 **Fride, E.** (2004). The endocannabinoid-CB₁ receptor system in pre- and postnatal life. *European Journal of Pharmacology* 500, 289–297.