

Chronic Cannabis Abuse, Delta-9-tetrahydrocannabinol and Thyroid Function

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Abstract

Objective: The aim of this study was to obtain rather rare information about the influence of chronic cannabis abuse on thyroid function.

Methods: Thyroid function tests (TSH, total T₃, free T₄) of 39 chronic cannabis-dependent subjects (ICD-10) were determined at admission (for in-patient detoxification). In a subgroup, serum levels of thyroid hormones were correlated with the serum levels of delta-9-tetrahydrocannabinol (THC, N=24) and its major metabolites, THC-OH (N=16) and THC-COOH (N=24).

Results: All of the tested patients were found to have TSH, total T₃ and free T₄ levels within the population reference range. The levels of thyroid hormones did not correlate significantly with levels of THC, THC-OH or THC-COOH in serum.

Conclusion: These results argue against a relevant influence of chronic cannabis intake on thyroid function in humans.

Key words

THC · TSH · thyroid hormones · cannabis-dependence

Introduction

Functional CB1 cannabinoid receptors are organized along the central and peripheral thyroid hormone axis [1,2]. Previous reports have shown that acute administration of delta-9-tetrahydrocannabinol (THC), the major psychoactive cannabinoid component of cannabis, reduces levels of thyroxine (T₄) and thyrotropin (TSH) in rodents [1]. This depressing effect is reversed by administration of exogenous TSH, suggesting a hypothalamic site of action [1]. Data about the effect of cannabis on thyroid function in humans are very rare. To the best of my knowledge, there is only one study published on this subject [3]. This study described subtle lower levels of T₄ in cannabis abusers compared to control subjects; but all of these values were within the standard range [3]. TSH was not significantly different between the 2 groups [3]. A study that was intended to relate thyroid function tests to serum THC levels in humans, which would provide more

insights in the interplay of THC and thyroid hormones, could not be found in the literature. Therefore, the objectives of this prospective cohort study were (i) to perform thyroid function tests [TSH, total T₃ (TT₃), free T₄ (fT₄)] in cannabis abusers and (ii) to correlate them with the patient's THC levels.

Patients and Methods

The population (age 28.6±7.5 years, all Caucasian) consisted of 39 (8 female) in-patients who came voluntarily for detoxification because of serious problems with cannabis. All of them were dependent on cannabis according to ICD-10 and DSM-IV and had given written informed consent to the investigation. The following cannabis history data were reported on average: daily cannabis intake of 2.5±1.2 g, 54.2±62.5 months of nearly daily abuse and 9.9±6.7 years of dependence. There was no relevant co-morbidity and no other substance abuse with the exception of cigarettes, because all patients met the criteria of nicotine dependence (ICD-10 and DSM-IV). Levels of thyroid hormones and THC in serum were determined directly at admission. Additionally, the serum levels of 2 major THC metabolites were measured, water-soluble THC-OH [4] and lipid-soluble THC-COOH [4]. Serum levels of THC, and its metabolites THC-OH and THC-COOH were 13.1±23.8 ng/mL (N=30), 4.3±8.6 ng/mL (N=16) and 146.4±149.9 ng/mL (N=30), respectively. These values indicate a substantial and sustained ("chronic") cannabis intake [5] and reflect the self-reported daily abuse.

Results and Discussion

All of the tested patients were found to have TSH, TT₃ and fT₄ levels within the population reference range (Table 1). As no abnormalities were found in these sensitive thyroid function assays, a TRH test was not performed. The levels of the thyroid hormones did not correlate significantly with the levels of THC, THC-OH or THC-COOH in serum (Table 2), suggesting no relevant interplay between THC (or its major metabolites) and thyroid hormones after chronic cannabis abuse. All together these results argue against a relevant influence of chronic cannabis intake on thyroid function of humans. A supposed acute depressant effect of cannabis on T₄-release [1] could have been masked by the development of tolerance in this cohort as was described in rats [6].

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Table 1 Thyroid-function* in serum of chronic cannabis-dependents.

Hormones	Average	SD	Minimum	Maximum	Reduced**	Normal**	Increased**
TSH (N=39)	1.50	0.54	1.00	3.00	0%	100%	0%
TT ₃ (N=24)	2.23	0.46	1.43	3.01	0%	100%	0%
fT ₄ (N=24)	1.54	0.23	1.25	1.95	0%	100%	0%

* Measured in LVR-Laboratory Düsseldorf (Germany) by Enzyme Immunoassay

** If compared with standard values: TSH (0.27–4.2 mU/L), total T₃ (TT₃; 1.3–3.1 nmol/L), free T₄ (fT₄; 1.2–2.19 pmol/L)

Table 2 Pearson's correlation of thyroid-function with THC and its metabolites* in serum**.

Cannabinoids/Hormones	TSH	TT ₃	fT ₄
THC (N=24)	-0.26	0.73	0.63
THC-OH (N=16)	-0.23	0.67	0.53
THC-COOH (N=24)	-0.22	0.29	0.33

*Measured in Laboratory of Laser (Cologne, Germany) with gas chromatography-mass spectroscopy

**All $p > 0.13$, there was no significance ($p < 0.05$)

Conflict of Interest



The author declares no conflict of interest.

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