Journal of Medical Phyto Research
Vol. 2, Article 1, (1-13)

ISSN: 2577-6541
Doi: 10.31013/2001e

Synthetic cannabinoids severely elevate amino transferase levels. Natural cannabidiol does not.

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Abstract:

Cannabidiol (CBD) is a promising and well-studied medicinal compound found in cannabis. While CBD has a favorable safety profile, the deleterious health effects of synthetic cannabinoids are well documented. The human body is not equipped with the tools needed to catabolize synthetic cannabinoids. Among the enzymes recruited to removing them from the body are Alanine Amino Transferase (ALT) and Aspartate Amino Transferase (AST). The present article is broken into one naturalistic medical observation, and two studies. Each of these is concerned with the ALT and AST levels of patients exposed to cannabinoids. The medical observation is of four patients who mistakenly consumed a dangerous synthetic cannabinoid, JWH-018. Their ALT and AST levels were recorded once. The first experimental study is of six patients that consumed a synthetic CBD derivative, H_4-CBD. ALT and AST levels were recorded over 22 weeks. The second experimental study is of 184 patients that consumed natural CBD. ALT and AST levels were recorded over 6 months. Taken together, these studies demonstrate clear differences between consumption of natural CBD, and two synthetic derivatives on ALT and AST levels.

Cannabidiol (CBD) is a promising and well-studied medicinal compound found in cannabis. It has been shown to be anxiolytic, antidepressant, antipsychotic, anticonvulsant, anti-nausea, antioxidant, anti-inflammatory, anti-arthritic, anti-neoplastic, and protective in animal models of epilepsy, anxiety, psychosis, and basal ganglia diseases (Ligresti, De Petrocellis, & Di Marzo, 2016). Anti-cancer effects have also been shown (Pisanti et al., 2017). Research involving CBD has burgeoned in recent years (Burstein, 2015; Zuardi, 2008). Concurrently, there has been a proliferation of synthetic CBD derivatives (for a list, see Morales, Reggio, & Jagerovic, 2017). The World Drug Report 2016 showed that the majority of substances reported for the first time between 2012 and 2014 were synthetic cannabinoids.

While CBD has a favorable safety profile (Iffland, & Grotenhermen, 2017; Devinsky et al., 2016), the deleterious health effects of synthetic cannabinoids are well documented (van Amsterdam, Brung, & van den Brink, 2015; Law, Schier, Martin, Chang, Wolkin, & Schauben, 2016). Reported side effects of synthetic cannabinoid use include extreme anxiety, confusion, hallucinations and paranoia, violent behavior, suicidal thoughts, tachycardia, nausea, and vomiting. Unlike CBD, synthetic cannabinoids are extremely potent, full agonists of the cannabinoid receptors (Weinstein, Rosca, Fattore, & London, 2017; Spaderna, Addy, D'Souza, 2013; Fantegrossi, Moran, Radominska-Pandya, & Prather, 2014).

The human body is not equipped with the tools needed to catabolize synthetic cannabinoids. Among the enzymes recruited to remove them from the body are Alanine Amino Transferase (ALT) and Aspartate Amino Transferase (AST). In a normal, healthy body, ALT levels are typically reported between 7 and 56 units/L, and AST levels between 5 and 40. Severely heightened ALT and AST levels can result in liver failure and subsequently death (Robles-Diaz et al., 2014).

The present article is broken into one naturalistic medical observation, and two experimental studies. Each of these is concerned with the ALT and AST levels of patients exposed to cannabinoids. The medical observation is of four patients who mistakenly consumed a dangerous synthetic cannabinoid, most likely JWH-018. Their ALT and AST levels were recorded once. The first experimental study is of six patients that consumed a synthetic CBD derivative, H_4-CBD. ALT and AST levels were recorded over 22 weeks. The second experimental study is of 184 patients that consumed natural CBD. ALT and AST levels were recorded over 6 months. Taken together, these studies demonstrate clear differences between consumption of natural CBD, and two synthetic derivatives on ALT and AST levels.

Medical Observation: JWH-018

On December 21, 2016, an emergency response call was made from Morjin Beach, Goa, India to Healthway Hosptial. Four Russian tourists (men = 3, women = 1) were received in an agitated and diaphoretic state. They complained of headache, dizziness, and diaphoresis. They demonstrated a tachycardia average of 132 bpm. Otherwise they had normal vital signs and normal oxygenation.

The three males were uncooperative, restless, and aggressive in the emergency room. They were treated with 2 mg of lorazepam intravaneously. These patients improved after 10 hours and were kept for observation overnight.

The lone female was catatonic and lying supine with her eyes wide open. She was silent, and unresponsive to verbal commands and stimuli. She also displayed tachycardia of 135. Vertical nystagmus was noted. Examinations of her heart, lungs, and abdomen seemed normal. Her lower extremities were slightly bent but rigid. She was first treated with a dose of diphenhydramine (50 mg IV), which improved her rigid extremities and partially gave her the ability to speak. She was then treated with lorazepam and continued to improve. She was kept overnight. By morning, her motor and verbal skills returned to normal, and she was released.

All four erroneously reported smoking CBD, which one of the males stated he purchased from China. The standard urine toxicology screen was negative. Serum ethanol levels were normal. Comprehensive Metabolic Panel blood tests showed extremely high ALT levels (M = 1227.5 Units/L, SD = 178.88) and AST levels (M = 1136.75 Units/L, SD = 183.74) (See Table 1).

	ALT Levels	AST Levels
Man #1	1447	1233
Man #2	1233	1012
Man #3	1221	1346
Woman #1	1009	956

Table 1: Observed ALT and AST levels (Units/L) of four patients who consumed a synthetic cannabinoid, most likely JWH-018.

Urine samples were sent for further toxicological studies. Potential metabolites were analyzed in the urine samples collected by liquid chromatography-mass spectrometry (LC-MS/MS). Tests detected an average of 10.6 ng/ml of pentatonic acid. This is the predominant metabolite of JWH-018. Other metabolites detected were 5-and 4-HO pentyl-JWH-018 and JWH-073 butanoic acid. Occasionally, further hydroxylated metabolites were found.

Experimental Study 1: H_4-CBD

Six college students allegedly purchased 1 kg of what they believed to be CBD from MBI Import and Export Pvt Ltd, China. They brought the product to ImmunAG, LLP, Goa, India to verify its authenticity.

A CBD isolate from ImmunAG™ (Cushing, Kristipati, Shastri, & Joseph, 2018; Cushing & Joseph, 2018) was used as a reference standard against which the 1 kg sample was tested. The purity of the reference standard was confirmed by liquid chromatography–ultraviolet-mass spectrometry (LC–UV-MS) measurements. It had a bioactivity of .96, whereas the reference sample had a very low bioactivity of .06. This strikingly low bioactivity suggested that this product may not have been natural CBD.

Mass Isolation Vibrational Spectroscopy was subsequently used to analyze the sample. It was then identified as H_4-CBD: A synthetic, hydrogenated derivative of CBD.

The students were informed that the product they bought was a hydrogenated derivative and not natural CBD. They were told that the safety of the product was unknown. They decided to use the product anyways, but they agreed to have their health monitored while they used it.

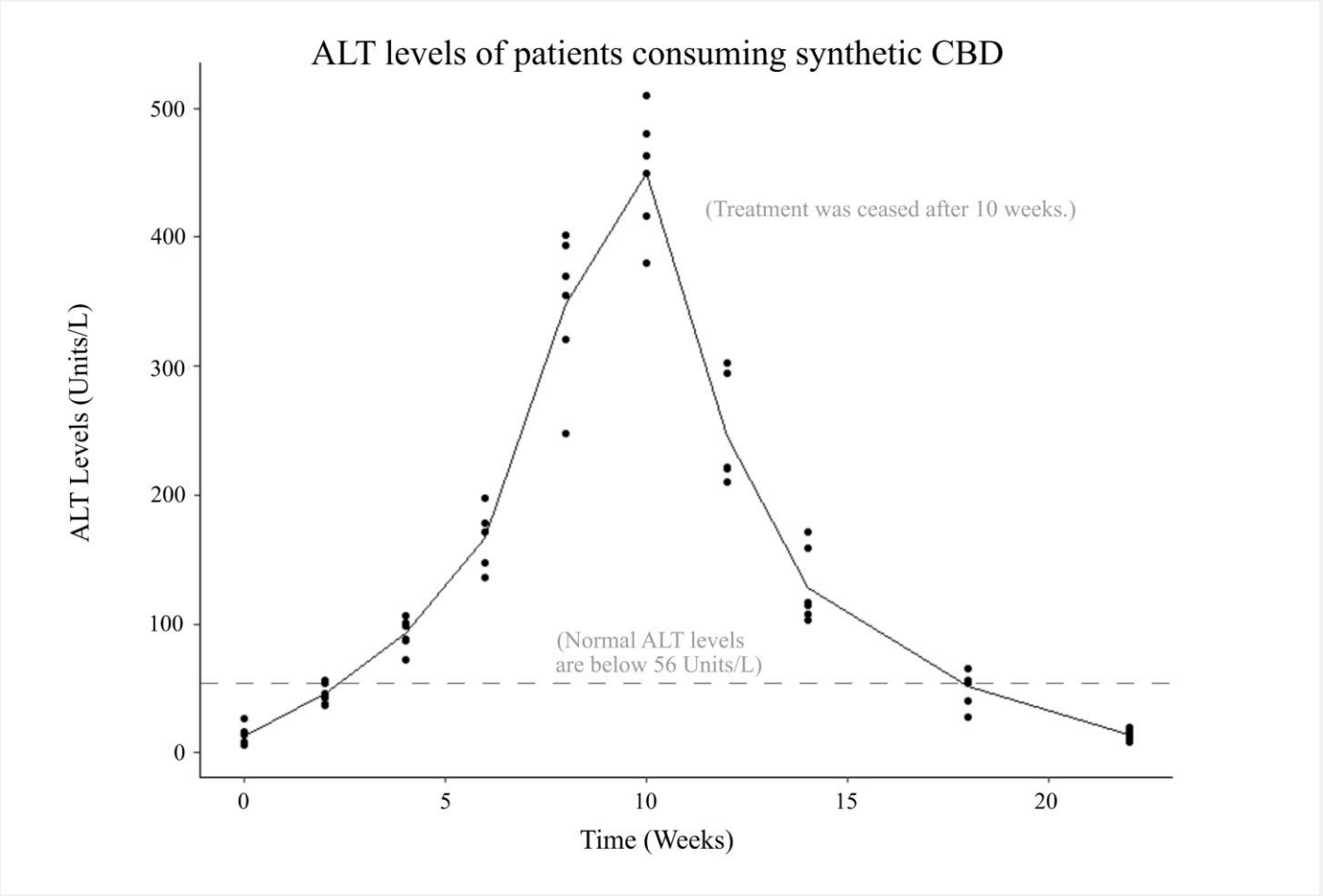

Figure 1: ALT levels increased drastically during H_4-CBD consumption, and returned to normal when patients ceased ingestion.

Method:

Subjects:

6 patients (men = 4, women = 2) consumed H_4-CBD, in 50 mg packets with variable total doses (*M* = 891.67 mg, *SD* = 58.45). Full data for H_4-CBD trials are listed in Appendix 1.

Procedure:

Every two weeks, patients had blood samples drawn at Healthway Hospital. AST and ALT levels were recorded. After 56 days, we strongly recommended to the patients that they stop using the product. After 70 days, patients stopped ingesting the H_4-CBD. AST and ALT levels were additionally examined 14, 28, 56, and 84 days after cessation.

Statistical analysis:

Growth curve modelling, as outlined in Field, Miles, and Field, 2012, would be an ideal way to analyze data of this sort, but ethical constraints limited the number of patients who could be exposed to the product in question. Instead, descriptive statistics, including means and standard deviations are provided for each time point. All AST and ALT levels are described in units/liter.

Results:

ALT levels at baseline ranged from 6 to 27 (*M* = 13.33, *SD* = 7.92). After 14 days of consumption, ALT levels ranged from 37 to 56 (*M* = 45.67, *SD* = 7.97). After 28 days, ALT levels ranged from 72 to 107 (*M* = 92.33, *SD* = 12.61). After 42 days, ALT levels ranged from 136 to 198 (*M* = 166.83, *SD* = 22.25). After 56 days, ALT levels ranged from 248 to 402 (*M* = 348.33, *SD* = 57.08). After 70 days, ALT levels ranged from 380 to 510 (*M* = 449.83, *SD* = 46.31). 14 days after cessation, ALT levels ranged from 210 to 302 (*M* = 245.33, *SD* = 41.49). 28 days after cessation, ALT levels ranged from 103 to 171 (*M* = 128.67, *SD* = 28.81). 56 days after cessation, ALT

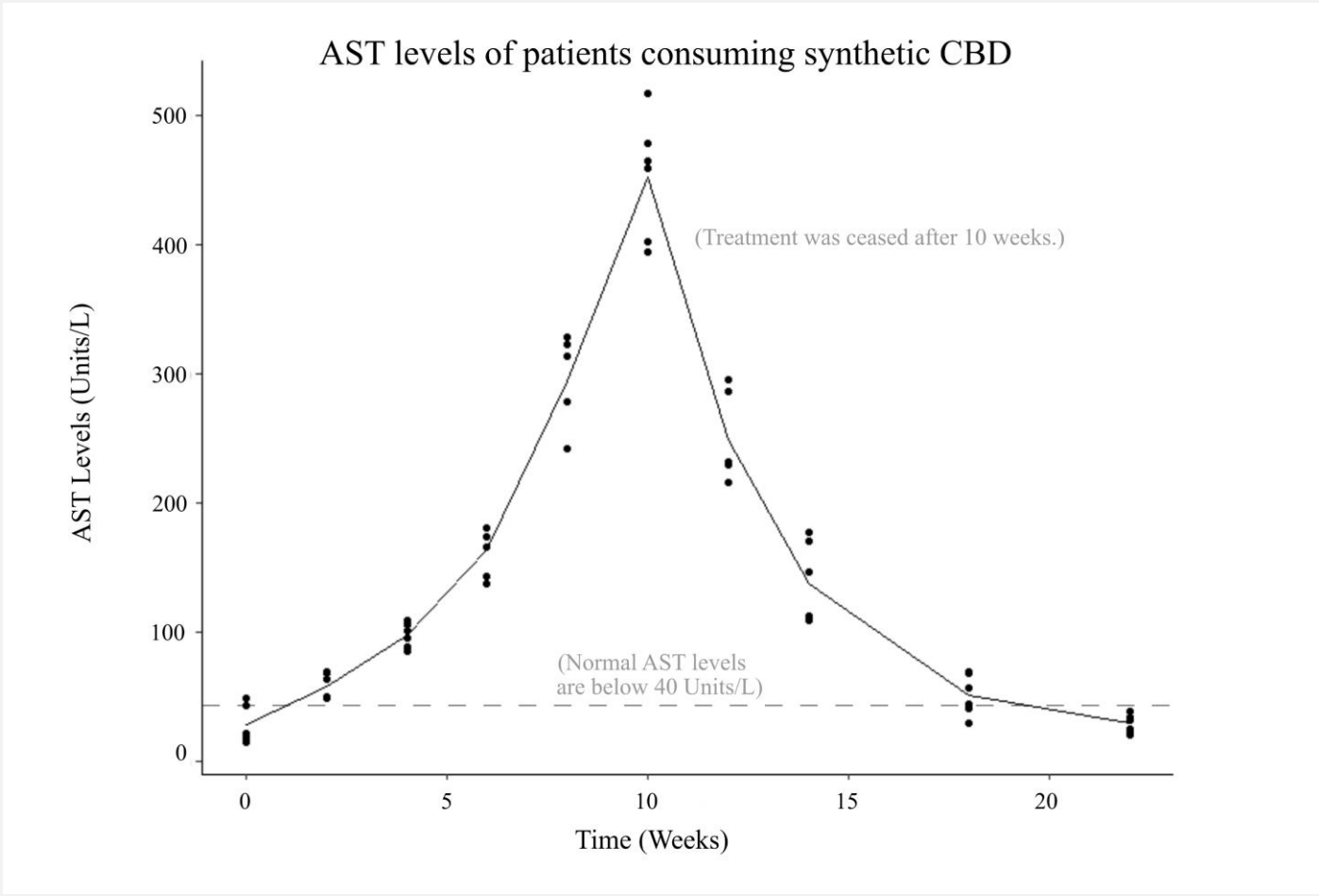

Figure 2: AST levels increased drastically during H_4-CBD consumption, and returned to normal when patients ceased ingestion.

levels ranged from 28 to 66 (*M* = 51.67, *SD* = 15.04). 84 days after cessation, ALT levels ranged from 8 to 20 (*M* = 13.83, *SD* = 5.04).

AST levels at baseline ranged from 14 to 48 (*M* = 27.33, *SD* = 14.36). After 14 days of consumption, AST levels ranged from 48 to 69 (*M* = 58, *SD* = 9.74). After 28 days, AST levels ranged from 85 to 109 (*M* = 97.17, *SD* = 9.52). After 42 days, AST levels ranged from 137 to 180 (*M* = 163.17, *SD* = 18.86). After 56 days, AST levels ranged from 242 to 328 (*M* = 293.5, *SD* = 33.21). After 70 days, AST levels ranged from 394 to 517 (*M* = 452.5, *SD* = 46.86). 14 days after cessation, AST levels ranged from 216 to 295 (*M* = 248, *SD* = 33.52). 28 days after cessation, AST levels ranged from 109 to 177 (*M* = 137.17, *SD* = 31.51). 56 days after cessation, AST levels ranged from 29 to 69 (*M* = 51, *SD* = 16.07). 84 days after cessation, AST levels ranged from 20 to 38 (*M* = 28.5, *SD* = 6.95).

To summarize, ALT and AST levels increased dramatically while patients were ingesting H_4-CBD. These levels returned to baseline 84 days after ceasing to ingest H_4-CBD (see Figures 1 & 2).

Experimental Study 2: Natural CBD

Having seen the toxicity of JWH-018 and H_4-CBD, we decided to study the safety of CBD. Volunteers were recruited through posters displayed in local hospitals throughout North Goa, India. Inclusion criteria are included in appendix 2. Volunteers were paid for their participation.

The CBD used in this study was an isolate acquired from ImmunAG, LLP (Cushing, Kristipati, Shastri, & Joseph, 2018).

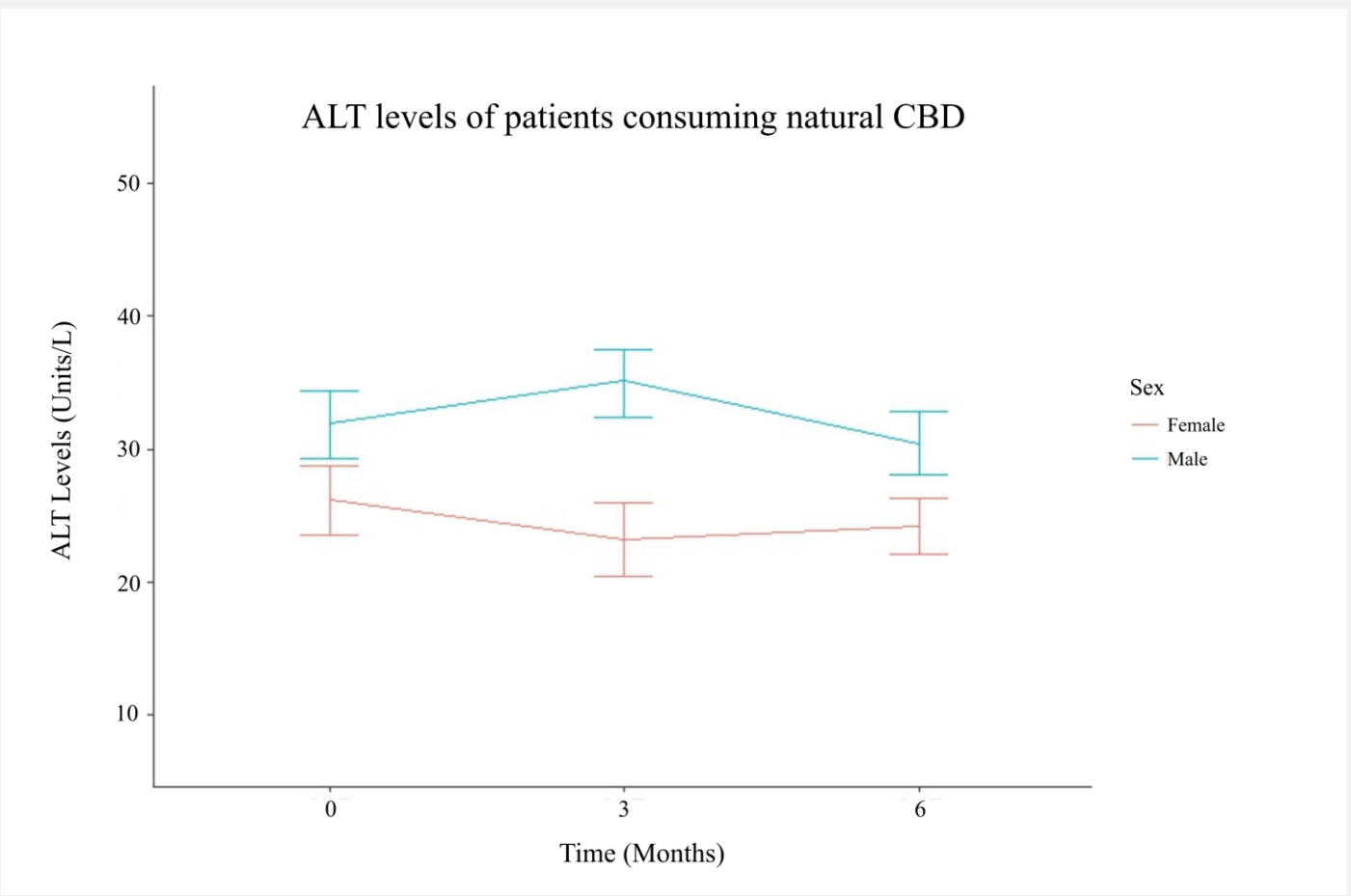

Figure 3: An increase in ALT levels among patients consuming natural CBD was not observed.

Method:

Subjects:

184 patients (men = 132, women = 56) consumed CBD isolated from ImmunAG, with variable dosages (*M* = 771.01 mg, *SD* = 264.82 mg). These dosages were recommended according to patient height (*M* = 11.09 mg/inch, *SD* = 4.05 mg/inch). CBD came in pill form, and patients were instructed consume it orally once per day.

Procedure:

AST and ALT levels were collected at the start of the experiment, after 3 months, and after 6 months via blood draw at Healthway Hospital, Goa, India.

Statistical analysis:

Repeated Measures ANOVAs were utilized to determine whether there were differences in AST or ALT levels over the 6-month consumption period, and whether there was an interaction effect of sex. ANOVAs were calculated using R version 3.4.4. Type III sums of squares were calculated through use of the 'ez' package. Descriptive statistics, including means and standard deviations are provided for each time point. All AST and ALT levels are described in units/liter. Full data for each patient, including height, dosage, dosage per height, and sex, are listed in Appendix 3.

Results:

Male AST levels at baseline ranged from 10 to 40 (*M* = 23.34, *SD* = 8.8). Female AST levels at baseline ranged from 9 to 56 (*M* = 31.25, *SD* = 13.02). Male AST levels at 3 months ranged from 12 to 44 (*M* = 29.01, *SD* = 9.55). Female AST levels at 3 months ranged from 9 to 56 (*M* = 31.57, *SD* = 14.72). Male AST levels at 6 months ranged from 10 to 40 (*M* = 25.59, *SD* = 8.83). Female AST levels at 6 months ranged from 8 to 55 (*M* = 29, *SD* = 14.36). Mean AST levels across the three time points are shown in Figure 3.

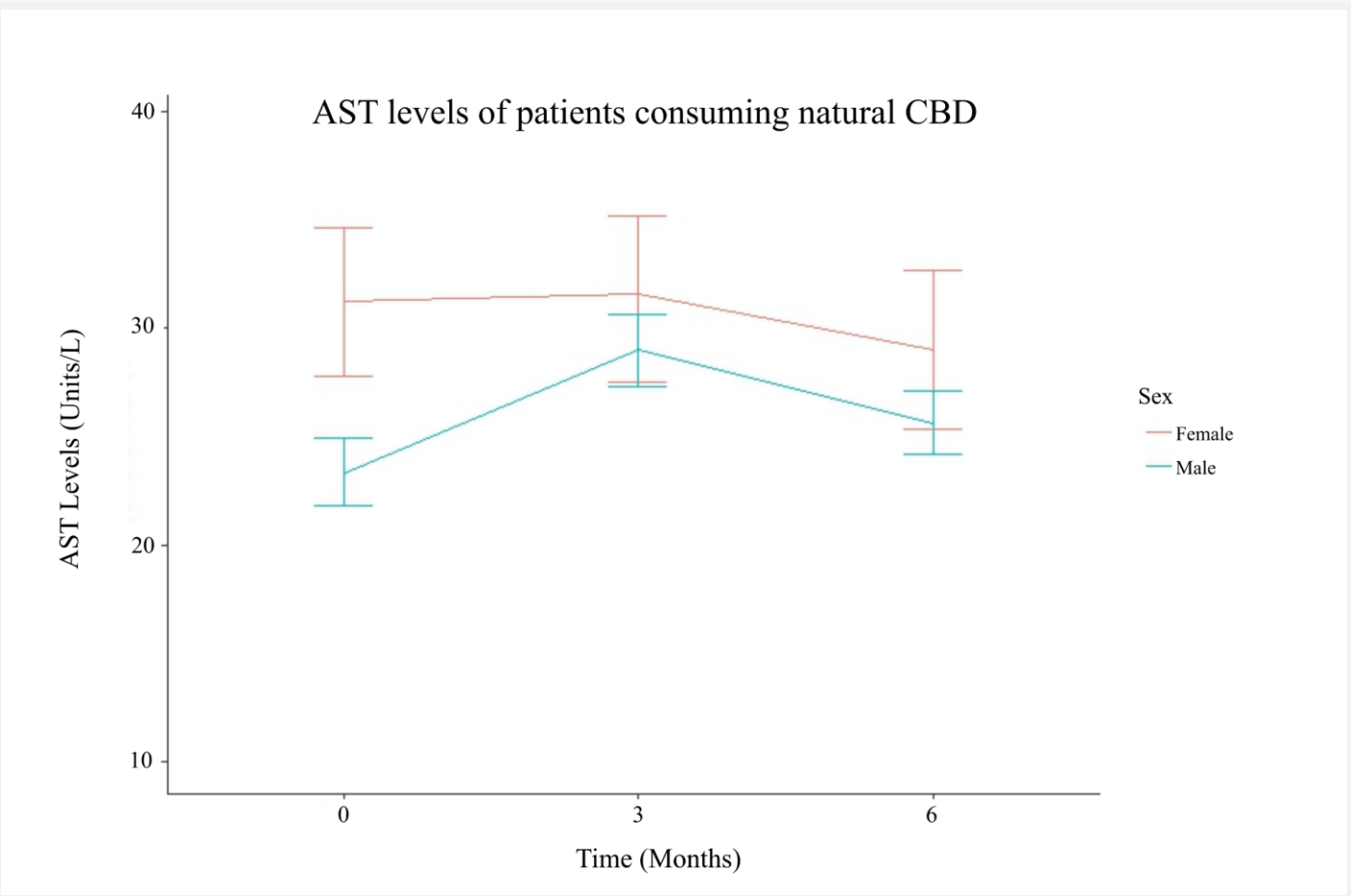

Figure 4: An increase in AST levels among patients consuming natural CBD was not observed.

A 2x3 Repeated Measures ANOVA was conducted. Mauchly's test for sphericity revealed no violation for the repeated measures variable, $W = .99$, $p = .88$, or for the interaction, $W = .99$, $p = .88$. There was a significant main effect of sex, $F(1, 186) = 19.75$, $p < .001$ Generalized $\eta^2 = .04$, and of timepoint, $F(2, 372) = 5.79$, $p = .003$, Generalized $\eta^2 = .02$. There was not a significant interaction effect, $F(2, 372) = 2.94$, $p = .054$.

Bonferroni-corrected post-hoc comparison revealed a significant difference between baseline levels and levels at 3 months among Males, $p = .004$. No other comparisons were significant (every $p > .15$).

Male ALT levels at baseline ranged from 7 to 56 ($M = 31.9$, $SD = 14.51$). Female ALT levels at baseline ranged from 8 to 40 ($M = 26.18$, $SD = 9.86$). Male ALT levels at 3 months ranged from 10 to 60 ($M = 35.18$, $SD = 15.18$). Female ALT levels at 3 months ranged from 8 to 40 ($M = 23.14$, $SD = 10.38$). Male ALT levels at 6 months ranged from 8 to 56 ($M = 30.45$, $SD = 14.48$). Female ALT levels at 6 months ranged from 8 to 39 ($M = 24.16$, $SD = 8.54$). Mean ALT levels across the three time points are shown in Figure 4.

A 2x3 Repeated Measures ANOVA was conducted. Mauchly's test for sphericity revealed no violation for the repeated measures variable, $W = .98$, $p = .19$, or for the interaction, $W = .98$, $p = .19$. There was a significant main effect of sex, $F(1, 186) = 41.47$, $p < .001$ Generalized $\eta^2 = .07$. There was a significant main effect of timepoint, $F(2, 372) = 3.94$, $p = .02$, Generalized $\eta^2 = .01$. There was not a significant interaction effect, $F(2, 372) = 2.70$, $p = .07$.

Bonferroni-corrected post-hoc comparison revealed no significant differences. However, among Males, a potential difference between 3 months and 6 months approached significance, $p = .06$. No other comparisons were significant (every $p > .71$).

To summarize, AST and ALT levels remained within acceptable limits over the course of six months. There was no evidence of AST or ALT level elevation. Both potentially significant differences between

timepoints for either AST or ALT appeared among men. These differences were small, occurred between different timepoints, and did not point to an overall trend. As such, it is likely that these observed differences were produced by random chance.

Discussion:

This investigation began with the initial observation of ALT and AST levels 20 times higher than normal in four patients who mistakenly smoked JWH-018. These alarmingly high levels prompted our examination of another synthetic cannabinoid closer to the structure of CBD, H_4-CBD. Within 10 weeks, AST and ALT levels in six patients were observed to rise to 10 times the normal, and they returned to normal twelve weeks after patients stopped consuming it. By contrast, ALT and AST levels remained within the normal range over the course of six months for patients consuming natural CBD. In fact, none of these 184 patients had ALT or AST levels rise above 60.

Our results are in line with the observation that synthetic cannabinoids appear to pose a greater risk to users' health than natural cannabinoids (Winstock, Lynskey, Borschmann, & Waldron, 2015). The clear differences outlined here should serve as a warning to patients and practitioners alike that synthetic variants of CBD should not be blindly substituted for natural CBD.

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Appendix 1: Full Data for H_4-CBD: Dangerous increase in AST/ALT over 10 weeks.

ID	27728	10688	12939	14195	25341	22991
Sex	M	M	M	F	M	F
mg/day	800	900	950	950	900	850
Initial ALT	48	14	21	18	20	43
2 week ALT	50	68	63	48	69	50
4 week ALT	109	88	85	101	95	105
6 week ALT	165	180	174	180	137	143
8 week ALT	313	278	328	278	242	322
10 week ALT	459	394	402	478	465	517
12 week ALT	295	216	229	232	286	230
14 week ALT	146	112	170	177	109	109
18 week ALT	29	40	44	56	68	69
22 week ALT	23	25	38	34	20	31
Initial AST	9	14	6	27	17	7
2 week AST	37	38	56	46	43	54
4 week AST	88	87	72	99	107	101
6 week AST	178	198	147	171	136	171
8 week AST	370	394	321	402	355	248
10 week AST	480	463	510	416	450	380
12 week AST	302	222	222	210	295	221
14 week AST	103	171	114	108	159	117
18 week AST	28	40	54	66	66	56
22 week AST	19	8	12	9	15	20

Appendix 2: Inclusion/Exclusion Criteria for H_4-CBD study:

Inclusion Criteria-

- Over the age of 18 at the time of screening.
- Judged by the study physician (D. Goakar) to be in generally good health.
- Body mass index between 18-35 kg/m2.
- Negative urine pregnancy test for women.

Exclusion Criteria-

- History of significant allergic condition, significant drug-related hypersensitivity, or allergic reaction to cannabinoids.
- Used cannabis, synthetic cannabinoid, cannabinoid analogue, or any CBD or THC-containing product within 30 days of eligibility screening.
- Patient has had a change in psychopharmacotherapy regimen in the last 4 weeks, or has any plans to change regimen over the course of the study.
- Current or past DSM-5 diagnosis of dissociative identity disorder, eating disorder with active purging, personality disorders, primary psychotic disorder, or bipolar affective disorder type 1.
- Patient is currently prescribed medications with possible CBD-drug interactions.
- History of actual suicide attempt in the last 5 years.
- Obstructive sleep apnea.
- Positive drug screen for THC, barbiturates, amphetamines, benzodiazepines, and/or opiates.
- History of treatment for, or evidence of, alcohol or drug abuse within the past year or regular alcohol consumption exceeding recommended limits.
- Lifetime history of Cannabis Use Disorder.

Appendix 3: Full Data for ImmunAG CBD; Null effects on ALT and AST levels

ID	Sex	mg/day	Initial ALT	3 month ALT	6 month ALT	Initial AST	3 month AST	6 month AST
3903084	M	1150	21	33	13	21	33	13
8414456	M	1200	38	16	31	38	16	31
7298908	M	800	32	59	26	32	59	26
9300266	M	1050	32	17	42	32	17	42
7149599	M	550	19	26	28	19	26	28
6387135	M	950	52	44	22	52	44	22
2525346	M	750	13	45	16	13	45	16
2063642	M	800	30	31	35	30	31	35
9282499	M	1000	23	35	23	23	35	23
5134362	M	1000	34	22	35	34	22	35
6942482	M	550	30	52	9	30	52	9
8047747	M	800	29	40	39	29	40	39
4902772	M	650	56	52	16	56	52	16
5543857	M	1000	9	52	53	9	52	53
7761964	M	850	23	35	22	23	35	22
7686663	M	350	16	56	55	16	56	55
9905916	M	400	12	52	47	12	52	47
8644764	M	450	56	21	50	56	21	50

5916306	M	750	54	43	16	54	43	16
6970960	M	800	17	16	20	17	16	20
5762713	M	850	47	31	56	47	31	56
3548060	M	550	32	37	40	32	37	40
2143482	M	700	50	37	15	50	37	15
9757661	M	800	10	42	19	10	42	19
1724204	M	1000	50	12	38	50	12	38
838415	M	350	25	49	51	25	49	51
2445581	M	850	54	34	48	54	34	48
7774440	M	700	28	10	19	28	10	19
5451833	M	800	48	42	8	48	42	8
5508098	M	1150	17	27	9	17	27	9
7296886	M	500	56	25	46	56	25	46
8692052	M	700	44	15	26	44	15	26
2595136	M	1000	35	50	39	35	50	39
1009593	M	850	24	23	50	24	23	50
8307501	M	300	39	23	18	39	23	18
7607767	M	1050	13	52	19	13	52	19
4757367	M	350	18	14	18	18	14	18
1144502	M	350	52	23	24	52	23	24
3668849	M	800	8	17	12	8	17	12
5731492	M	750	38	57	28	38	57	28
5013991	M	300	54	24	29	54	24	29
148354	M	1150	33	26	14	33	26	14
7089837	M	350	33	23	10	33	23	10
5137584	M	450	48	19	40	48	19	40
40356	M	1150	40	39	20	40	39	20
5583214	M	600	15	33	21	15	33	21
3345178	M	1000	47	19	49	47	19	49
1031842	M	1100	38	47	54	38	47	54
937758	M	600	26	33	23	26	33	23
9581523	M	1000	10	60	43	10	60	43
5497829	M	1000	25	42	40	25	42	40
2468790	M	300	24	53	13	24	53	13
8230503	M	500	42	57	41	42	57	41
1778564	M	1050	28	48	18	28	48	18
3921047	M	1100	21	52	14	21	52	14
3678708	M	400	29	47	40	29	47	40
5401913	M	400	20	18	55	20	18	55
6239329	M	700	37	52	10	37	52	10
8683910	M	1150	14	27	20	14	27	20
6458351	M	650	29	32	25	29	32	25
1910185	M	1150	51	42	23	51	42	23
7417283	M	1000	54	22	41	54	22	41
4714170	M	700	25	45	21	25	45	21
3406222	M	950	25	44	42	25	44	42
6000358	M	500	8	56	27	8	56	27
7008952	M	1100	38	48	35	38	48	35
5316453	M	1100	38	39	15	38	39	15

2924221	M	550	31	50	9	31	50	9
7680588	M	1100	31	39	47	31	39	47
8824091	M	850	20	28	8	20	28	8
2492940	M	850	48	11	43	48	11	43
8223432	M	1150	50	51	51	50	51	51
3237424	M	1150	39	38	55	39	38	55
3384779	M	350	41	29	29	41	29	29
474616	M	950	51	20	33	51	20	33
5611200	M	550	49	32	22	49	32	22
5650557	M	900	43	48	51	43	48	51
1233772	M	1000	10	19	33	10	19	33
4577950	M	850	16	57	19	16	57	19
5608793	M	400	12	49	43	12	49	43
6545551	M	1050	27	37	19	27	37	19
6127075	M	950	16	17	24	16	17	24
1624904	M	500	19	11	8	19	11	8
4092695	M	700	7	49	49	7	49	49
2323199	M	850	51	43	13	51	43	13
4100763	M	750	26	13	23	26	13	23
8020810	M	800	42	41	53	42	41	53
1699519	M	550	39	19	27	39	19	27
7100433	M	500	42	11	54	42	11	54
3339762	M	400	33	31	44	33	31	44
2023673	M	800	29	16	11	29	16	11
8481024	M	850	45	58	25	45	58	25
391209	M	550	33	14	38	33	14	38
7807493	M	800	13	39	44	13	39	44
2521663	M	1000	54	13	10	54	13	10
5926886	M	900	34	52	32	34	52	32
1927245	M	500	50	54	30	50	54	30
8935197	M	350	45	38	15	45	38	15
4251651	M	1000	51	14	12	51	14	12
7174872	M	400	15	57	8	15	57	8
4855461	M	300	46	37	41	46	37	41
3679552	M	800	33	14	18	33	14	18
6171493	M	1200	18	30	40	18	30	40
4394926	M	800	54	21	51	54	21	51
7631350	M	350	19	10	8	19	10	8
1016130	M	550	25	11	48	25	11	48
1489746	M	850	27	28	41	27	28	41
7099947	M	600	17	34	14	17	34	14
2750505	M	700	46	43	42	46	43	42
3983277	M	900	20	35	46	20	35	46
8560228	M	1050	53	22	44	53	22	44
4169021	M	900	40	12	43	40	12	43
714573	M	550	50	55	26	50	55	26
6840648	M	900	18	59	49	18	59	49
8464553	M	700	40	20	12	40	20	12
2557248	M	1050	15	32	34	15	32	34

4879447	M	550	26	55	15	26	55	15
8979211	M	750	56	54	49	56	54	49
7000022	M	900	18	58	35	18	58	35
8698541	M	800	23	14	15	23	14	15
5798974	M	1200	52	46	18	52	46	18
9137737	M	550	52	48	44	52	48	44
1161410	M	500	7	19	48	7	19	48
9641435	M	700	25	54	22	25	54	22
32644	M	300	18	39	34	18	39	34
7839138	M	800	53	55	55	53	55	55
360802	M	900	19	45	35	19	45	35
6286688	M	800	35	55	14	35	55	14
8212933	M	850	18	19	19	18	19	19
7148131	M	700	13	10	43	13	10	43
1399782	M	1150	11	45	32	11	45	32
8573654	M	750	16	53	38	16	53	38
1274	F	700	9	15	15	9	15	15
1365	F	500	19	23	16	19	23	16
1384	F	1000	36	20	25	36	20	25
1468	F	650	32	11	26	32	11	26
1487	F	350	15	39	26	15	39	26
1592	F	800	38	31	33	38	31	33
1594	F	550	21	10	24	21	10	24
2123	F	1150	39	24	26	39	24	26
2160	F	850	40	24	37	40	24	37
2169	F	1150	40	32	22	40	32	22
2390	F	700	35	21	10	35	21	10
2580	F	550	8	16	16	8	16	16
2634	F	950	37	17	35	37	17	35
2636	F	1000	19	26	33	19	26	33
2701	F	500	13	38	38	13	38	38
2712	F	350	36	14	27	36	14	27
2752	F	700	26	16	8	26	16	8
2905	F	850	38	11	37	38	11	37
3082	F	300	20	17	14	20	17	14
3249	F	1000	38	16	24	38	16	24
3331	F	750	18	24	35	18	24	35
3396	F	1150	28	38	26	28	38	26
3410	F	1000	31	9	32	31	9	32
3735	F	1000	33	37	24	33	37	24
4007	F	850	11	22	21	11	22	21
4015	F	800	38	9	23	38	9	23
4345	F	350	10	38	16	10	38	16
4392	F	450	30	30	9	30	30	9
4655	F	1100	15	9	37	15	9	37
4800	F	1000	24	29	31	24	29	31
4921	F	1150	35	32	13	35	32	13
4938	F	850	38	30	9	38	30	9
5213	F	600	27	28	32	27	28	32

5520	F	950	31	35	28	31	35	28
5753	F	1150	28	10	25	28	10	25
5835	F	1100	27	36	18	27	36	18
6143	F	1100	20	11	16	20	11	16
6312	F	600	25	40	15	25	40	15
6373	F	300	14	26	23	14	26	23
6381	F	1050	39	17	39	39	17	39
7112	F	1000	25	29	18	25	29	18
7178	F	350	23	39	21	23	39	21
7486	F	800	23	38	36	23	38	36
7650	F	350	29	13	26	29	13	26
7827	F	1100	13	8	29	13	8	29
7846	F	1150	24	31	36	24	31	36
7916	F	850	32	15	10	32	15	10
8177	F	400	37	32	18	37	32	18
8213	F	400	21	25	23	21	25	23
8431	F	500	35	32	15	35	32	15
8532	F	300	37	9	20	37	9	20
8561	F	700	14	17	22	14	17	22
8992	F	1100	8	40	31	8	40	31
9730	F	1050	31	13	26	31	13	26
9828	F	900	10	15	35	10	15	35
9887	F	1150	23	9	23	23	9	23
M		771	30.2	31.60	28.57	30.20	31.60	28.57
SD		264.82	13.53	14.95	13.29	13.53	14.95	13.29

Citation: Cushing, C., Goakar, D., Joseph, B. (2018). Synthetic cannabinoids severely elevate amino transferase levels. Natural cannabidiol does not. *Journal of Medical Phyto Research, 2*(1), 1-13. https://doi.org/10.31013/2001e

Recieved: July 24, 2018

Accepted: July 26, 2018

Published: July 26, 2018