

THE EFFECTS OF LARGE DOSES OF CANNABIS INDICA.*

(SUBJECTIVE EXPERIMENT.)

BY ALBERT SCHNEIDER, M.D., PH.D.

Much has been said and written about the effects produced upon the human mind by large doses of *Cannabis indica*. The reports of lay writers (mostly writers of fiction and newspaper reporters), and of the unfortunates who are addicted to the drug, are fairly uniform as to the stimulating (?) effects and the ultra-mental exaltation. Writers on drug action have little to say about, or express doubts as to such effects and suggest that probably the Oriental mind alone reacts in so remarkable a manner. These doubters could easily arrive at definite conclusions through a few subjective tests with the drug.

It has been suggested that the Islam religion is founded in Cannabis action. It is a fact that the Mohammedan appears to manifest a special predilection to this drug but that may after all be mere coincidence and certainly a matter aside from the purpose of this report.

Among American medical writers, the late Horatio C. Wood reports in detail the effects of a single large dose of Cannabis on himself. The exact amount of the dose is not given and it is stated that it was the fluidextract made of the American-grown hemp. Among the pharmacologists, Sollman and Cushny refer to the intoxicating and exhilarating effects produced by Indian hemp, but make no mention of having tried it out on themselves. The reports by lay writers are of little value from the scientific standpoint and many of them make no distinction between actual sensations experienced and sensations which they imagined they experienced. The following report, it is hoped, will add to our knowledge of the mental effects produced by large doses of *Cannabis indica*.

It was the original intention to repeat the tests to a final conclusion, but after the fourth major test as herein recorded it was decided to discontinue all further subjective experimentation with this drug, not because of fear of possible permanent harmful effects, nor of the fear of becoming an addict, but because of the conclusion arrived at that any number of additional tryouts would not greatly alter the conclusions which might be drawn from the tests. Besides, other more important tests and experiments occupied writer's time and attention. It is necessary to add that experimenter had never before made subjective tests with a narcotic drug, is not addicted to narcotic drugs of any kind whatsoever (inclusive of tobacco), and is a moderate user of tea and coffee. He is fairly sensitive to the action of drugs in general, but is especially sensitive to the action of tobacco and also quite sensitive to the action of atropine. The following is a brief report of the tests made.

FIRST TEST.

(OMAHA, NEBRASKA. MAY 3, 1921.)

9:20 P.M.—Took about 3 cc of a fresh fluidextract of *Cannabis indica* obtained from Lathrop's pharmacy. Pulse 63 (which is normal), respiration 18 (normal). I am in a room in a private residence. Had a rather light dinner at 6:00 P.M. In good health.

9:30 P.M.—Pulse 62, fuller than at 9:20. Respiration normal. Experienced slight difficulty in keeping my mind on the count of the pulse. Some slight mental perturbation. Music down stairs (player piano) somewhat disturbing. Some sensation of gastric warmth.

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9:40 P.M.—Pulse 59, rather weak and slightly irregular. Respiration somewhat irregular and disturbed. Tendency to forget impressions momentarily. Some mental disquietude. Hands and face feel warm but not flushed or dry.

9:50 P.M.—Pulse 63 and a little stronger than at 9:40, but heart action somewhat labored and irregular. Mentally apprehensive and disturbed. Precordial oppression.

10:00 P.M.—Pulse 64, fair. Breathing somewhat difficult. Mental worry and feeling of oppression and of apprehension marked. Knee reflex somewhat increased. At this time I make a resolve to discontinue all subjective experimentations in the future.

10:10 P.M.—Pulse 62, fair. Respiration nearly normal again. The feeling of oppression and of apprehension comes and goes in flashes and is very pronounced. Slight giddiness. Have reached the conclusion that the assertions made as to the exhilarating and stimulating effects of Cannabis, as recorded by various writers, are all wrong. Completely conscious of self and of surroundings. Very transient death fear.

10:20 P.M.—Pulse 66, full and strong. Too much disturbed mentally to note respiration. Momentary amnesia. A few indescribable mental flashes. Skin becoming somewhat moist. All of the senses keener, vision especially. Still conscious of self but realize the need of self-control. The idea of duality or of a second self develops. Fully conscious of my environment. Note that some one is moving about in an adjoining room, and that some one is coming up the stairs. At this time I reach the conviction that there is a Cannabis action. General excitation and slight trembling of the hands. Quite suddenly there is developed an indescribable feeling of exaltation and of grandeur. The words "fine," "superfine" and "grand" come to mind as being applicable to the feeling. This indescribable feeling is purely subjective. Self-consciousness is completely annihilated for the time being. The concepts time, space and place have vanished. The confines of my room are no longer existent. I say to myself, "If this drug can produce such marvelous effects, I will certainly take it often." Recollect in flashes that I must exert self-control. I apparently exist in limitless space and my second or "astral" self is everywhere, now here, now in remote lands and again it cannot be located in any particular spot or place.

10:30 P.M.—Pulse 74, full and strong. No time for noting respiration, though it was quite irregular. All mental oppression and apprehension is gone. Self-consciousness has returned and the wish is expressed that the feeling of exaltation might return. At the very next moment it has returned grander than ever before. I am somewhat amused at the feeling of exaltation because I am satisfied that it is without real basis or cause. Mouth and lips are becoming quite dry. I make an attempt to explain this very remarkable drug action but am unable to formulate any conclusion. (At this point my pencil record ends in an illegible scrawl. The ever-varying mental effects cannot be recorded.)

10:40 P.M.—Unable (due to excited state) to record the pulse rate and respiration. Pulse good, however, and forget to breathe for some moments. Acts more or less irrational and apparently purposeless and more or less reflex in nature. An insignificant detail of my watch lying before me excites my keen interest. The special senses are fully normal and even somewhat stimulated. The feeling of exaltation and of grandeur continues. Gait somewhat irregular but no definite sign of muscular incoördination. Thinking difficult. The second self appears to be in control directing my every effort. Mouth dry.

10:50 P.M.—Pulse 74, full and strong. Memory fails completely, though fully conscious of the environment. I am capable of anything and everything. No task would be too great, no problem too difficult. The exalted feeling is much increased and wholly indescribable and appears to be general and all-inclusive. Thoughts of Kant's "Ich und das Nicht-Ich" flash through my mind. I realize that I have lost control of myself but am wholly unable to fight off the feeling.

From 10:55 P.M. to about 2:30 A.M. it was impossible to continue the record. The idea of duality continues. I watch myself lay away the unfinished record of the test, make the usual preparations for bed, undress, get into bed, doing everything in my wonted manner and at all times fully comprehending every act. Sleep is impossible. To describe the sensations which continue for some three hours is impossible. They are very imperfectly and incompletely tabulated as follows, from memory.

1. The feeling of supreme exaltation and of grandeur continues in varying degrees.
2. The idea of oneness with all nature and with the entire universe seems to take hold. There is no material body or personality.
3. I point out to myself objects in my room, as clothing on a chair, the door to my room, the window through which the light from street lamps shines, to convince myself of my own existence. I look at myself lying in bed and feel reassured. I apply the following test. I hold my right hand before my face and say, "I recognize this as my hand, it belongs to me, and hence I am I." This argument amuses me considerably. I wonder if this may be the end but there is absolutely no feeling of worry or of anxiety about it. The skin is now moist but the mouth continues dry.
4. I have momentary but imperfect visions or glimpses of vast beautiful landscapes, showing wonderful color effects. The landscape features are not clearly outlined. There appear to be rolling hills and valleys with wonderful coloring, recalling vaguely California landscapes. I do not visualize persons nor do persons play any part in the mental imagery. I touch myself here and there to convince myself of my existence. Tactile sense apparently normal.
5. There is a marvelous color imagery, blues, purples and old gold predominating, with most delicate shading effects. The most beautiful designs and patterns (curved lines) appear in space, all with wonderful coloring. Beautiful gardens filled with flowers appear. Again grotesque monsters appear of ever-varying forms and without producing any terrifying effects.
6. The mind flits about everywhere. It is wholly impossible to fix the attention.
7. I hold lively arguments with myself on all imaginable subjects. I try to solve important problems, as universal gravitation, the cancer problem, tuberculosis, the European muddle, the financial crisis, etc., but in each instance I fail to arrive at any conclusions.
8. Humorous incidents flash through my mind and I snigger to myself. The all-satisfying and supremely comforting feeling continues in varying degrees of intensity.
9. Impulses to indulge in rhythmic motion of hands, of feet, of the entire body, seize upon me. There is the impulse to whistle, to sing, to hum tunes. Doing these things entails no conscious effort on my part. Apparently no actual sounds are made.
10. I wonder what the end will be? Will I come out of it alive? I continue from time to time the tests to satisfy myself of my own existence. The thought comes to me from time to time that the experiences are not real, that I am bluffing, that I only imagine the experiences but at the very next moment I am compelled to admit that it is all real.
11. The idea that a drug which can produce a feeling of such extreme happiness and well-being can do no harm and that it would be proper to take such a drug as a stimulant, passes through my mind several times. I regret that others cannot share with me this feeling of well-being. Skin is moist but mouth continues dry.
12. I indulge in random chatter (evidently in a whisper or possibly in lip movement only) on all sorts of topics, but never completing a sentence, for the mind is constantly presenting new subjects and the speech centers cannot keep up the pace.
13. I wonder whether I am awake or asleep and try to find reasons for and against the idea but I am unable to convince myself as to the state I am in. Pulse full and regular and probably not over 62. Respiration apparently normal.
14. Evidently sleep gradually set in and continued undisturbed until the usual rising time, about 6 o'clock A.M. No special sensation on rising. Feeling, if anything, more than usually refreshed. All of the sensations above recorded have completely vanished. The recollections of the experiences are however very clear and vivid. Mouth continued dry until the morning. No after-effects of any kind. The action of the kidneys is increased but no effects as to the intestinal tract. Skin normal and heart action and respiration entirely normal.

Three adult members of the household were informed that a drug test was to be made. No one was present with the experimenter during the entire time of the drug action. None of the three persons noted the slightest disturbance in the writer's room, no walking about, no talking, no laughing or singing. The experimenter has at all times, during his entire life, exercised considerable self-control which no doubt had important bearing on the fact that there were no physical expressions to the mental impulses above recorded. The writer was fully aware of

the fact that there were others in the building who might be disturbed by unusual physical expressions. The following may be given as a summary of the effects produced by a single large dose of a fresh fluidextract of *Cannabis indica*.

1. Mental depression. Worry, apprehension, death fear. Slight reduction in heart action. Somewhat irregular respiration.
2. Slight increase in heart rate. Pulse becomes fuller and stronger.
3. Subconscious or dual nature state. Extreme mental exaltation. Apparently the natural inclinations and desires hold sway and are apparently under the control of the second self, but it is the first or the original self which prevents the performance of acts which are under the domination of the second self. Apparently the two selves cannot act independently, one acting as a check upon the other.
4. Kalaidescopic sequence of events. Color imagery. Remarkable landscape imagery. Persons are not visualized in any way whatsoever.
5. Extreme happiness. All sense of fatigue is annihilated. Physical acts entail no appreciable exertion or effort.
6. Normal, apparently dreamless sleep with normal awakening.
7. No after-effects of any kind.
8. Diuretic action marked.

The period of mental depression is brief. The period of exaltation up to the time of normal sleep induction endured for about five hours, perhaps a little longer. Being personally convinced of the ability to control all impulses due to *Cannabis* action it was decided to try the second test in public, as follows.

SECOND TEST.

(LINCOLN, NEBRASKA. FROM 10:00 A.M. OF MAY 8 TO 6:00 A.M. OF MAY 9, 1921.)

10:00 A.M.—Took one drachm of fluidextract of *Cannabis*. The preparation was only slightly green and not very bitter. Wholly inert. No effects of any kind, excepting the diuretic action, followed. This would seem to indicate that the diuretic action of the drug is quite distinct from the mental effects and that it does not readily deteriorate.

1:05 P.M.—Took one drachm of Mulford fluidextract of *Cannabis*. This had a dark green color, was very bitter and resinous and was thought to be active. One hour after only a slight reaction was observable, indicated by a slight increase in pulse rate and mere suggestions of mental disturbance. Diuretic effects marked.

2:05 P.M.—Took $\frac{1}{2}$ drachm of fluidextract of *Cannabis* labeled "College of Pharmacy," which was also very bitter and markedly dark green and had the characteristic odor of *Cannabis*. Within one hour distinct effects were developed which may be described as follows.

1. Far-away dreamy condition of mind. Repeated spells of temporary amnesia. These spells probably did not endure for more than a second or two and the awakening was in each instance explosively abrupt. Street noises are unusually distinct. Vision very clear. After arranging certain laboratory experiments I decide to take a walk.

2. I walk for several blocks meeting many people. Nothing worthy of mention occurs. I attempt to measure the time of the memory lapses, from the time of onset to recovery, by the distance any one may have walked during a spell, and decided that they endure for five or six seconds and I also arrive at the conclusion that these spells do not in the least affect my acts, such as walking, opening a door to a public building, talking to a person, etc.

3. A heavy thunder storm is coming on and I enter the lobby of a hotel. I feel drowsy and sit down in a chair. The lobby is fairly filled with men who are engaged in the usual hotel lobby conversation. The memory lapses continue. A man sits down beside me commenting upon the thunder storm to which I reply in my usual manner. The voices appear distant though distinct. I note that with great regularity, the first thought that comes to me after one of the memory lapses, is that the very first remark which I hear has reference to my mental condition, it making no difference whatsoever what the remark may or might be, such as "That is certainly the limit," "He is certainly off," "I doubt it very much," "That was a good one certainly," etc., etc. If

silence prevailed immediately upon recovery from such a lapse, that was construed as a silence due to horror at my condition. I casually look about me to make sure that I am not being observed. There is not the faintest indication that anyone present has observed anything unusual in my condition. The drowsy feeling continues.

4. I enter the dining room of the hotel. Read the menu card and order my dinner in the usual manner, the waitress taking no notice of me. I eat my meal entirely in the usual manner. The storm continues. During one of my memory lapses I overhear one of the waitresses remark, "Isn't it awful," and immediately construe this to apply to my mental condition until I realize that the remark was occasioned by an unusually heavy clap of thunder which also brought me out of the memory lapse. The waitress approaches to ask what else I might wish to eat, and she is reminded that she had not as yet brought on my dessert. At no time during the entire test was there a feeling of exaltation and of grandeur as during the first test. There was some color imagery but even that was not marked. The drowsy far-away feeling continues.

5. I sit in the office of the hotel for a while, feel drowsy, go to my room and to bed about 6:30 P.M. and drop off to sleep within an hour. Sleep apparently undisturbed and did not awake until about 6 A.M., feeling a little better than usual. As is usual with me, my mind at once occupies itself with the work that awaits me, as the cancer research, certain drug investigations, the college work, the summer school work, etc. I again drop off to sleep for perhaps one-half hour, get up and proceed to my usual work, no evidence of drug action remaining. Diuretic action marked.

The test may be summarized as follows:

1. At no time was there any distinct mental exaltation or feeling of grandeur.
2. The dual nature idea was not as marked as it was during the first test.
3. The far-away dreamy state was the most marked feature of this test, and endured for fully five hours from the time of the onset of the Cannabis action. The peculiar memory lapses have already been described, which were a marked feature in the test.
4. Color and form (patterns, designs, monsters, etc.) imagery were poorly developed as compared with the first test.
5. The diuretic action continued throughout the drug action.

THIRD TEST.

(LINCOLN, NEBRASKA. JANUARY 8, 1922.)

At 8:50 P.M. took about 3 cc of the Lathrop pharmacy fluidextract of *Cannabis indica* under conditions apparently similar to those of test one. The drug action may be summarized as follows:

1. No special preliminary symptoms; no special feeling of worry or of apprehension. Heart action increased from 63 (normal) to 78, pulse being at times weak and thready and again weak and soft.
2. At no time was there any feeling of exaltation or of grandeur.
3. The feeling of remoteness was pronounced, but the dual nature idea did not develop.
4. Did not feel especially at ease or comfortable at any time during the entire drug action.
5. Color imagery quite marked. Vast landscapes and extensive fields of flowers appear. Indistinct forms develop which later change into the most grotesque ever-changing figures of indescribable beings. At no times are human beings distinctly visualized.
6. After a time, several hours after the beginning of the drug action, I retire and apparently drop off to sleep. Awaken less refreshed than on the occasion of the other tests. Slight feeling of nausea. Mouth dry. Diuretic action marked.

FOURTH TEST.

(LINCOLN, NEBRASKA. FEB. 12, 1922.)

At 8 P.M. took about 8 cc of the Lathrop pharmacy fluidextract of *Cannabis indica* (now about one year old), washing it down with liberal quantities of water. No appreciable effects for about 1½ hours, when suddenly the sensation of being asleep developed, and I had some difficulty in deciding as to the state I was in, sleeping or waking. Thinking that the Cannabis action might be more pronounced in the dark, more especially as to color imagery, I went to bed turning out the light. The idea of a dual nature developed, but to a less marked degree than on previous occasions. There was considerable color imagery but even that was less than on previous occasions. At no time during the entire test was there any distinct feeling of elation, exaltation or of mental grandeur.

About one hour after the onset of the Cannabis action, I rather suddenly lose my subjective identity completely and my "astral" body appears to be making trips to various parts of the earth and to remote parts of the universe. In a hazy sort of way I am reminded of Mark Twain's "Captain Stormfield's Trip to Heaven." That which I visit and visualize is quite indescribable. There are vast cities of oriental aspect, and landscapes of forest-covered plains, hills and mountains, all wonderfully colored. Nowhere do people appear. Indescribable animal monsters flit here and there but without creating the least sensation of fear. No sooner does one shape appear when it begins to melt into another form or to disappear completely. The dread thought seizes upon me that I am getting so far away that it will be impossible for me to get back to earth. I try to get back but am constantly carried on against my will into new portions of the universe. Quite suddenly, after a monster effort, I come back to earth, back to my room in the hotel, back to bed. I am greatly relieved and say to myself, "It is good to be back."

More color imagery develops, landscapes appear to vanish as quickly. I see mountain ranges in the distance with marvelous shadows and colors (mostly deep, dull purplish blues). I try to test my mind and as on other occasions I seek the solutions to various problems but without the least satisfaction, it being impossible to keep the mind on one subject for any length of time. I quote simple statements and word-analyze each statement with apparently remarkable results. That is, I find that each word in the sentence has a special significance and could not possibly have been replaced by any other word. I also note striking double meanings of the words. (Have given considerable attention to psychoanalysis recently.)

Rather suddenly all is changed. Probably for a period of not less than six hours I suffer from nightmare. I am convinced that the end has arrived and that I cannot recover. I try to shake off this feeling and I succeed momentarily by fixing my gaze on some bright object, as the markings on my bed quilt, one of the silver cuff buttons in my shirt which is hanging on a chair near the bed, the light which shines through the open window, the trunk in the corner of the room. I can also shake off the feeling momentarily by raising myself on my elbow. After a time I fail even in these attempts and I admit to myself that I am no longer in existence, as far as ordinary life is concerned, yet I appear to be fully conscious of all that transpires. Dizziness and nausea develop. I realize that the nausea cannot be controlled. I get up and make use of the waste water jar. After the vomiting I feel slightly relieved. I get a towel, get back to bed. All is done in what appears to be a dream state and I am convinced that I was in a dream or somnambulistic state. I had three attacks of vomiting and each time I appear to be asleep or dreaming. After the third attack of vomiting I feel less disturbed, less alarmed and in time I apparently dropped off to sleep, possibly about 3 A.M., and did not awaken until about 6:30 A.M. On awakening I felt anything but refreshed, some nausea continuing. Diuretic action marked as on previous occasions. A severe attack of the grippe followed this final test about 24 hours after, which lasted for fully three weeks.

SUMMARIZING AND CONCLUDING STATEMENTS.

1. The effects of large doses of Cannabis are extremely variable even in one and the same person.
2. Cannabis has marked diuretic action which endures for twelve to fourteen hours after the drug is taken. Apparently the diuretic action is independent of the mental effects. Cannabis preparations which have almost completely lost all mental effects still retain full diuretic action. The intestinal tract is not affected. Appetite is somewhat improved.
3. Since Cannabis is a drug of such variable and unreliable action it should be taken from the U. S. P. As a hypnotic it is inferior to many others. It does not lessen the sense of pain to any appreciable degree. Mentally it tends toward listlessness, lessening the power to concentrate, and gives rise to amnesia and forgetfulness. It does not stimulate the higher faculties nor does it paralyze them.
4. Cannabis action should prove of great interest to students of psychology, of psychiatry and of psychoanalysis.

5. Cannabis has a profound effect upon the imaginative faculties. The lower or animal faculties are apparently neither stimulated nor dulled or paralyzed. There is nothing in the tests herein recorded which would throw light on the cases of homicidal mania observed in Hindoo addicts. One of the constant manifestations of Cannabis action is the idea that the sensations are not real, that they are a "bluff," but invariably the reality of the sensations is admitted.

6. The following statements are offered as to the sex emotions due to Cannabis. Wood in his single test has this to say—"At no time was there any aphrodisiac effect produced." On the other hand nearly all commentators on Cannabis action refer to the sex imagery as described by the Hindoo addicts to this drug. The writer's own experience with the drug would indicate that there is a distinct and unmistakable sex tinge to its action, more especially in the association with the effects of exaltation and emotions of grandeur. The subjective nature of the sex imagery is unmistakable, but it is never objectively materialistic. The sex imagery is very difficult to describe and is most apparent during the first half of the period of drug action.

7. The specific effects of Cannabis have been set forth in the text and are not summarized.

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TOXICITY OF NEOARSPHENAMINE. II.*

BY FREDERICK W. HEYL, MERRILL C. HART AND WILBUR B. PAYNE.

In the course of some work on mixed arseno derivatives, which will be reported later, we have prepared condensation products in which the amino groups in both benzene rings were substituted. We have been interested in comparing the toxicities of these preparations with neoarsphenamine.

As we have previously shown¹ such a comparison can only be made by eliminating the error introduced through the variations in the test rats. We therefore prepared fresh solutions of neoarsphenamine on a number of occasions, and were surprised to find the tolerance much higher than we had previously reported. Instead of 320 mg./Kg., maximum tolerated doses of 440 mg./Kg. were almost always withstood, due simply to variation in the rats.

During this work 3-amino-4-hydroxyphenylarsinic acid has been used as starting material, and the reduction yielding mixed arseno compounds have been made with sodium hydrosulphite of high purity. We have incidentally determined the influence of these apparent improvements upon the toxicity of the resultant neoarsphenamine. It amounts to 40-60 mg./Kg. in the tolerance test. The rats used were uniformly from one strain.

In a series of papers² Christiansen has shown that where the synthesis of arsphenamine is carried out, using 3-amino-4-hydroxyphenylarsinic acid, instead of

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¹ Hart and Payne, *J. Am. Chem. Soc.*, 44, 1150, 1922.

² *J. Am. Chem. Soc.*, 42, 2402, 1920; 43, 370 and 2202, 1921.