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Khat effect on the conduction velocity of nerve fibers in Toad

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Abstract

Conduction velocity of sciatic of sciatic nerve of toad Buformelano stiticuts was studied by khat extract.
Experiments were done by determining the dose dependent of khat using on nerve fiber and as believed khat like amphetamine can relive pain as same as ibuprofen1 has psycho stimulant mediated by dopamine so the groups of experiment that was studied the conduction velocity of the sciatic nerve after pretreatment by khat, then was determined the affected nerve by khat after treatment with haloperidol which known as a dopaminergic blocker.
Results were demonstrated that after khat treatment there was a decrease in latent period decrease in the time taken to disseminate excitation through nerve and there was increase in conduction velocity while on the contrary after treatment with haloperidol the latent period and the time taken to propagate provocation along nerve fiber increased with decrease in conduction velocity. accordingly it possibly that khat type of excitant drug , causes increase the conduction velocity of sciatic nerve due to its effects that mediated by dopamine and reverses these effects by haloperidol .

Introduction

In spite of the widespread use of khat among the people of eastern Africa and southern Arabia (Yemen). 2-3
A medieval Arabic medical treatise recommends the chewing of khat leaves to avoid hunger, fatigue to cause social interaction .4-5
Recently, the excessive chewing khat covered by pesticides by minority of Yemenis people, guide to adverse consequences in health, family income and country budget .6-7

Khat possibly caused destructive effects, like insomnia, anorexia, sexual importance, constipation,8 and might caused oral malignancy when accompanied by alcohol and tobacco consumption,9
In according to khat's physiological function there no systemic work has been done.
Only few reports are available regarding its clinical effects. It has been shown, that behavior of recurrent khat chewing has been labeled a form of psychic dependence.10 Since, the active principle isolated from khat is cathinone (pheny1 ,propy1 mine alkaloid) is a stimulant of CNS in the rats and monkeys and increases loco-motor activity in primates,11-12a,b,c it seemed pertinent to study the conduction velocity of nerve fibers by khat.

Experiments were conducted on sciatic nerve of toad (Bufo melanostictus). Experiments were done to determine the dose dependent effects of khat on conduction velocity following treatment by khat extract. As psycho stimulant effects are believed at least in part to be mediated by dopaminergic systems in the second group of our experiment the conduction velocity of the sciatic nerve was determined after treatment with haloperidol which is a cholinergic blocker.

From the results it was found that after khat treatment, there was a decrease in the latent period, decrease in the time then to propagate excitation along nerve and there was increase in conduction velocity.
But after pretreatment with haloperidol latent period increased together with decrease in conduction velocity. this from these preliminary studies , it may be stated that khat is stimulant type of drug which increases the conduction velocity of sciatic nerve of toad and this effect is mediated by dopamine as haloperidol reverses these effects.

Material and methodology

In the present work thirty matured toads of (Bufo melanostictus) of both sexes weighing between 50-75 gm were used, housed at room temperature with water and a normal diet was provided.
Experimental animals were classified in two sectors, control and Experimental groups; these were divided into 4 groups.
Group (1) treated with khat dose of 1.67 mg
Group (2) treated with khat dose of 6.66 mg
And the preparation of nerve-muscle was immersed in khat solution between 10-25 minutes.
Group (3) was treated at dose 16.66 mg and
Group (4) was pretreated with haloperidol.

Experimental work was provided with kymograph apparatus used as for tow simple muscle twitch, for recording the tow muscle contraction and measuring the conduction velocity by division of the dispute in the latent periods.13 khat leaves were washed carefully with tap water to remove the pesticides that almost covered the surface of the leaves, then rinsed and was kept under the sun and dried for 3 day (dried leaves become brownish black against there reddish-yellow or green glossy colour when they were fresh) .

Dried khat leaves were found by the electric mixture for an hour. Leave powder was treated successively with distilled water, and then the mixture was homogenized by the monogenesis apparatus. The solution was mixed with methanol, and after shaking was treated by rolavapor apparatus till the methanol evaporated by boiling the mixture Between 20 -30 minutes. The free methanol mixture was kept in closed container and was cooled in room temperature for 30 minutes. The cooled solution was shaken strongly and was then filtered. This khat extract can be use for 10 days, by keeping it in closed container in temperature 5 c. (the filtrate contains and active principle) treated with charcoal.

By proper eluent-acetone the adsorb portion of cathinone and cathine were eluted from charcoal (the active principle constituent of khat in charcoal). The filtered and eluated was assayed by N-bromosuccinimide.

Toad's never-muscle preparation was made and placed upon the myograph board .2pairs of the electrodes were placed on the nerve fiber(A) one near its proximal end and (B) the other at distal end next the electrodes were connected to the secondary coil through the pharul's cummulator . Two simple muscle curves and 2 twitches were taken (A) once by stimulating the nerve at its proximal end and (B) by stimulating the nerve at its distal end. A base line was drawn and the time tracing was taken by a tuning frock. The distance between the electrodes on the nerve was measured. The time difference between the PTS of contraction the 2 curves was also measured from the time tracing.

Results

The latent contraction phases were changed after treatment with khat. And found that by increasing the concentration of khat, there was a slight increasing in the speed impulse which traverses the distance between the two stimulated points. But after pretreatment with haloperidol the conduction velocity of m-n fiber was restored similarly in control. On the contrary, by keeping the preparation immersed in khat solution, under any concentration for some time, occurred a delay in the time taken by impulses that passed through scientific nerve fiber, which the preparation was left plunging in khat solution for period more than 30 minutes there was no response has been occurred.

Values

Equation calculation:

$$1 - \text{Conduction velocity} = \frac{\text{distance between the 2 pt. of stimulation}}{\text{erse the distance}}$$

xperiments) = 40 mm
0 oscillation per second = 0.002

Control group (normal):

Latent period = 22 mm
Time taken by the impulse to traverse the distance = 1 x 0.002
= 0.002 sec
c.v = 20 m/sec

Experimental groups:

First group of (low dose) = 1.67 mg of khat extract 0.24 x 10-5 mg/kg cathinone 1st group.
Similar to 0.004 mg of cathinone latent period = 9.5

Time taken by the 0.5 x 0.002 = 0.001 sec
c.v = 40 m/sec

Long time treatment
(2nd dose)6.66mg of khat extract
similar to 0.01 mg cathinone
latent period = 12.75
time taken by the 1.3 x 0.002= 0.0026 sec
c.v = 15m/sec

(High dose):
16.66mg of khat equivalents to 0.04 mg of cathinone latent period = 5
Time taken by the 0.30 X0.002 = 0.006 sec
c.v = 66 m/ sec.

No.	Type of group	Latent period In (mm)	Period %	Time taken to traverse the distance (sec)	Conduction Velocity (m / sec)	Period %
1-	**Control Group.**	22		1×0.002 = 0.002	20	
2-	**Experimental groups**.					
(A)	Lower dose 1.6 mg	9.5 (8-11)	-200 times	0.5×0.002= 0.001	40	200 times
(B)	Higher dose 16.66 mg	5 (4 -6)	-400 times	0.3×0.002= 0.006	66	300 times
(C)	30 minutes treatment.					
(i)	H.D.	12.75	-170 times	1.3×0.002= 0.0026	15	- 75 times
(ï)	L.D.	13.50				
(D)	Pretreat m-ent with Haloper id-ol .	21		1×0.002= 0.002	20	

Conclusion

Concluded that the conduction of nerve impulse is affected with khat treatment, and this influence differs in according with the concentration of khat dose. It may be stated that khat is a stimulant type of drug which increases the conduction velocity of sciatic nerve fiber of toad, due to its effect which may causes increase of dopamine in the muscle- nerve junctions and was shown as haloperidol reverses these effects. This khat effect may event on both potential membrane of the mixed nerve (considering that
gastro sciatic nerve contains both of sensory and motor fibers),
Caused acceleration for the speed propagation of never impulse and retardate it in case of the long time of the treatment with khat, and blocked any response when the preparation was left plunging in khat extract longer than that. These results were indicated that caused progressive wave of muscle enhance a companied by liberating of chemical energy by consumption of oxygen, formation of co2 and heat production. But the results were adverse according to the term of khat used, the long time caused the decrement speed of the potential nerve action, which may affected on the process of k+ and na+, the influx and deflux of the Ca++ through the plasma nerve membrane.

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تأثير القات على سرعة التوصيل العصبي في الألياف العصبية للضفادع

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سرعة التوصيل العصبي للعصب ألوركي للضفدعة (بوفوميلانو ستيتيكتس) قد درس تحت واقع تأثير مستخلص القات.
التجارب التي قمنا بهاعبرتحديد الجرعة المعتمدة للقات المستخدم للتأثير على الليفة العصبية وكما هو معتقد بأن القات ذات تأثير مشابه للأمفيتامين ويمكنه تخفيف الألم مثله مثل عقار الأيبوبروفين، وله أثر نفس- تحفيزي مفروز بواسطة الناقل الكيميائي- العصبي المعروف بالدوبامين. مجموعات التجارب التي أجريت تمت لدراسة سرعة التوصيل العصبي في العصب ألوركي للضفدعة بعد المعالجة بواسطة القات، ومن ثم بعد تحديد العصب المتأثر بالقات تمت عملية إعادة معالجته بالهالوبريدول الذي يعرف بكونه أحد الحاصرات للأعصاب الدوبامينرجيكية .
النتائج كانت قد أوضحت بأن فترة الكمون تتناقص للعصب ألوركي بعد معالجته بالقات وأيضا وجود تناقص في الزمن المقطوع لانتشار الاستثارة خلال العصب، وقد وجد في نفس الوقت حدوث زيادة في سرعة التوصيل العصبي وهو ماوجد عليه بالعكس بعد إعادة المعالجة بالهالوبريدول ، ففترة الكمون والزمن المستقطع لانتشار التحريض على طول الليفة العصبية قد زادت مع حدوث واضح في التناقص في مقدار سرعة التوصيل العصبي. ووفقا للنتائج المتحصل عليها يمكن اعتبار القات نوعا من العقاقير المنبهة، حيث يسبب زيادة في سرعة التوصيل العصبي في العصب ألوركي وذلك تحت تأثيره المفرز بواسطة الدوبامين والذي يتم عكس ذلك الأثر ألتنبيهي الجاري على العصب ألوركي عبر الهالوبريدول .