RESULTS

Group I :

A- Histological results :

a- HX. and E.:

Subgroup I-1 :

Since area 18a resembled area 18 in the general granular appearance and gave the same results so area 18 only was discussed in this study.

From the six layers mentioned in books only one layer (layer I) was easily distinguished in areas 17 and 18. They consisted of closely packed granular cells with very few pyramidal ones. The cells were arranged in vertical columns (Figs. 1 & 2).

Subgroup I-2 :

Area 17 :

It was formed of six layers which could be easily distinguished from each other.

- Layer I cells became flattened with nerve fibers.
- Layers II and III appeared as a single layer and consisted of small granular and pyramidal cells.
- Layer IV consisted of very closely packed granular cells and small pyramidal cells.
- Layer V consisted of less packed broad pyramidal cells deeply stained and granular cells.
- Layer VI appeared thick and consisted of large granular cells (Fig. 3 & 4).

Area 18 :

It was formed of six layers with a uniformly granular appearance.

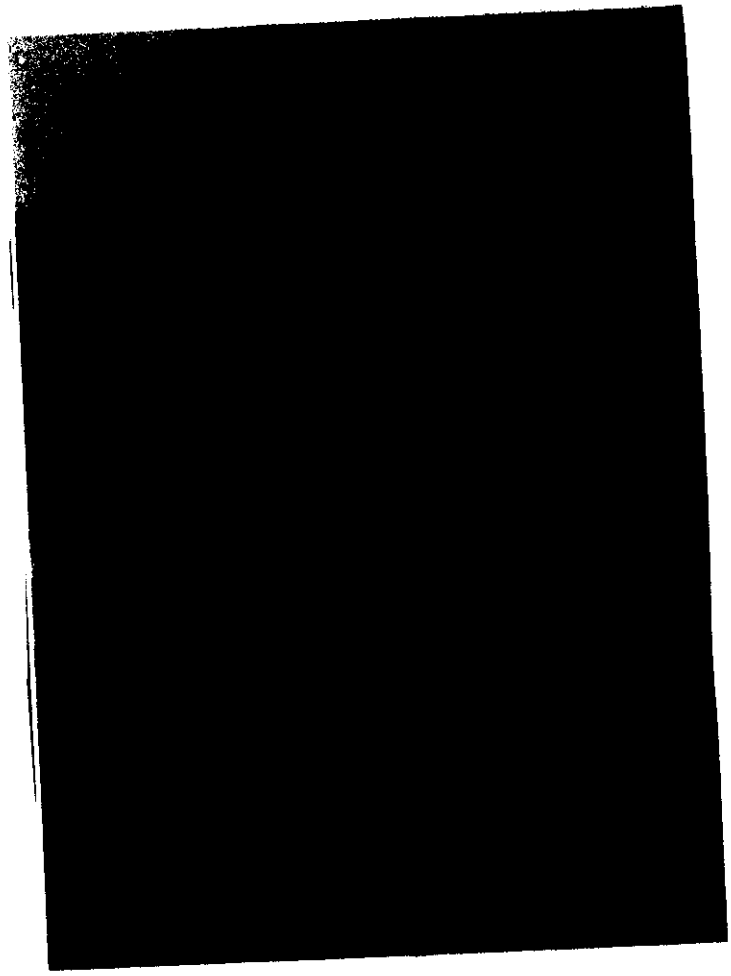

Fig. (1): A photomicrograph of a section from area 17 of a rat aged one day showing undifferentiated cortical layers with deeply stained cells and nuclei. (Hx. & E. x100).

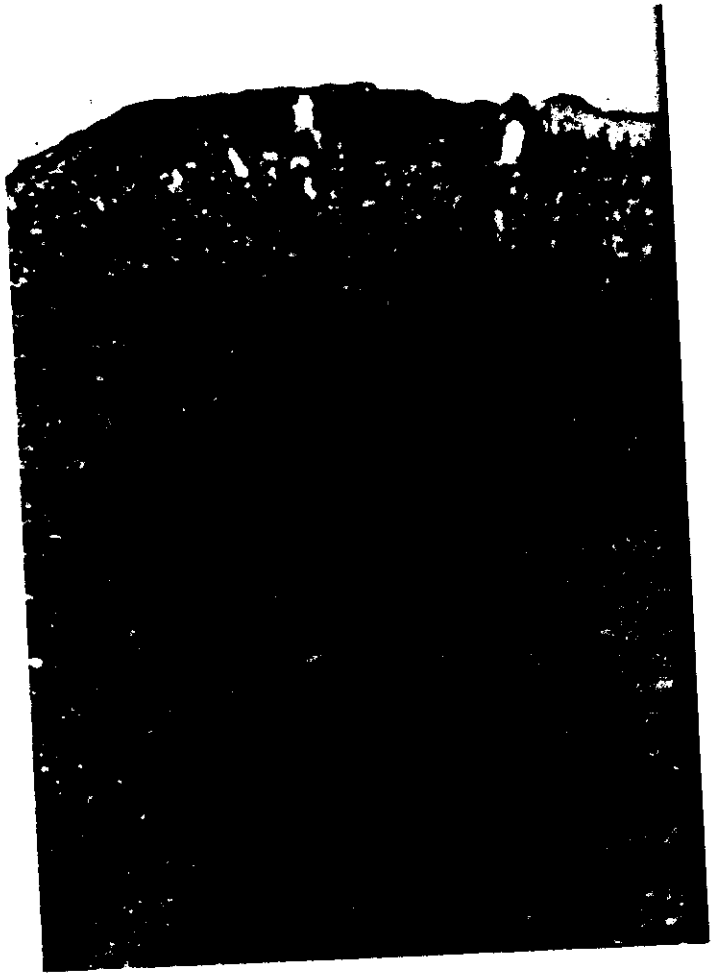

Fig. (2): A photomicrograph of a section from area 18 of a rate aged one day showing undifferentiated cortical layers with deeply stained cells and nuclei.

(Hx & E. x100).

Fig. (3) : A photomicrograph of a section in area 17 of a control rat aged one day and received distilled water for 15 days showing the six layers of area 17.

(Hx & E x100).

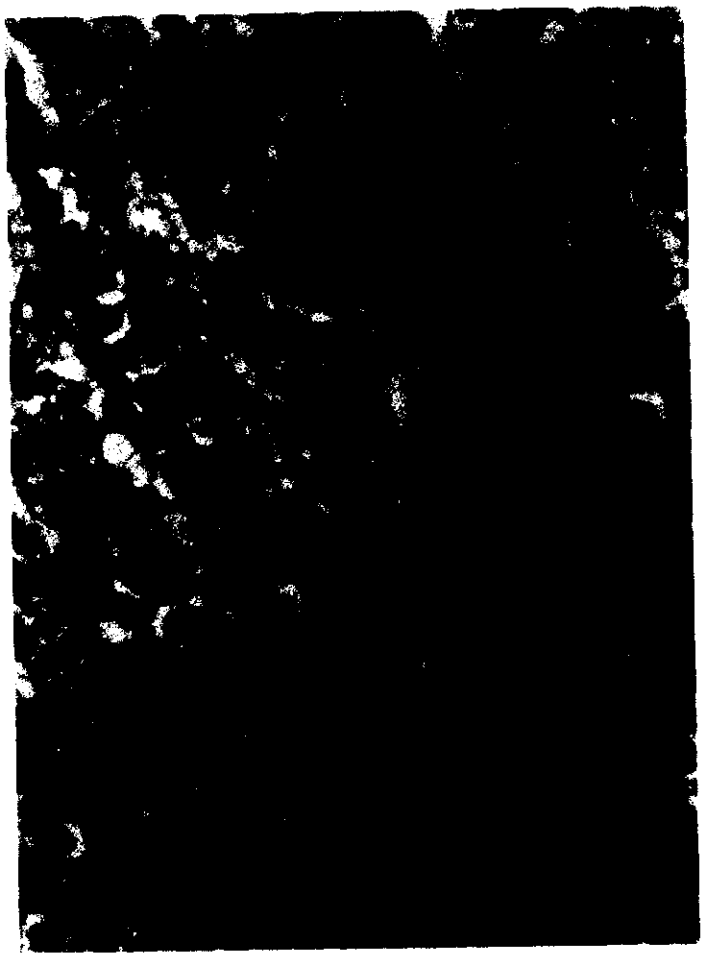

Fig. (4): A higher magnification of the previous section showing layer 5 of area 17 which consists of granular (gr.) and pyramidal (P.) cells.

(HX & E.x 400)

- Layer I cells became flattened with nerve fibers.
- Layers II and III appeared as a single layer and consisted of lozenge shaped cells.
- Layer IV consisted of small granular cells.
- Layers V and VI appeared as a single layer and consisted mainly of granular cells with few small pyramidal cells (Figs. 5 & 6).

Subgroup 1-3 :

Areas 17 and 18 showed shrinkage in all layers and the cells (Figs. 7 and 8).

b- Toluidine blue :

Subgroup 1-1 :

Areas 17 and 18 showed scanty Nissl granules in the cells of the deepest part only while no granules could be detected in the superficial one.

Subgroup 1-2 :

Areas 17 and 18 showed a moderate amount of Nissl granules in the different cells of all layers (Fig. 9).

Subgroup 1-3 :

Chromatolysis appeared in the different cells of both areas (Fig. 10).

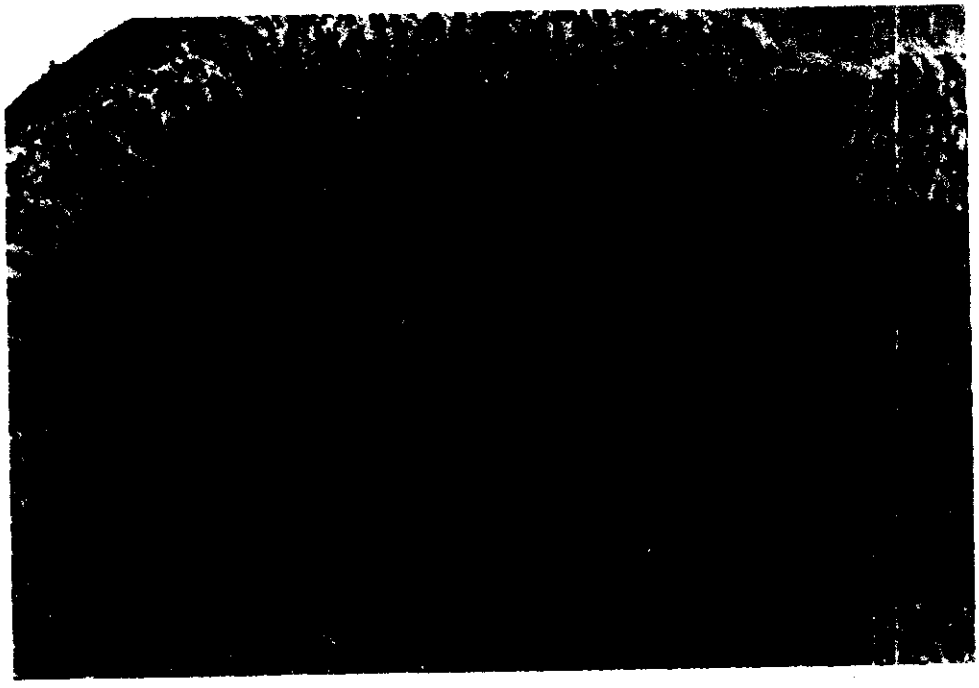

Fig. (5) : A photomicrograph of a section in area 18 of a control rat aged one day and received distilled water 15 days showing the six layers of area 18. (Hx. & E. x 100).

Fig. (6): A higher magnification of the previous section showing layer 4 and 5 consisting of granular (gr.) and pyramidal (P.) cells.

(HX & E. x 400)

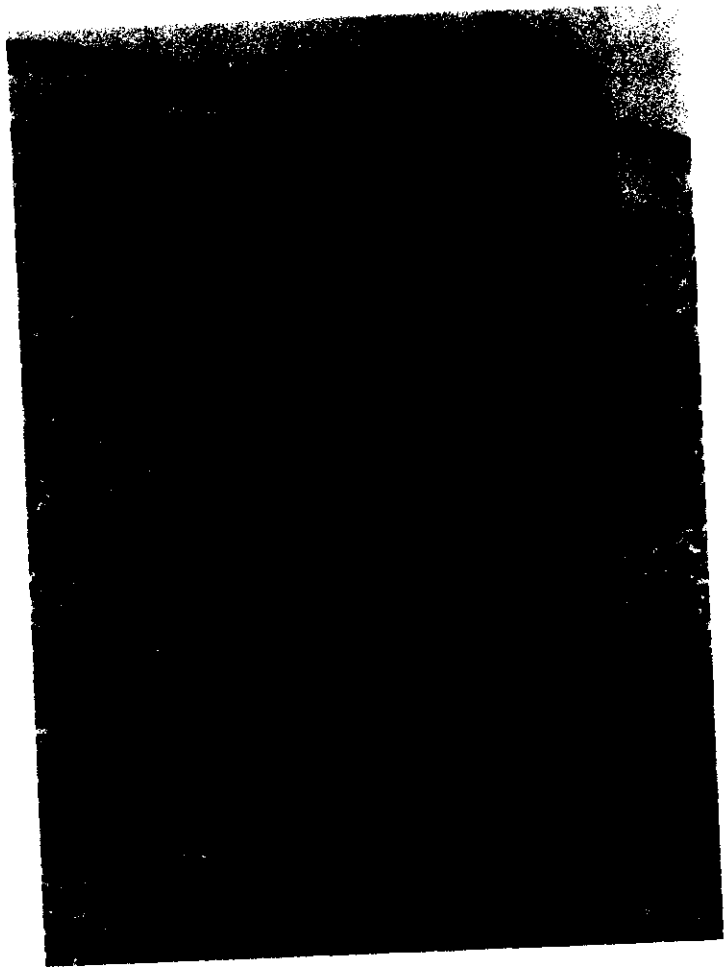

Fig. (7) : A photomicrograph of a section in area 17 of a rat aged one day and treated with malathion for 15 days showing a shrinkage of cells and layers. (Hx. & E. X 100).

Fig. (8): A higher magnification of the previous section showing layers 4 and 5 and area with shrinkage of the cells.

(HX & E. x 400)

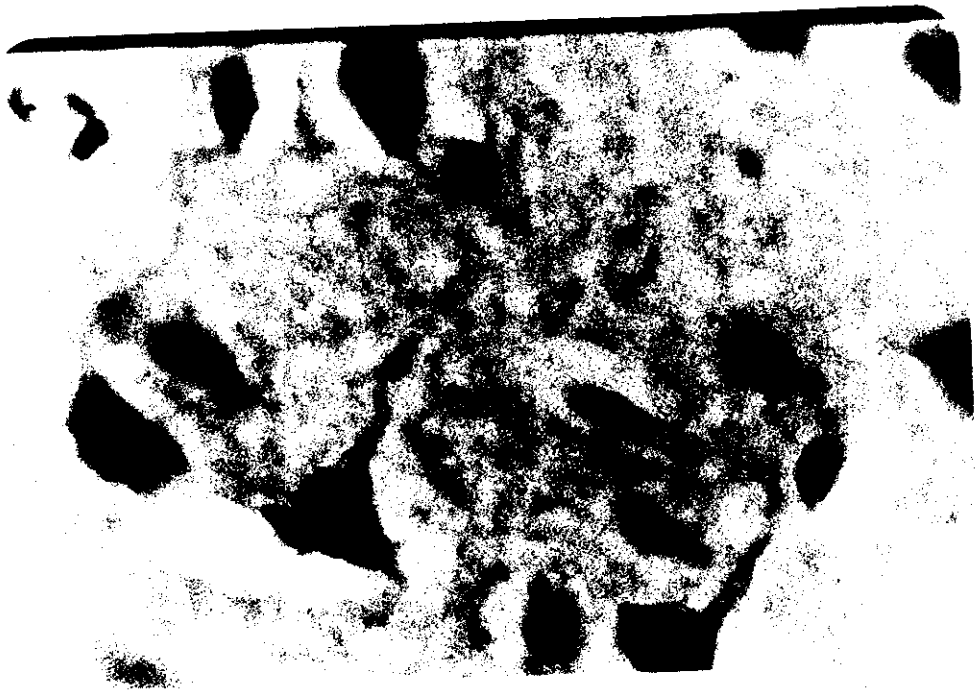

Fig. (9) : A photomicrograph of area 17 of control rat aged one day and received distilled water for 15 days showing numerous Nissl granules.
(Toluidin blue x1000).

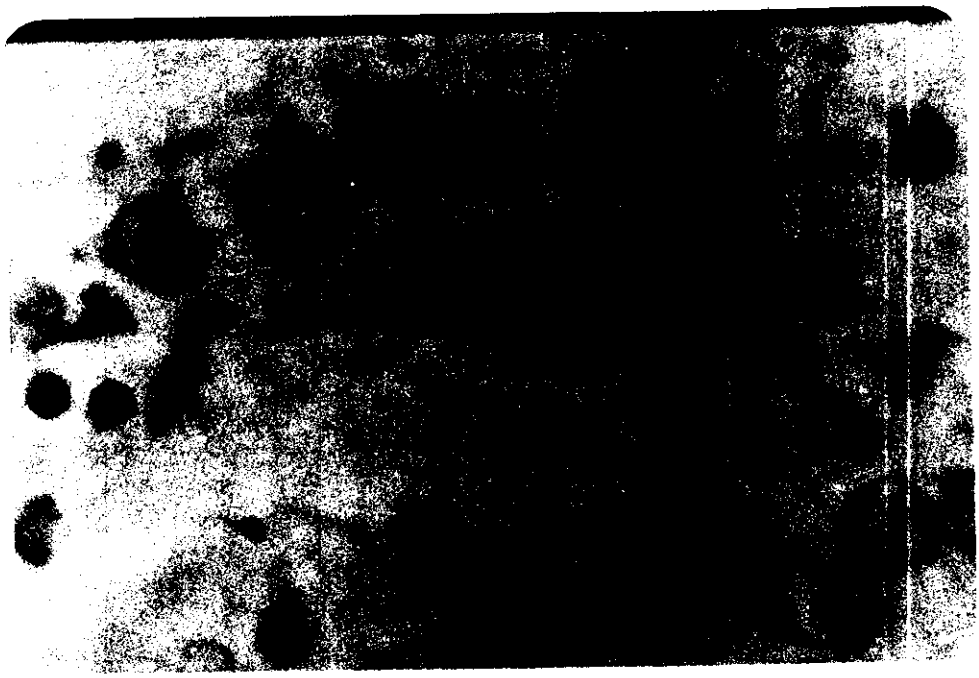

Fig. (10) : A photomicrograph of area 17 of a rat aged one day treated with malathion for 15 days showing chromatolysis.

(Toluidine blue x1000).

c- **Glees's silver stain :**

Subgroup 1-1 :

Areas 17 and 18 showed fine thin neurofibrils in all the layers but more prominent in deeper layers 5 and 6 (Fig.11).

Subgroup 1-2 :

Areas 17 and 18 showed a moderate amount and thin neurofibrils in the cells of all the layers.

Subgroup 1-3 :

The neurofibrls became thin and few in both areas (Fig.12).

d- **Heidenhan's modification of Kultschitsky's method :**

Subgroup 1-1 :

Areas 17 and 18 showed thin myelinated fibers in the deepest layer (Fig. 13).

Subgroup 1-2 :

In both areas 17 and 18 there were thin fascicles of tangentially running myelinated fibers in layers 5 and 6 however markedly suppressed in the other layers (Fig. 14).

Subgroup 1-3:

Areas 17 and 18 showed a marked decrease in the stainability of the myelinated fascicles (Figs. 15).

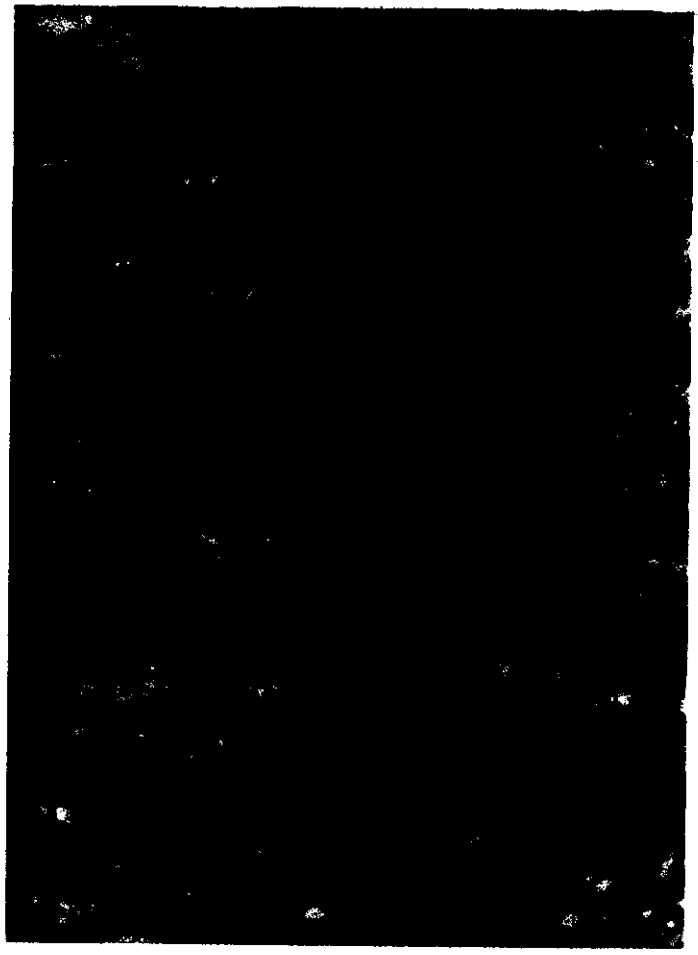

Fig. (11) : A photomicrograph of a section from area 17 of a rat aged one day showing very few and thin neurofibrils in layers 5 and 6.
(Glees's silver stain x1000).

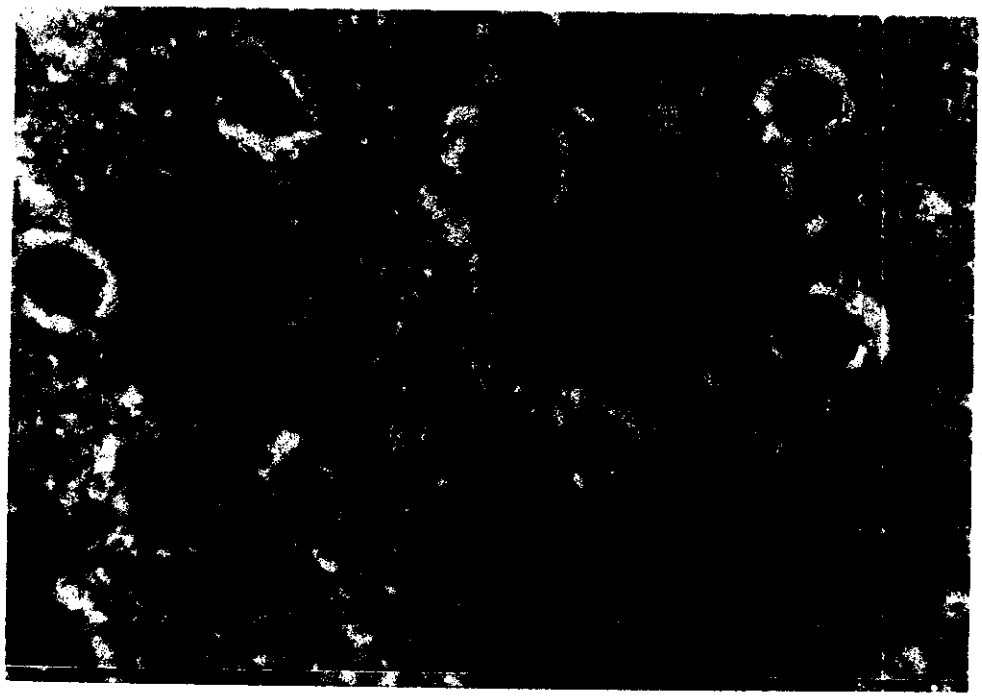

Fig. (12) : A photomicrograph of area 17 of a rat aged one day treated with malathion for 15 days showing weakly stained and less codensed meurofibrils.
(Glees's silver stain x1000).

Fig. (13) : A photomicrograph of a section from area 17 of a rat aged one day showing very few and thin myelinated fibers in the basal layers 5 & 6. (Kultschitsky's method x1000).

Fig. (14): A photomicrograph of area 17 of a control rat aged one day and received distilled water for 15 days showing strongly stained myelin sheath with thin fascicles of tangentially running myelinated fibers.

(Kultschitsky's method x 1000)

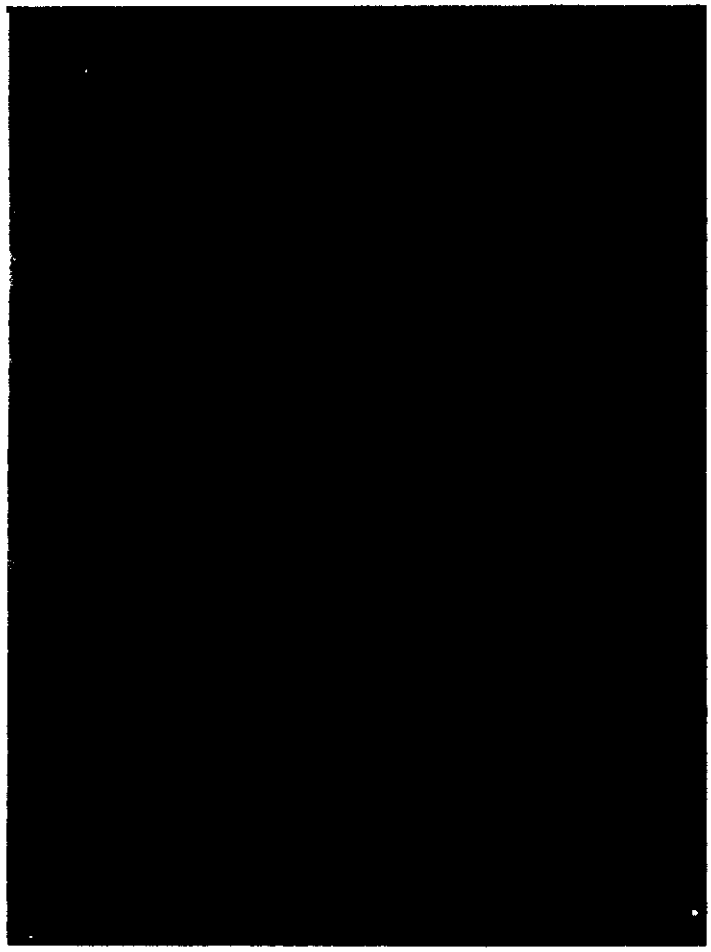

Fig. (15): A photomicrograph of a section from area 17 of a rat aged one day and treated with malathion for 15 days showing thin weakly stained myelin sheath. (Kultschitsky's method x 1000)

B- Histochemical results :

a- Non specific esterase enzyme :

Areas 17 and 18 in subgroups I-1 and I-2 showed a moderate reaction in all cells (Fig. 16), while in subgroup I-3 they showed a weak one.

B- Acetyl cholinesterase enzyme :

Subgroup 1-1 and I-2 :

Areas 17 and 18 should a moderate reaction of the enzyme in all layers. However, in subgroup I-3 the areas showed a marked decrease in the reaction of the enzyme in all layers.

Subgroup 1-3 :

The areas showed a marked decrease in the reaction of the enzyme in all the layers.

C- Adenosine triphosphatase enzyme :

Areas 17 and 18 in subgroups I-1 and I-2 showed a moderate reaction of adenosine triphosphatase enzyme in all layers. While in subgroup I-3 they showed an intense reaction of the enzyme.

C- Quantitative methods :

a- Layers thickness :

Subgroup I-1 : (Table 1)

Area 17 :

- Layer I thickness ranged from 22.02um to 28.79um with a mean of 25.14 um ± 0.56.

Fig. (16) : A photomicrograph of a section from area 17 of a rat aged one day showing moderate reaction of non specific esterase enzyme.

(Gomori method x100).

ole (1) : Showing measurements of the layers' thickness (um), the diameters of the granular cells (um) and the surface areas of the pyramidal cells um^2 in the cortical layers of areas 17 and 18 in animals aged one day.

Area No.	Animal No.	Layer No.	Thickness of layers (um)	Granular cells (um)	Pyramidal cells (um^2)
	1	I	23.65-27.7	1.01-5.7	
	2		23.5-27.65	1.6-4.8	
	3		22.6-28.79	2.0-5.85	
	4		22.2-26.85	1.6-4.3	
	5		22.02-26.84	2.40-7.25	
17	mean		25.14±.56	3.59 ± 0.24	
	1	II-VI	417.95-421.65	3.43-8.28	121.7-134.84
	2		416.08-421.38	4.6-10.74	122.0-135.84
	3		418.2-425.16	6.5-10.41	121.4-133.55
	4		413.7-419.6	2.7-5.92	122.19-134.29
	5		420.55-426.06	5.17-7.25	120.6-134.64
	mean		419.86± 2.06	6.53 ± 1.89	128.09 ± 0.38
	1		23.65-26.75	1.9-5.26	
	2	I	23.7-27.75	1.2-7.4	
18	3		22.35-26.59	3.2-6.35	
	4		22.5-26.79	2.1-4.64	
	5		23.85-26.95	2.0-4.64	
	mean		25.27 ± .64	3.19 ±1.00	
	1		366.2-373.8	3.3-8.7	113.56-123.69
	2	II-VI	366.01-373.61	3.1-8.56	112.39-123.75
	3		365.07-374.67	3.25-7.61	113.31-123.84
	4		364.5-370.72	3.33-7.89	112.59-123.75
	5		369.54-373.4	3.4-7.95	112.49-123.85
	mean		370.1 ± 1.14	5.63 ± 0.34	118.14 ± .27

- Layers II to VI thickness ranged from 413.7um to 426.06um with a mean of 419.86um ± 2.06

Area 18 : (Table 1)

- Layer I thickness ranged from 22.35um to 27.75 um with a mean of 25.27 um ± 0.64.
- Layers II to VI thickness ranged 364.5um to 374.67um with a mean of 370.1 um ± 1.14.

Subgroup I-2 :

Area 17 : (Table 2)

- Layer I thickness ranged from 43.34 um to 51.16 um with a mean of 48 um ± 1.71 which was significantly increased than that of the previous subgroup ($P < 0.001$).
- Layers II and III thickness ranged from 182.4 um to 191.4 um with a mean of 187.29um ± 1.43.
- Layer IV thickness ranged from 184 um to 193.12 um with a mean of 188. 34 um ± 2.41.
- Layer V thickness ranged from 226.3 um to 236.4 um with a mean of 230.34 um ± 2.46.
- Layer VI thickness ranged from 360.4um to 384.7 um with a mean of 373.2um ± 6.9. Since the layers (II-VI) of the previous subgroup could not be easily distinguished, so their thickness could not be compared with layers' thickness of this subgroup.

Area 18 : (Table 3)

- Layer I thickness ranged from 40.35 um to 51.55 um with a mean of 48.20 um ± 1.46 which was significantly increased than that of the previous subgroup ($P < 0.001$).

Table (2): Showing the measurements of layers' thickness (um), the diameters of the granular cells (um) and the surface areas of the pyramidal and flattened cells (um^2) in all the cortical layers of area 17 in the control treated animals aged one day.

Animal No.	Layer No.	Thickness of layers (um)		Granular cells (um)		Pyramidal cells (um^2)		Flattened cells (um^2)	
		Subgroup 1-2	Subgroup 1-3	Subgroup 1-2	Subgroup 1-3	Subgroup 1-2	Subgroup 1-3	Subgroup 1-2	Subgroup 1-3
1	_	43.34-46.65	41.13-43.23					8.65-18.55	4.12-10.5
2		46.45-47.5	42.85-44.9					6.35-19.85	4.88-14.6
3	I	46.98-49.0	40.22-42.43					8.15-19.9	6.22-16.7
4		48.84-51.16	38.47-41.68					7.18-18.6	4.52-12.5
5		46.95-51.05	43.63-45.66					6.45-19.89	4.96-10.8
Mean		48 ± 1.71	42.4 ± 1.59					12.75 ±2.23	7.44 ± 2.71
1		186.3-189.55	181.13-183.35	4.09-8.71	2.9-4.6	153.7-157.6	128.45-139.2		
2	II	186.64-189.3	182.13-184.23	4.4-9.8	2.73-4.9	150.45-157.3	131.6-144.6		
3	&	185.5-187.25	180.3-181.29	5.87-8.65	3.3-5.9	156.38-161.2	133.5-143.9		
4	III	188.8-191.4	180.17-182.17	7.3-10.02	3.5-7.74	150.9-160.5	131.8-142.95		
5		182.4-185.05	179.3-182.36	5.51-9.1	2.11-4.45	152.0-160.05	130.35-140.9		
Mean		187.29± 1.43	181.67± 1.08	7.3 ± 0.87	4.3 ± 0.87	156.02± 2.09	136.9 ± 1.95		
1		185.4-187.6	180.13-184.49	5.5-9.5	2.79-4.77	153.85-159.7	140.65-150.3		
2		186.75-188.4	179.58-182.17	6.48-10.53	3.87-8.35	150.85-158.1	145.85-154.2		
3	IV	184.0-186.25	180.3-182.26	6.22-10.12	2.51-5.39	154.55-163.7	144.7-155.5		
4		189.24-191.5	180.55-182.75	6.75-11.6	2.3-6.7	150.4-157.4	141.6-157.65		
5		196.8-193.12	177.60-179.61	5.43-8.51	4.25-8.48	148.65-153.1	133.16-148.6		
Mean		188.34± 2.41	181.04± 0.63	8.06± 0.70	4.82±0.65	155.32± 2.23	145.6 ± 2.24		
1		228.85-232.5	219.31-221.69	7.27-11.37	3.35-7.45	269.6-275.8	231.7-239.7		
2		229.8-232.7	224.6-225.67	7.1-12.9	3.8-7.4	244.95-250.8	232.55-241.2		
3	V	232.6-236.4	220.48-222.74	7.5-12.5	3.68-7.46	237.85-244.7	233.4-242.87		
4		226.3-229.63	221.58-224.25	9.7-14.3	4.74-8.32	236.75-243.6	231.6-247.3		
5		226.65-228.2	223.18-227.37	9.1-14.6	3.5-6.38	240.69-246.3	227.4-234.2		
Mean		230.34± 2.46	223.13± 2.04	10.58±1.16	5.24± 0.54	243.14± 2.97	235.36± 1.47		
1		374.6-381.7	363.7-366.6	8.2-14.1	4.4-7.75				
2		376.5-384.7	365.65-370.49	8.7-13.9	3.74-8.35				
3	VI	360.4-369.4	360.9-366.33	8.8-13.2	5.95-11.55				
4		366.3-373.5	363.1-367.23	12.5-17.55	7.55-11.45				
5		369.3-375.7	364.55-368.03	10.2-15.4	8.4-13.4				
Mean		373.2 ± 6.9	365.82± 1.64	12.28±1.89	8.22± 1.77				

Table (3): Showing measurements of layers' thickness (um), the diameters of the granular cells (um) and the surface areas of the lozenge, pyramidal and flattened cells (um^2) in all the cortical layers of area 18 in control and treated animals aged one day.

Animal	Layer	Thickness of layers (um)		Lozenge cells (um^2)		Granular cells (um)		Pyramidal cells (um^2)		Flattened cells (um^2)	
		Subgroup 1-2	Subgroup 1-3	Subgroup 1-2	Subgroup 1-3	Subgroup 1-2	Subgroup 1-3	Subgroup 1-2	Subgroup I-3	Subgroup 1-2	Subgroup 1-3
1		46.35-51.51	36.75-49.87							5.19-18.8	4.5-12.6
2	I	40.35-51.55	40.6-49.2							10.59-21.6	6.34-15.35
3		43.45-48.5	36.45-45.83							5.36-15.7	7.3-16.9
4		43.23-51.39	38.6-47.54							15.3-22.5	5.33-13.8
5		46.8.51.45	41.35-50.25							6.8-16.3	4.5-12.6
Mean		48.2± 1.46	43.56 ± 1.5							13.1 ± 4.6	9.44 ± 2.15
1		96.8-103.9	93.3-100.32	17.31-33.62	15.7-23.12						
2	II	94.6-102.4	88.4-94.78	18.9-27.5	7.7-14.49						
3	&	97.95-105.0	90.4-97.42	20.57-36.89	20.65-28.15						
4	III	94.1-101.85	90.48-97.86	17.22-33.54	15.55-21.28						
5		95.55-103.35	87.35-93.57	16.59-24.34	10.33-15.12						
Mean		99.55 ± 1.59	93.29 ± 1.57	24.54± 2.28	17.07 ±5.13						
1		93.25-100.9	85.75-95.75			6.8-10.48	2.9-5.97				
2		93.7-97.1	85.72-96.62			6.55-10.38	3.7-7.57				
3	IV	91.8-96.05	83.15-93.05			7.1-10.78	3.54-5.21				
4		93.4-96.75	86.6-96.04			5.74-9.39	4.12-6.79				
5		92.3-96.7	86.3-93.15			7.96-11.79	3.69-6.64				
Mean		95.45 ± 1.28	90.64 ± 1.77			8.45 ±0.82	5.10±0.66				
1		358.85-364.4	355.3-362.2			5.25-13.22	3.38-7.14	134.4-157.2	125.25-135.6		
2		369.6-365.2	352.8-357.63			5.79-11.41	4.39-8.24	143.4-155.39	126.65-135.85		
3	V &VI	358.06-363.4	353.31-360.35			5.6-10.44	4.03-6.82	134.6-158.31	128.25-137.09		
4		359.32-364.9	353.27-358.27			4.82-11.56	3.4-7.42	132.52-155.32	128.9-141.77		
5		357.15-362.5	353.24-357.63			5.53-10.64	5.02-8.78	133.27-156.07	130.45-137.8		
Mean		361.34± 0.71	356.46± 2.80			8.56 ±0.56	5.17± 0.47	146.24± 2.42	132.51± 1.57		

- Layer II and III thickness ranged from 94.1 um to 105.0um with a mean of 99.55 um ± 1.59
- Layer IV thickness ranged from 91.8 um to 100.9 um with a mean of 95.45 um ± 1.28.
- Layers V and VI thickness ranged from 357.15um to 365.2um with a mean of 361.34um ± 0.71. Since the layers (II-VI) of the previous subgroup could not be easly distinguished, so their thickness could not be compared with the layers thickness of this subgroup.

Subgroup I-3 :

Area 17 : (Table 2)

- Layer I thickness ranged from 38.47um to 45.66 um with a mean of 42.4 um ± 1.59 which was significantly decreased than that of the previous subgroup (P =.02).
- Layer II and III thickness ranged from 179.3 um to 184.23 um with a mean of 181.67 um ± 1.08 which was significantly decreased than that of the previous subgroup (P = .02).
- Layer IV thickness ranged from 177.6 um to 184.39 um with a mean of 181.04um ± 0.63 which was significantly decreased than that of the previous subgroup (P = .01).
- Layer V thickness ranged from 219.31 um to 227.37 um with a mean of 223.13 um ± 2.04 which was significantly decreased than that of the previous subgroup (P = 0.01)
- Layer VI thickness ranged from 360.9 um to 370.49 um with a mean of 365.82 um ± 1.64 which was significantly decreased than that of the previous subgroup (P = 0.002).

Area 18 :

- Layer I thickness ranged from 36.45 um to 50.25 um with a mean of 43.56 um ± 1.5 which was significantly decreased than that of the previous subgroup (P = 0.02).
- Layers II and III thickness ranged from 87.35 um to 100.32 um with a mean of 93.29 um ± 1.57 which was significantly decreased than that of the previous subgroup (P = 0.02).
- Layer IV thickness ranged from 83.15 um to 96.62um with a mean of 90.64 um ± 1.77 which was significantly decreased than that of the previous subgroup (P = 0.01)
- Layers V and VI thickness ranged from 352.8um to 362.2um with a mean of 356.46 um ± 2.8 which was significantly decreased than that of the previous subgroup (P = 0.01).

B- The cells :

Subgroup I-1 : (Table 1)

Area 17 :

- Layer I: the diameters of the granular cells ranged from 1.01 um to 7.25um with a mean of 3.59 um ± 0.24.
- Layers II to VI the diameters of the granular cells ranged from 2.7um to 10.74um with a mean of 6.53 um, ± 1.89 and the surface areas of the pyramidal cells ranged from 120.6 um^2 to 135.84 um^2 with a mean of 128.09 um^2 ± 0.38.

Area 18 : (Table 1)

- Layer I : the diameters of the granular cells ranged from 1.2um to 7.4 with a mean of 3.19 um ± 1.0

- Layers II to VI : The diameters of the granular cells ranged from 3.1um to 8.7um with a mean of 5.63um, ± 0.34 and the surface areas of the pyramidal cells ranged from 112.39 um^2 to 123.85 um^2 with a mean of 118.14 um^2 ± 0.27.

Subgroup I-2 :

Area 17 : (Table 2)

- Layer I the surface area of the flattened cells ranged from 6.35um^2 to 19.9um^2 with a mean of 12.75um^2 ± 2.23 since the cells of this layer became flattened so they could not be compared with the granular cells of the previous subgroup.
- Layers II to VI : The diameters of the granular cells ranged from 4.09 um to 17.55 um with a mean of 10.56 um, ± 0.87 which was significantly increased than that of the previous subgroup ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 148.65 um^2 to 275.8 um^2 with a mean of 224.83 um^2 ± 2.09 which was significantly increased than that of the previous subgroup ($P < 0.001$).

Area 18 : (Table 3)

- Layer I the surface area of the flattened cells ranged from 5.19um^2 to 22.5um^2 with a mean of 13.1um^2 ± 4.6. since the cells of this layer became flattened so they could not be compared with the granular cells of the previous subgroup.
- Layers II to VI : The diameters of the granular cells ranged from 4.82um to 13.22 um with a mean of 8.51um ± 2.28 which was significantly increased than that of the previous subgroup ($P = 0.01$) and the surface areas of the

($P < 0.001$) and the surface areas of the pyramidal cells ranged from 227.4 um^2 to 247.3 um^2 with a mean of 235.36 $um^2 \pm 1.47$ which was significantly decreased than that of the previous subgroup ($P < 0.001$).

- Layer VI : the diameters of the granular cells ranged from 3.74um to 13.4with a mean of 8.22 um $\pm$ 1.77 which was significantly decreased than that of the previous subgroup ($P < 0.001$).

Area 18 : (Table 3)

- Layer I the surface area of the flattened cells ranged from 4.5um^2 to 16.9um^2 with a mean of 9.44um $\pm$ 2.15 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layers II and III : The surface areas of the lozenge cells ranged from 7.7um^2 to 28.15 um^2 with a mean of 17.07 um^2 $\pm$ 5.13 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layer IV : The diameters of the granular cells ranged from 2.9 um to 7.57 um with a mean of 5.10 um $\pm$ 0.66 which was significantly decreased than that of the previous subgroup ($P < 0.001$)
- Layers V and VI : The diameters of the granular cells ranged from 3.38 um to 8.78 um with a mean of 5.17 um, $\pm$ 0.47 which was significantly decreased than that of the previous subgroup ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 125.25 um^2 to 141.77 um^2 with a

mean of 132.51 um^2 $\pm$ 1.57 which was significantly decreased than that of the previous subgroup ($P < 0.001$).

Group II :

A- Histological results :

a- HX. and E. :

Subgroup II-1 :

Area 17 :

It was formed of six layers which were thicker than the previous group and could be easily distinguished from each other, with an apparent increase in the size of the cells.

- Layer I consisted of few flattened cells and nerve fibers.
- Layers II and III appeared as a single layer and consisted of small granular and pyramidal cells.
- Layer IV consisted of very closely packed granular cells and small pyramidal cells.
- Layer V the density of the cells was less than that of layer IV and it consisted of broad pyramidal cells deeply stained and granular cells.
- Layer VI appeared thick and consisted of large granular cells. (Fig. 17).

Area 18 :

It was formed of six layers which were thicker than in the previous group with an increase in the cell size and had a uniformly granular appearance.

- Layer I consisted of few flattened cells and nerve fibers.

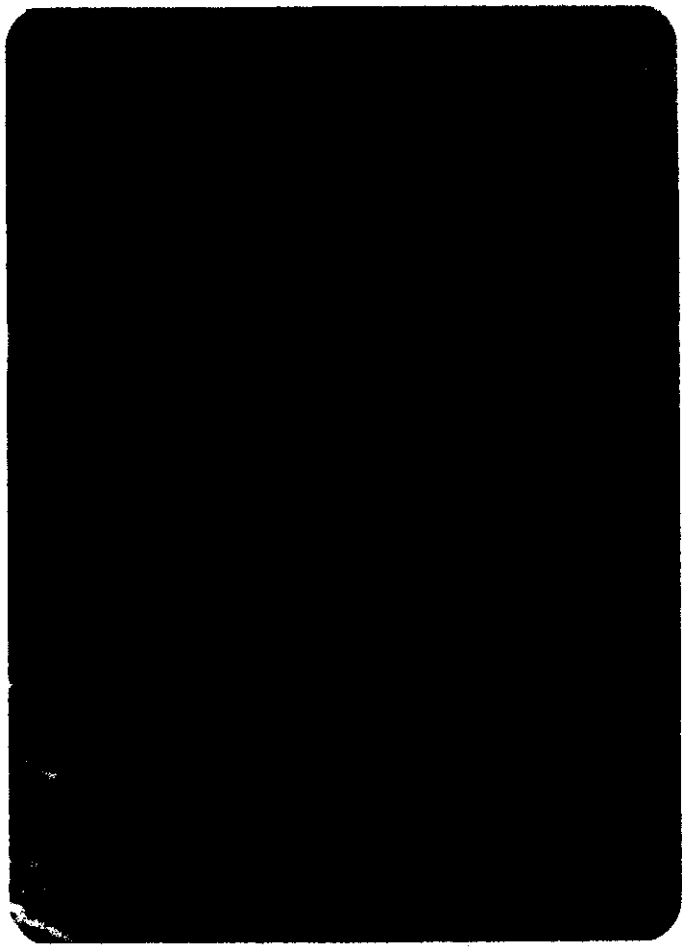

Fig. (17) : A photomicrograph of a section in area 17 of a control rat aged 21 days showing the six layers of area 17.

(Hx & E x 100).

- Layers II and III appeared as a single layer and consisted of lozenge shaped cells.
- Layer IV consisted of small granular cells with a density as layer V.
- Layers V and VI appeared as a single layer and consisted mainly of granular cells with few small pyramidal cells (Fig. 18).

Subgroup II-2 :

Areas 17 and 18 showed a shrinkage of the thickness of all layers and the cells (Fig. 19).

B- Tobuidine blue :

Subgroup II-1 :

Areas 17 and 18 showed numerous stained Nissl granules in all the cells of all the layers (Figs. 20 & 21).

Subgroup II-2 :

Areas 17 and 18 showed chromatolysis in all the cells of all the layers (Figs. 22 & 23).

C- Glees's silver stain :

Subgroup II-1 :

The cells of areas 17 and 18 showed numerous and thick network of neurofibrils (Figs. 24 & 25).

Subgroup II-2 :

The cells of both areas showed thin and less condensed neurofilaments.

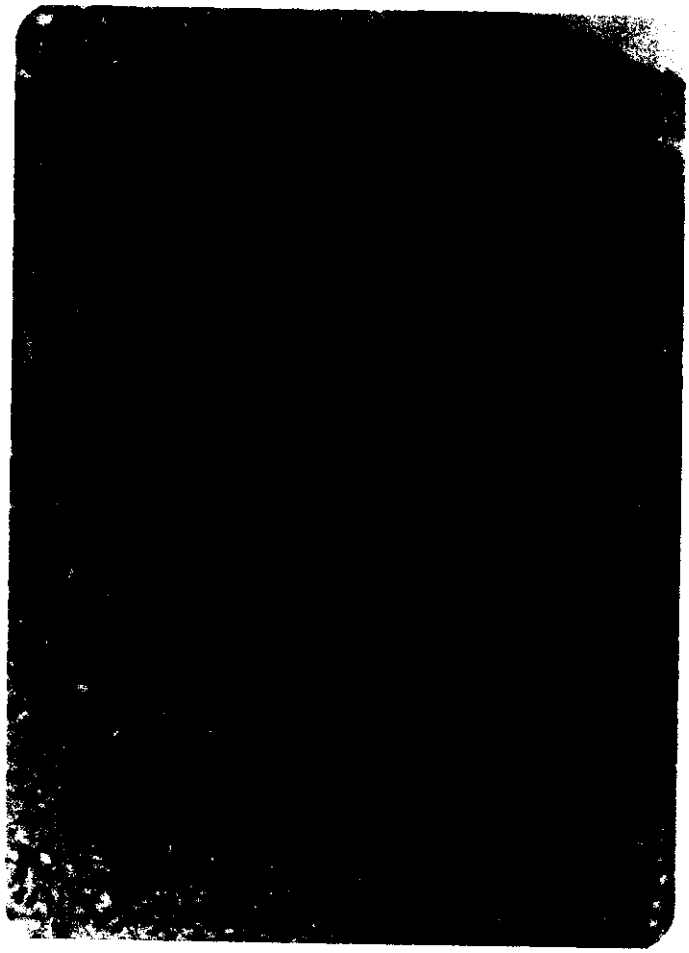

Fig. (18) : A photomicrograph of a section in area 18 of a cotrol rat aged 21 days showing the six layers of area 18.

(Hx. & E. x 100).

Fig. (19) : A photomicrograph of a section in area 17 of a rat aged 21 days and treated with malathion for 15 days showing shrinkage of cells and layers. (Hx & E. X 100).

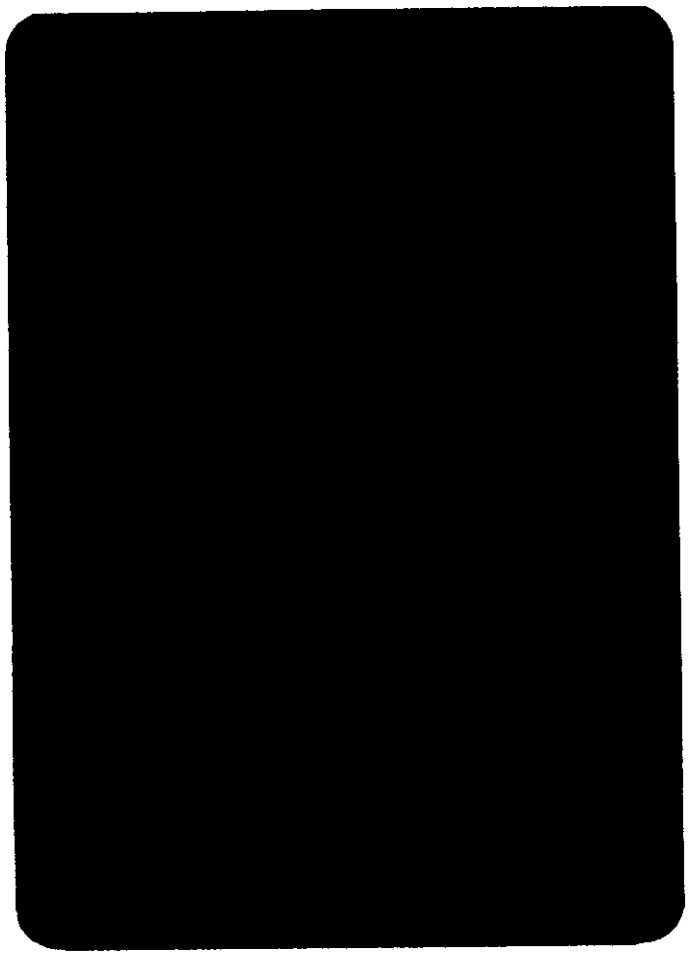

Fig. (20) : A photomicrograph of a section in area 17 of a control rat aged 21 days and received distilled water for 15 days showing strongly stained cells in the six layers with toluidine blue. (Toluidine blue X 100).

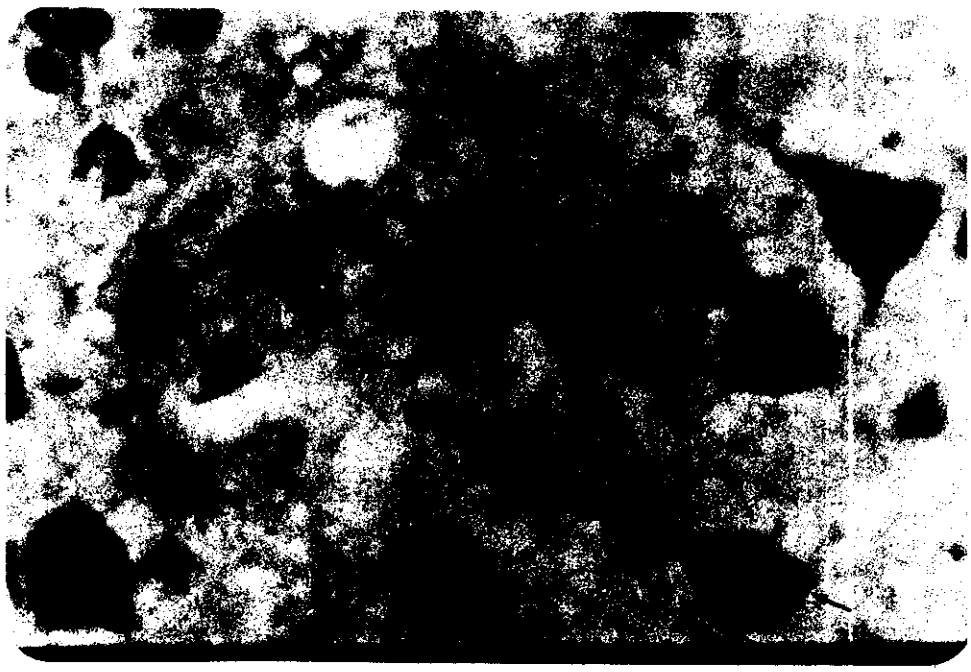

Fig. (21): A higher magnification of the previous section shwoing numerous strongly stained Nissl granules. (Toluidine blue x 1000)

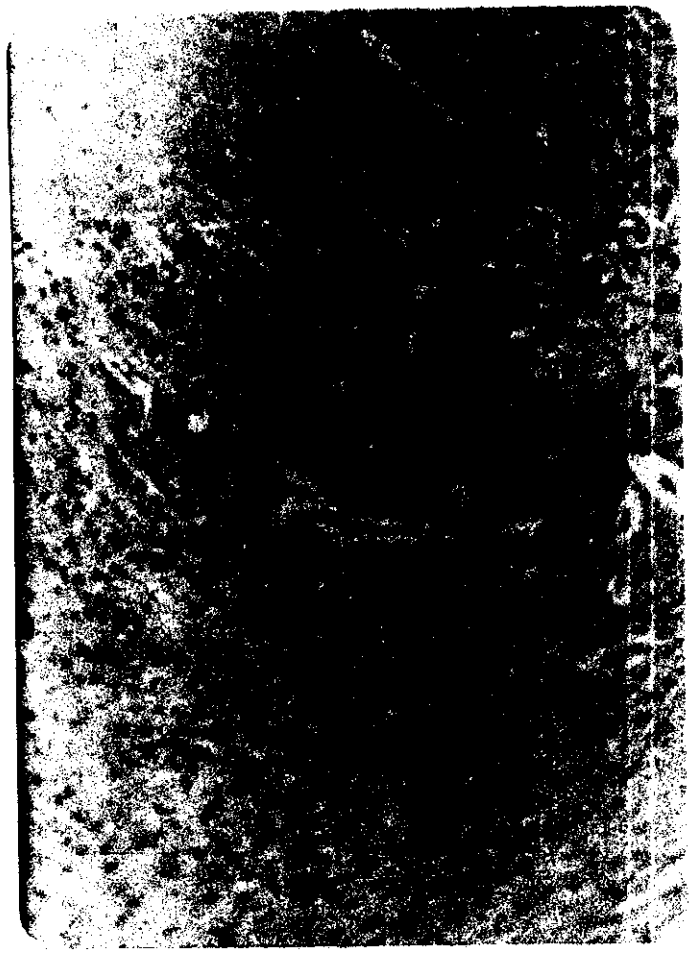

Fig. (22) : A photomicrograph of a section in area 17 of a rat aged 21 days and treated with malathion for 15 days showing weakly stained cells in the six layers of area 17.
(Taluidine blue x 100).

Fig. (23): A higher magnification of the previous section showing chromatolysis.

(Toluidine blue x 1000)

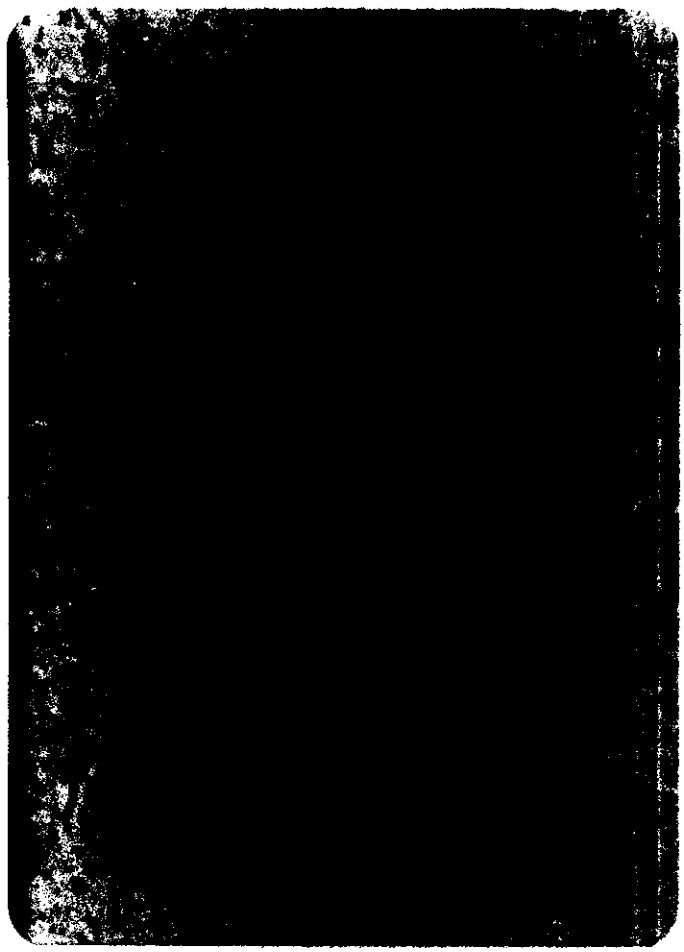

Fig. (24) : A photomicrograph of a section in area 17 of a control rat aged 21 days and showing deeply stained cells in the six layers.
(Glees's silver stain X 100).

Fig. (25): A higher magnification of the previous section showing numerous strongly stained neurofibrils. (Glees'ssilver stain x 1000)

D- Heidenhan's modification of Kultschitshy's method :

Subgroup II-1 :

Area 17 :

There was thick myelinated fasciculi running tangentially in layers V and VI and suppressed in the other layers (Fig. 26).

Area 18 :

There was thin myelinated fibers running in layers V and VI and suppressed in other layers.

Subgroup II-2 :

Areas 17 and 18 showed marked degeneration of myelin sheath with a decrease in the thickness of the myelinated fascicles (Figs. 27 & 28).

B- Histochemical results :

a- Non specific esterase enzyme :

Subgroup II-1 :

There was a moderate reaction of non specific esterase enzyme in all the layers of both areas (Fig. 29).

Subgroup II-2 :

There was a weak reaction of the enzyme in all the layers of both areas (Fig. 30).

b- Acetyl cholinesterase enzyme :

Subgroup II-1 :

The cells of both areas showed a moderate reaction of the enzyme (Fig.31).

Fig. (26) : A photomicrograph of a section in area 17 of a control rat aged 21 days and received distilled water for 15 days showing strongly stained myelin sheath.
(Kultschitsky's method X 100).

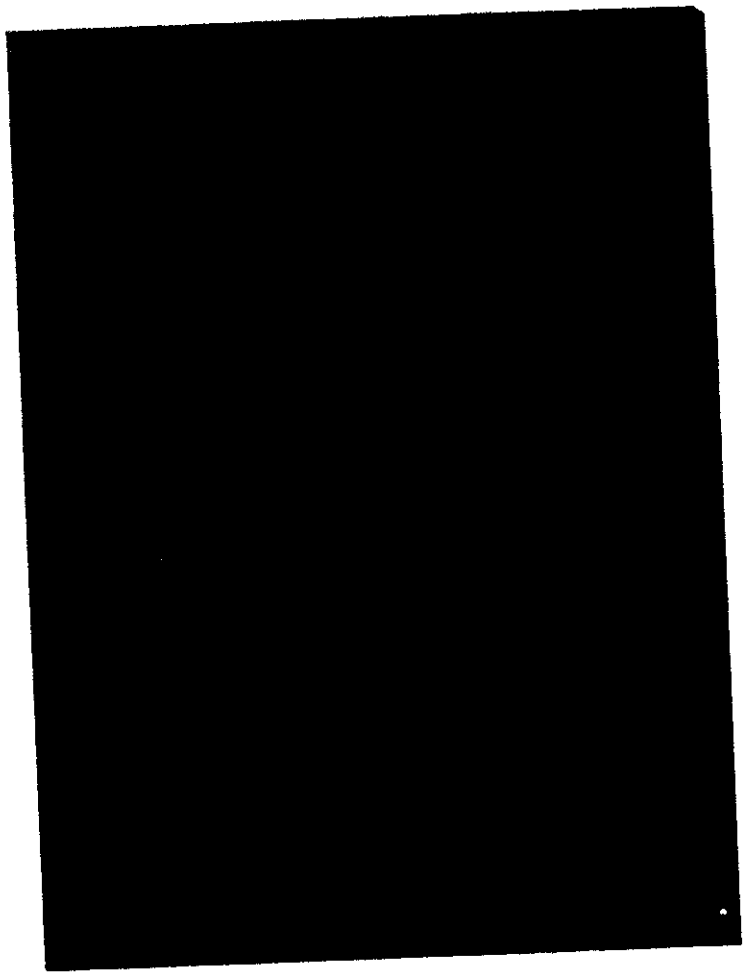

Fig. (27) : A photomicrograph of a section in area 17 of a rat aged 21 days and treated with malathion for 15 days showing weakly stained myelin sheath. (Kultschitsky's method X 100).

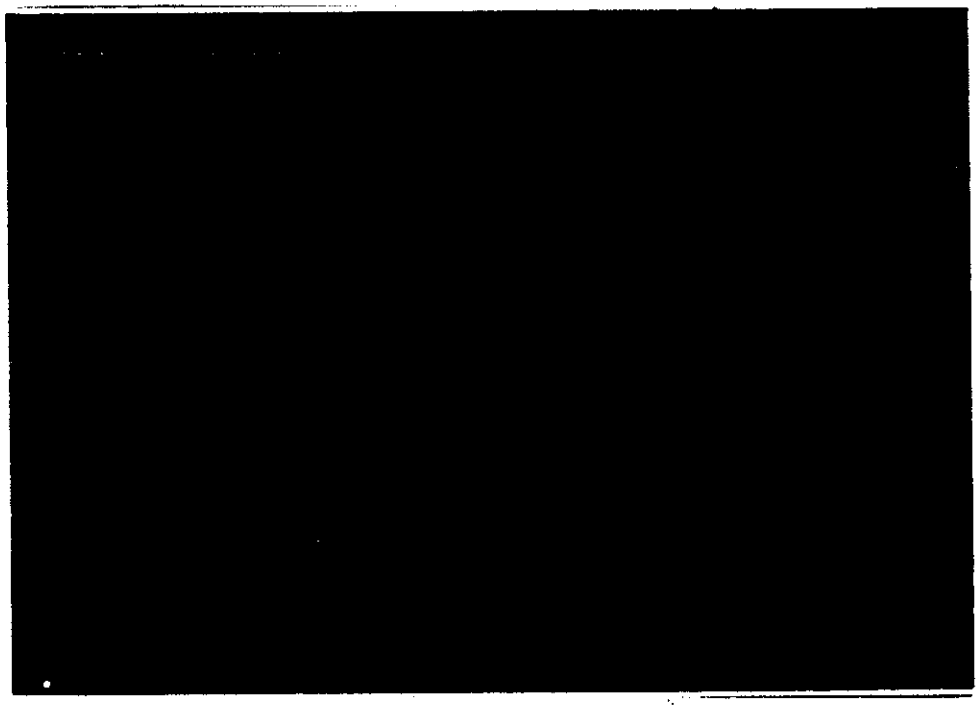

Fig.(28): A higher magnification of the previous section showing weakly stained mayelin sheath.
(Kultschitsky's method x 1000)

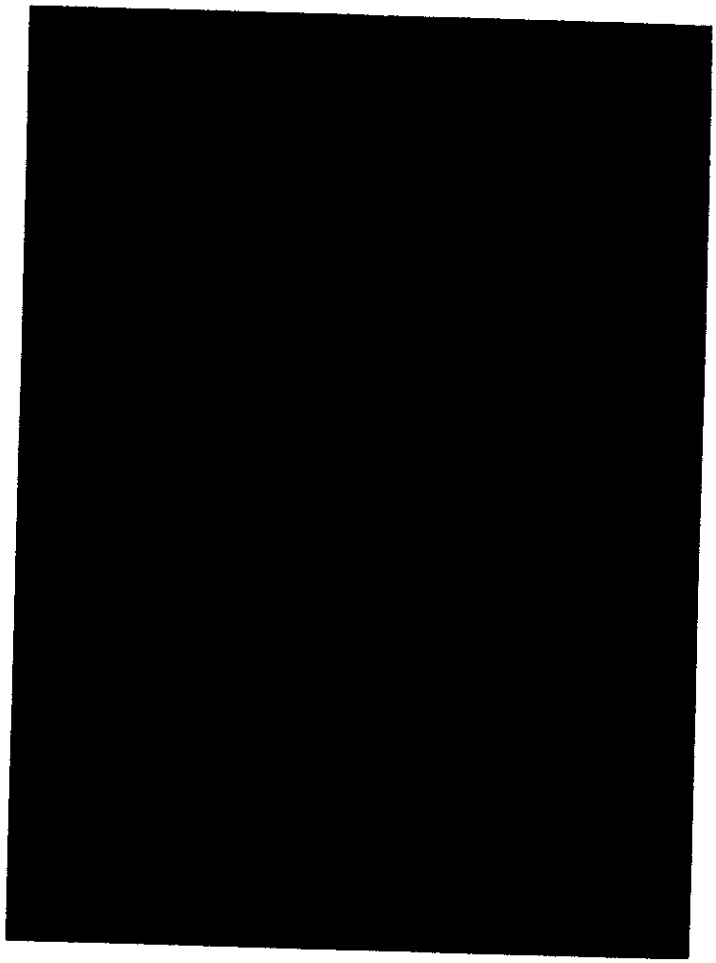

Fig. (29) : A photomicrograph of a section in area 17 of a control rat aged 21 days showing moderate reaction of non specific esterase enzyme in the six layers. (Gomori method X 100).

Fig. (30): A photomicrograph of a section in area 17 of a rat aged 21 days and treated with malathion for 15 days showing weak reaction of non specific esterase enzyme in the six layers.
(Gomori method X 100).

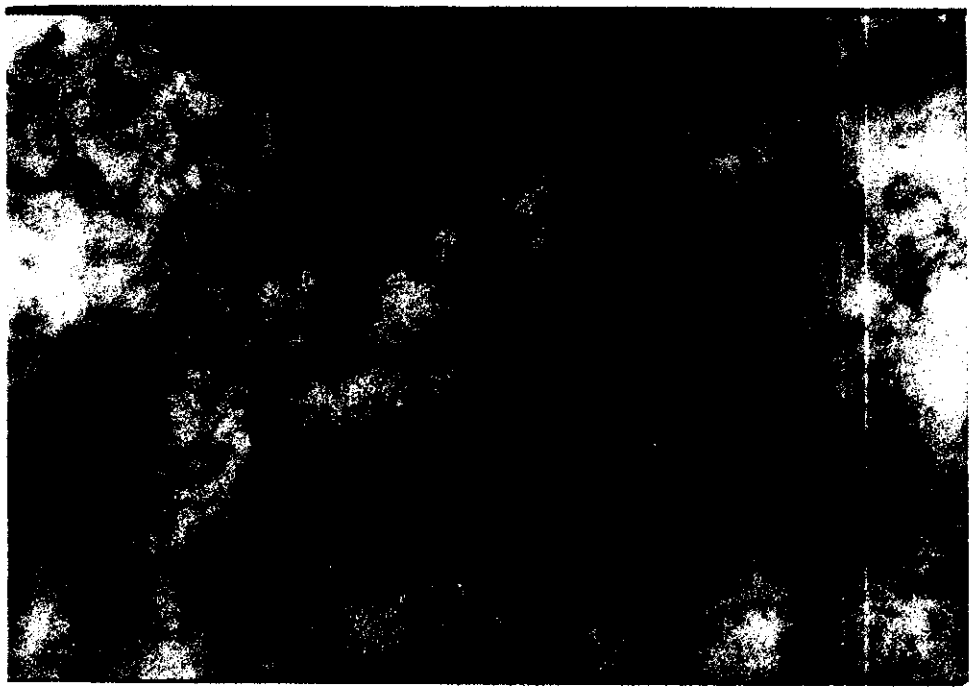

Fig. (31): A photomicrograph a section from area 17 of a control rat aged 21 days showing a moderate reaction of cholinesterase enzyme.
(Thiocholine method x.400).

Subgroup II-2 :

The cells of both areas showed a weak reaction of the enzyme (Fig. 32).

c- Adenosine triphoshatase enzyme :

Subgroup II-1 :

The cells of both areas showed a moderate reaction of adenosine triphosphatas enzyme (Fig. 33).

Subgroup II-2 :

The two areas showed an intense reaction of adenosine triphosphatase enzyme (Fig. 34).

C- Quantitative methods :

a- Layer thickness :

Subgroup II-1 :

Area 17 : (Table 4)

- Layer I thickness ranged from 174.4 um to 182.6um with a mean of 179 um ± 1.83 which was significantly increased than that of the previous group ($P < 0.001$).
- Layers II and III thickness ranged from 233.4um to 243.6um with a mean of 239 um ± 2.16 which was significantly increased than that of the previous group ($P < 0.001$).
- Layer IV thickness ranged from 231.6 um to 241.4 um with a mean of 237.4 um ± 3.03 which was significantly increased than that of the previous group ($P < 0.001$).
- Layer V thickness ranged from 288.6 um to 295.4 um with a mean of 292.6 um ± 2.06 which was significantly increased than that of the previous group ($P = 0.02$)

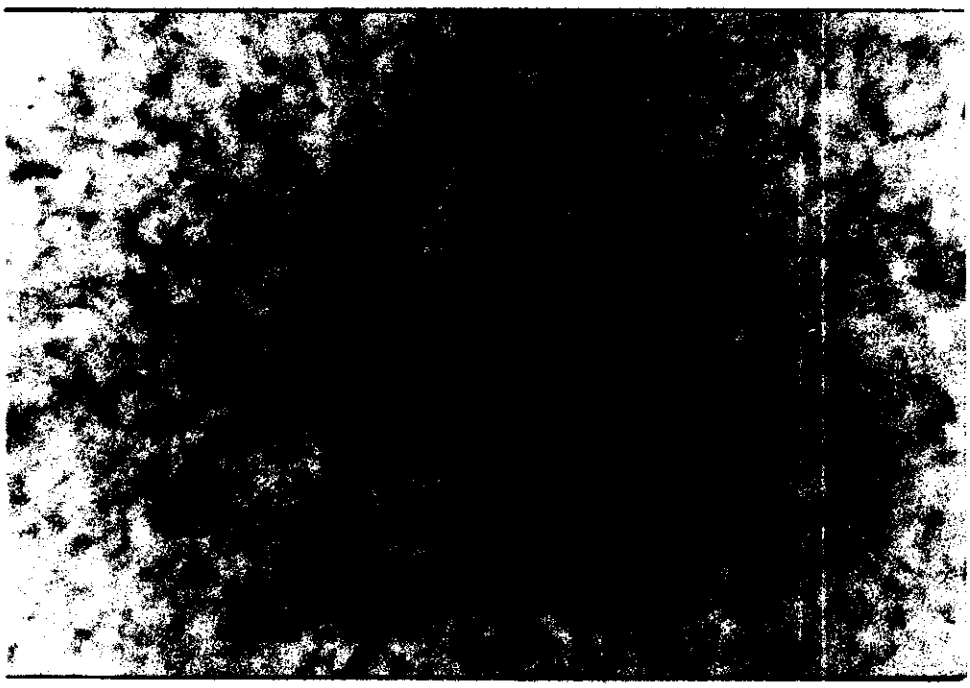

Fig. (32): A photomicrograph of a section from area 17 of a rat aged 21 days treated with malathion for 15 days and showing weak reaction of cholinesterase enzyme.

(Thiocholine method x:400).

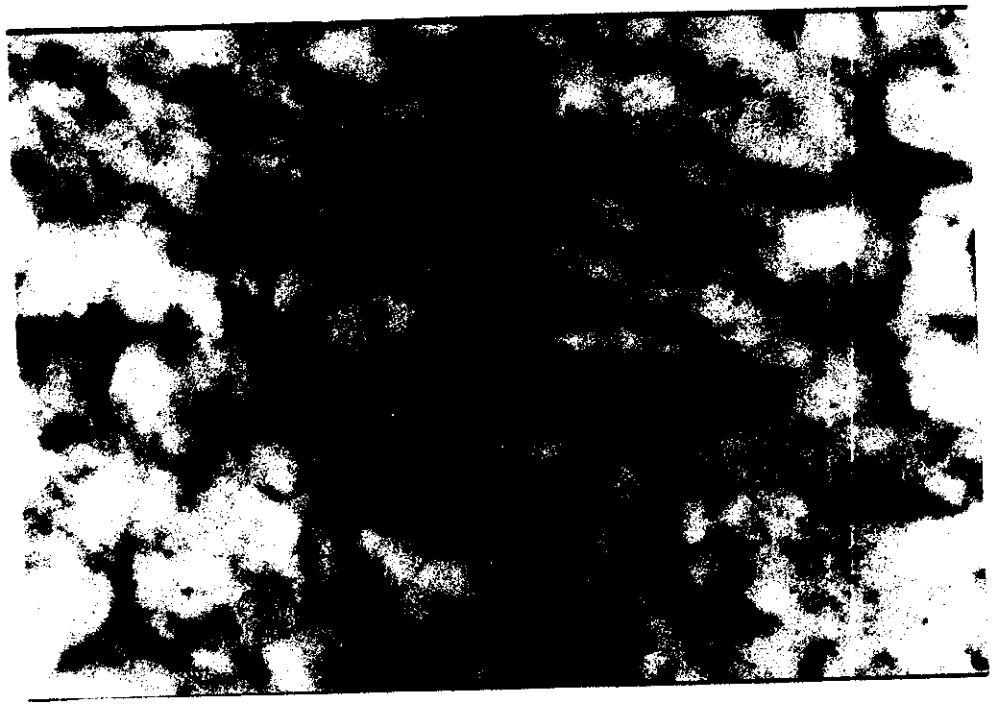

Fig. (33) : A photomicrograph of section from area 17 of a control rat aged 21 days showing moderate reaction of adenosin triphosphatase enzyme.

(Lead method x400).

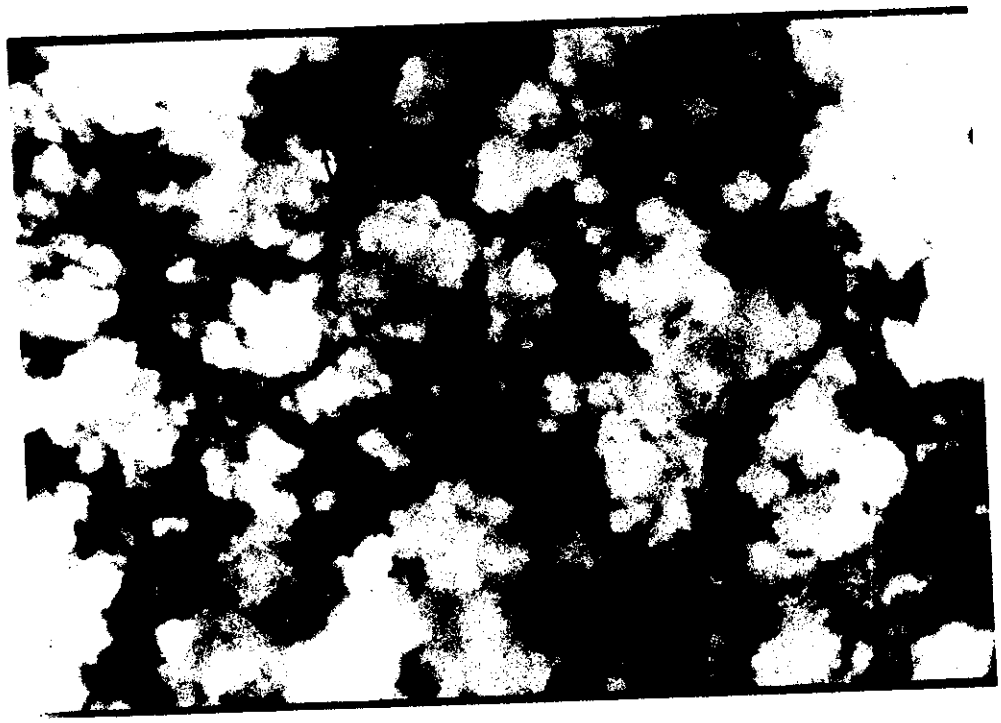

Fig. (34): A photomicrograph of a section in area 17 of a rat aged 21 days and treated with malathion for 15 days showing intense reaction of adenosine triphosphatase enzyme.

(Lead method x 400)

Table (4): Showing measurements of layers' thickness (um), diameters of the granular cells (um) and surface areas of the pyramidal and flattened cells (um^2) in all the cortical layers of area 17 in control and treated animals aged 21 days.

Animal No.	Layer No.	Thickness of layers (um)		Granular cells (um)		Pyramidal cells (um^2)		Flattened cells (um^2)	
		Subgroup II-1	Subgroup II-2	Subgroup II-1	Subgroup II-2	Subgroup II-1	Subgroup II-2	Subgroup II-1	Subgroup II-2
1		174.4-179.7	169.65-172.47					15.49-30.5	6.18-15.28
2		178.35-181.6	169.6-173.8					12.79-26.6	10.85-20.24
3	I	176.3-179.7	168.3-173.4					15.61-25.35	10.68-22.3
4		179.4-182.6	173.75-175.4					15.6-30.78	15.56-29.6
5		177.6-180.4	173.2-177.46					18.62-27.5	10.31-25.5
Mean		179 ± 1.83	173.29 ± 2.11					23.26 ±3.85	16.72± 4.3
1		235.4-238.5	231.5-236.68	7.6-12.75	3.78-7.55	239.15-251.5	222.8-240.6		
2	II	239.55-242.4	232.58-235.31	10.55-14.6	5.35-8.85	240.65-250.4	225.64-236.5		
3	&	238.55-241.4	233.9-237.49	8.6-14.6	3.85-7.75	237.7-246.5	231.5-241.2		
4	III	240.35-243.6	230.9-233.61	9.5-14.25	3.3-8.5	240.4-248.7	233.1-246.45		
5		233.4-241.7	234.55-238.15	8.4-12.48	4.35-7.85	240.3-247.5	220.8-238.2		
Mean		239 ± 2.16	234.32± 1.18	11.3± 1.25	6.21± 0.68	244.32± 1.57	233.57± 4.37		
1		231.6-235.4	229.6-232.53	10.2-14.3	4.7-10.2	242.4-249.2	235.55-245.4		
2		237.45-240.5	229.4-232.47	9.4-16.0	5.7-10.3	245.5-250.25	235.8-246.5		
3	IV	239.64-241.4	228.85-232.72	9.47-14.25	3.45-9.15	239.3-246.85	235.49-244.7		
4		235.5-238.3	231.5-234.6	10.3-15.4	4.4-10.1	245.2-253.7	236.62-244.9		
5		233.4-236.6	232.75-235.57	10.88-15.9	5.5-11.7	240.6-247.3	240.24-250.05		
Mean		237.4 ± 3.03	232.18± 0.96	12.54±0.76	7.66±1.11	246.32± 2.7	241.56± 0.60		
1		288.6-291.35	285.5-288.36	11.6-16.8	5.3-10.8	350.4-357.5	339.2-349.95		
2		292.65-295.4	287.4-290.89	10.55-15.5	4.5-10.15	349.45-356.8	341.5-350.35		
3	V	289.5-292.5	286.3-291.4	11.55-14.1	9.35-14.2	350.6-358.8	344.49-350.5		
4		292.55-295.3	285.6-287.0	11.65-16.1	7.3-10.3	349.5-356.3	339.49-346.1		
5		289.2-292.85	283.55-286.4	11.4-16.55	6.6-11.5	348.4-353.65	342.6-349.23		
Mean		292.6 ± 2.06	287.3 ± 1.36	13.92±0.26	9.40± 2.06	353.32± 1.08	345.5 ± 2.18		
1		378.3-381.5	373.55-374.69	13.6-17.3	6.5-10.33				
2		382.7-385.4	371.3-374.4	12.6-19.63	9.45-13.3				
3	VI	381.85-384.1	373.45-377.4	13.8-18.75	8.4-18.49				
4		377.7-380.4	379.65-380.48	12.5-16.18	9.4-15.8				
5		379.67-382.2	381.25-383.1	8.3-14.45	8.35-11.65				
Mean		381.4 ± 2.28	376.96± 3.18	14.48±0.74	10.6± 1.84				

- Layer VI thickness ranged from 377.7 um to 385.4 um with a mean of 381.4um ± 2.28 which was significantly increased than that of the previous group (P = 0.02).

Area 18 : **(Table 5)**

- Layer I thickness ranged from 74.5 um to 85.2 um with a mean of 80.24 um ± 1.2 which was significantly increased than that of the previous group (P < 0.001).
- Layers II and III thickness ranged from 142.65 um to 151.63 um with a mean of 146.66 um ± 1.76 which was significantly increased than that of the previous group (P < 0.001).
- Layer IV thickness ranged from 133.82um to 147.51 um with a mean of 140.32um ± 2.96 which was significantly increased than that of the previous group (P < 0.001).
- Layers V and VI thickness ranged from 414.42um to 424.62um with a mean of 421.04 um ± 2.17 which was significantly increased than that of the previous group (P < 0.001).

Subgroup II-2 :

Area 17 : **(Table 4)**

- Layer I thickness ranged from 168.3um to 177.46 um with a mean of 173.29 um ± 2.11 which was significantly decreased than that of the previous subgroup (P = 0.01).
- Layers II and III thickness ranged from 230.9um to 238.15um with a mean of 234.32 um ± 1.18 which was significantly decreased than that of the previous subgroup (P = 0.01).

Table (5): Showing measurements of layers' thickness (um), the diameters of the granular cells (um) and the surface areas of the lozenge, pyramidal and flattened cells (um^2) in all the cortical layers of area 18 in control and treated animals aged 21 days.

Animal No.	Layer No	Thickness of layers (um)		Lozenge cells (um^2)		Granular cells (um)		Pyramidal cells (um^2)		Flattened cells (um^2)	
		Subgroup II-1	Subgroup II-2	Subgroup II-1	Subgroup II-2	Subgroup II-1	Subgroup II-2	Subgroup II-1	Subgroup II-2	Subgroup II-1	Subgroup II-2
1		77.93-83.47	71.55-77.7							19.5-25.8	6.9-15.6
2	I	70.4-83.42	71.4-75.2							10.6-20.09	6.2-15.6
3		77.65.85.2	71.7-79.74							10.9-25.6	6.34-17.8
4		74.5-82.71	71.6-73.95							12.2-24.5	7.52-19.6
5		76.65-83.4	69.5-74.81							16.3-25.9	6.37-19.45
Mean		80.24 ± 1.2	73.87 ± 3.56							20.1 ± 3.6	12.59± 2.85
1		143.81-151.63	138.55-144.46	42.65-60.67	37.4-47.22						
2	II	143.3-147.08	140.63-146.7	53.35-66.3	38.6-45.8						
3	&	142.65-148.58	137.35-142.73	56.3-70.25	37.4-52.56						
4	III	145.83-150.31	140.75-147.49	65.14-63.07	31.45-46.7						
5		143.92-150.7	137.85-143.7	53.93-67.93	29.28-41.58						
Mean		146.66± 1.76	141.93± 2.79	58.04± 5.38	41.05 ±5.77						
1		137.6-142.45	131.7-138.3			9.8-15.36	6.5-11.9				
2		135.74-143.43	131.88-138.6			7.7-16.28	5.5-11.72				
3	IV	140.8-144.6	132.7-141.76			10.4-16.38	4.25-10.78				
4		139.15-143.75	133.72-141.62			7.4-14.2	4.95-9.89				
5		133.82-147.51	128.9-137.46			5.95-17.09	4.65-9.17				
Mean		140.32± 2.96	135.53± 1.25			11.91±0.95	7.99±0.89				
1		414.42-421.32	411.85-416.97			8.55-14.64	4.38-8.9	229.72-241.52	220.84-236.34		
2		419.52-424.45	412.71-418.66			8.8-17.17	4.47-10.11	229.2-240.32	220.84-237.53		
3	V &VI	417.25-420.39	413.77-422.67			9.0-13.54	6.48-12.12	230.31-242.33	225.65-235.25		
4		419.55-424.62	408.7-415.59			8.2-13.54	5.58-12.22	231.65-242.7	220.65-232.58		
5		418.35-423.68	414.95-423.89			8.5-16.32	5.5-10.07	229.65-241.82	223.45-233.65		
Mean		421.04± 2.17	416.06± 2.4			12.28±1.17	7.87± 1.14	235.98± 0.87	228.61± 1.62		

- Layer IV thickness ranged from 228.85um to 235.57 um with a mean of 232.18 um ± 0.96 which was significantly decreased than that of the previous subgroup (P = 0.01).
- Layer V thickness ranged from 283.55um to 291.4um with a mean of 287.3 um ± 1.36 which was significantly decreased than that of the previous subgroup (P = 0.002).
- Layer VI thickness ranged from 371.3um to 383.10um with a mean 376.96 um 3.18 which was significantly decreased than that of the previous subgroup (P = 0.002).

Area 18 : (Table 5)

- Layer I thickness ranged from 69.5um to 79.74 um with a mean of 73.87 um ± 3.56 which was significantly decreased than that of the previous subgroup (P = 0.02).
- Layers II and III thickness ranged from 137.35 um to 147.49 um with a mean of 141.93 um ± 2.79 which was significantly decreased than that of the previous subgroup (P = 0.02).
- Layer IV thickness ranged from 128.9 um to 141.76 um with a mean of 135.53 um ± 1.25 which was significantly decreased than that of the previous subgroup (P = 0.02).
- Layer V and VI thickness ranged from 408.7 um to 423.89 um with a mean of 416.06 um ± 2.4 which was significantly decreased than that of the previous subgroup (P = 0.01).

b- The cells :

Subgroup II-1 :
Area 17 : (Table 4)

- Layer I the surface areas of the flattened cells ranged from 12.79 um^2 to 30.78um^2 with a mean of 23.26um^2 ± 3.85

which was significantly increased than that of the previous group ($P < 0.001$).

- Layers II and III : The diameters of the granular cells ranged from 7.6 um to 14.6 um with a mean of 11.3 um, $\pm$ 1.25 which was significantly increased than that of the previous group ($P < 0.001$) and the surface areas of pyramidal cells ranged from 237.7 um to 251.5um with a mean of 244.32 um $\pm$ 1.57 which was significantly increased than that of the previous group ($P < 0.001$)
- Layers IV : The diameters of the granular cells ranged from 9.4um to 16.0um with a mean of 12.54 um, $\pm$ 0.76 which was significantly increased than that of the previous group ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 239.3 um^2 to 253.7 um^2 with a mean of 246.32 um^2 $\pm$ 2.7 which was significantly increased than that of the previous group ($P < 0.001$).
- Layer V : The diameters of the granular cels ranged from 10.55 um to 16.8 um with a mean of 13.92 um, $\pm$ 0.26 which was significantly increased than that of the previous group ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 348.41 um^2 to 358.8um^2 with a mean of 353.32 um^2 $\pm$ 1.08 which was significantly increased than that of the previous group ($P < 0.001$).
- Layer VI : The diameters of the granular cells ranged from 8.3um to 19.63um with a mean of 14.48 um $\pm$ 0.74 which was significantly increased than that of the previous group ($P < 0.001$).

Area 18 : (Table 5)

- Layer I the surface area of the flattened cells ranged from 10.6um^2 to 25.9um^2 with a mean of 20.1um ± 3.6 which was significantly increased than that of the previous group ($P < 0.001$).
- Layers II and III : The surface areas of the lozenge cells ranged from 42.65 um^2 to 70.25um^2 with a mean of 58.04 um^2 ± 5.38 which was significantly increased than that of the previous group ($P < 0.001$).
- Layer IV : The diameters of the granular cells ranged from 5.95 um to 17.09 with a mean of 11.91 um ± 0.95 which was significantly increased than that of the previous group ($P < 0.001$).
- Layers V and VI : The diameters of the granular cells ranged from 8.2 um to 17.17 um with a mean of 12.28 um, ± 1.17 which was significantly increased than that of the previous group ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 229.2 um^2 to 242.7 um^2 with a mean of 235.98 um^2 ± 0.87 which was significantly increased than that of the previous group ($P < 0.001$).

Subgroup II-2 :

Area 17 : (Table 4)

- Layer I the surface area of the flattened cells ranged from 6.18 um^2 to 29.6um^2 with a mean of 16.72um ± 4.3 which was significantly decreased than that of the previous subgroup ($P < 0.001$).

- Layers II and III : The diameters of the granular cells ranged from 3.3 um to 8.85um with a mean of 6.21 um, $\pm$ 0.68 which was significantly decreased than that of the previous subgroup ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 220.8 um^2 to 246.45 um^2 with a mean of 233.57 um^2 $\pm$ 4.37 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layer IV : The diameters of the granular cells ranged from 3.45 um to 11.7um with a mean of 7.66 um $\pm$ 1.11 which was significantly decreased than that of the previous subgroup ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 235.49 um^2 to 250.05 um^2 with a mean of 241.56 um^2 $\pm$ 0.4 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layer V : The diameters of the granular cells ranged from 4.5 um to 14.2 um with a mean of 9.4 um $\pm$ 2.06 which was significantly decreased than that of the previous subgroup ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 339.2 um^2 to 350.5 um^2 with a mean of 345.5 um^2 $\pm$ 2.18 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layer VI : The diameter of the granular cells ranged from 6.5 um to 18.49 um with a mean of 10.6 um $\pm$ 1.84 which was significantly decreased than that of the previous subgroup ($P < 0.001$).

Area 18 : (Table 5)

- Layer I : the surface area of the flattened cells ranged from 6.2um to 19.45um with a mean of 12.59um ± 2.85 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layers II and III : The surface area of the lozenge cells ranged from 29.28um^2 to 52.56um^2 with a mean of 41.05 um^2 ± 5.77 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layer IV : The diameters of the granular cells ranged from 4.25um to 11.9 um with a mean of 7.99 um ± 0.89 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layers V and VI : The diameters of the granular cells ranged from 4.38um to 12.22um with a mean of 7.87um ± 1.14 which was significantly decreased than that of the previous subgroup ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 220.65um^2 to 237.53 um^2 with a mean of 228.61 um^2 ± 1.62 which was significantly decreased than that of the previous subgroup ($P < 0.001$).

Group III :

A- Histological results :

a- HX. and E. :
Subgroup III-1 :
Area 17 :

It was formed of six layers which were thicker than in the previous group with increase in the size of the cells more than that of the previous group.

- Layer I consisted of few flattened cells and nerve fibers.
- Layers II and III appeared as a single layer and consisted of small granular and pyramidal cells.
- Layer IV consisted of very closely packed granular cells and small pyramidal cells.
- Layer V the density of the cells was less than in layer IV so it had an open structure and it consisted of broad deeply stained pyramidal cells and granular cells.
- Layer VI appeared thick and consisted of large granular cells (Fig.35).

Area 18 :

It was formed of six layers which were thicker than in the previous group with increase in the size of the cells more than that of the previous group.

- Layer I consisted of few flattened cells and nerve fibers.
- Layers II and III appeared as a single layer and consisted of lozenge shaped cells.
- Layer IV consisted of small granular cells of the same density as layer V.
- Layers V and VI appeared as a single layer and consisted mainly of granular cells with few small pyramidal cells (Fig.36).

Subgroup III-2 :

Areas 17 and 18 showed a shrinkage of the cells of all layers without change in the thickness of the layers (Fig. 37).

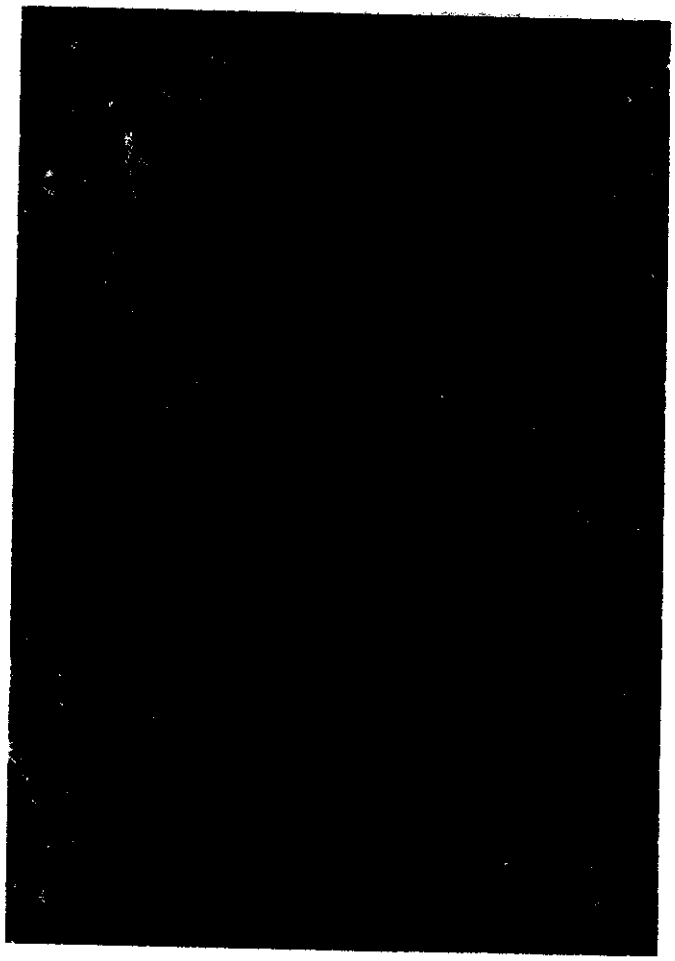

Fig. (35) : A photomicrograph of a section in area 17 of a control rat aged 3 months showing the six layers of area 17.

(Hx & E x 100).

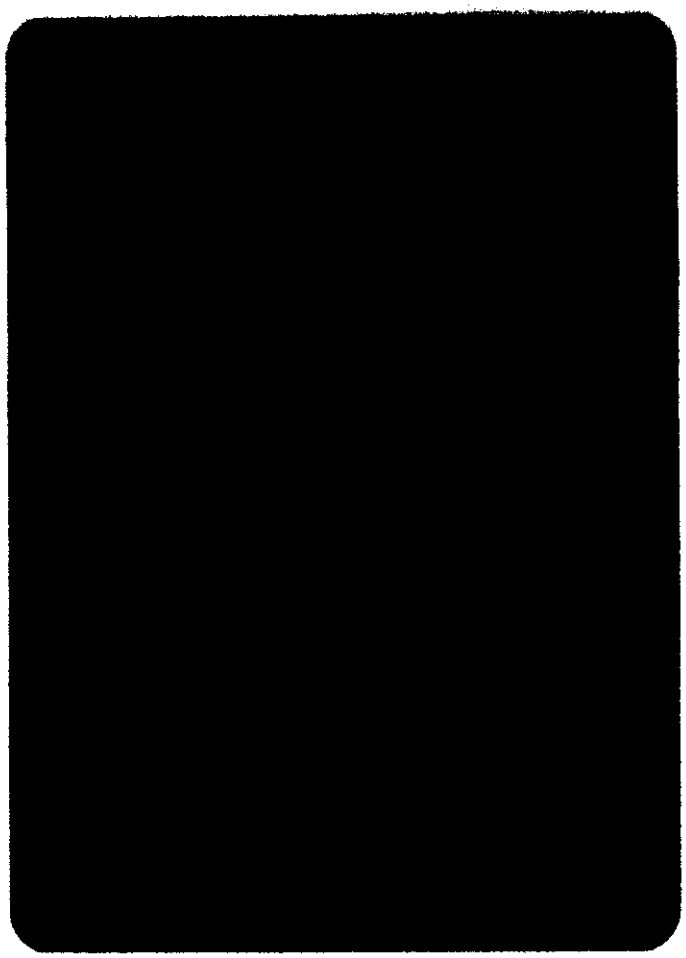

Fig. (36) : A photomicrograph of a section in area 18 of a control rat aged 3 months showing the six layers of area 18.

(Hx. & E. x 100).

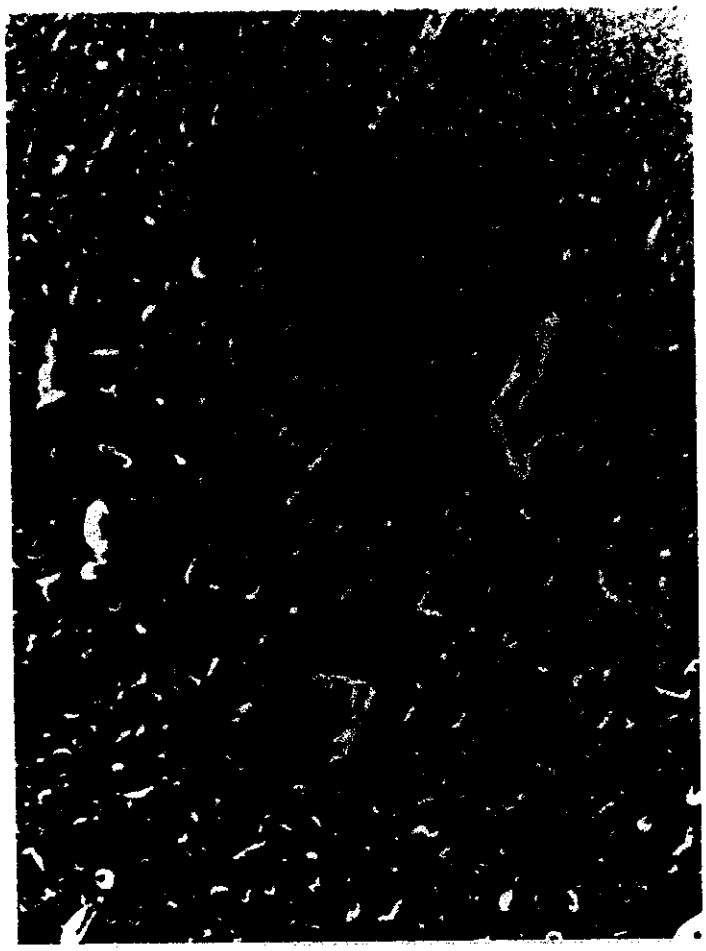

Fig. (37) : A photomicrograph of a section in area 17 of a rat aged 3 months and treated with malathion for 15 days showing shrinkage of cells without shrinkage of layers.
(Hx. & E. X 100).

b- Toluidine blue :

Subgroup III-1 :

Areas 17 and 18 showed numerous stained Nissl granules in all the cells of all the layers.

Subgroup III-2 :

Both areas 17 and 18 showed chromatolysis which appeared in all the cells of all the layers.

c- Glees's silver stain :

Subgroup III-1 :

The cells of both areas showed thick networks of neurofibrils.

Subgroup III-2 :

The cells of both areas showed thin and less condensed neurofilaments.

d- Heidenhan's modification of Kultschitsky's method :

Subgroup III-1 :

Area 17 :

There was thick myelinated fasciculi running tangentially in layers V and VI and suppressed in the other layers (Fig. 38).

Area 18 :

There were thin myelinated fibers running in layers V and VI and suppressed in other layers.

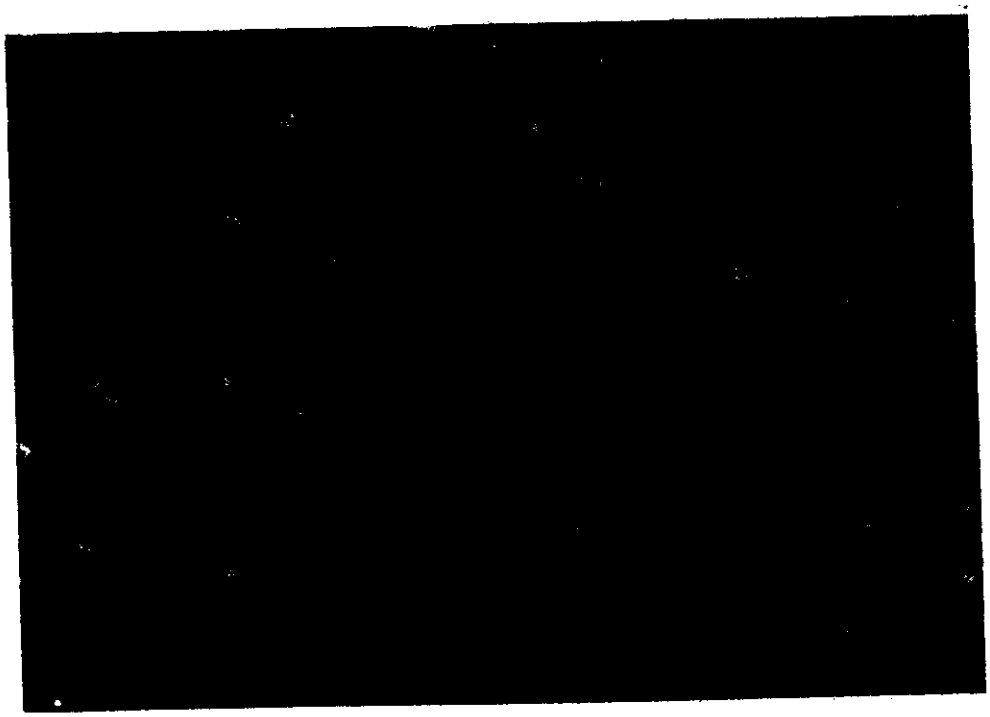

Fig. (38) : A photomicrograph of a section in area 17 of a control rat aged 3 months showing thick fascicles and strongly stained myelin sheath in layer 5 & 6. (Kultschitsky's method x 1000).

Subgroup III-2 :

Areas 17 and 18 showed degeneration of the myelin sheath with a decrease in the thickness of the myelinated fascicles (Fig.39).

B- Histochemical results :

a- Non spefcific esterase enzyme :

Subgroup III-1 :

There was a moderate reaction of non specific esteras enzyme in all the layers of both areas.

Subgroup III-2 :

There was a weak reaction of the enzyme in all the layers of both areas.

b- Acetyl cholinesterase enzyme :

Subgroup III-1 :

The cells of both areas showed a moderate reaction of acetyl cholinesterase enzyme.

Subgroup III-2 :

The cells of both areas showed a weak reaction of acetyle cholinesterase enzyme.

c- Adenosine triphosphatase enzyme :

Subgroup III-1 :

The cells of both areas showed a moderate reaction of adenosine triphosphatase enzyme.

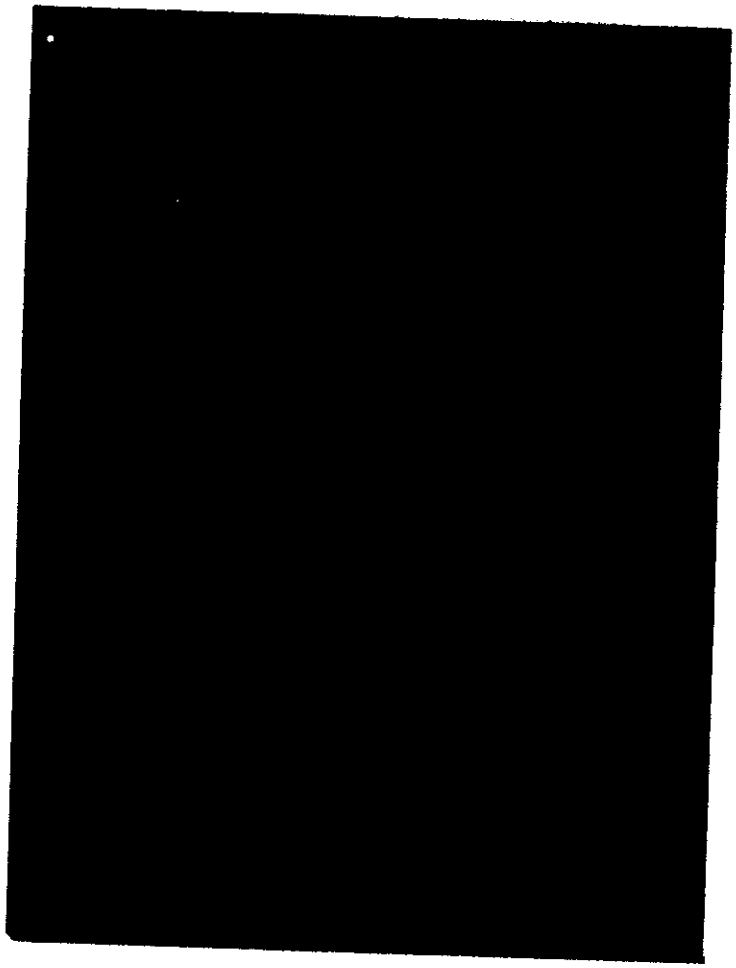

Fig.(39) : A photomicrograph of a section in area 17 of a rat aged 3 months treated with malathion and showing thin weakly stained myelin sheath.

(Kultschitsky's method x 1000)

Subgroup III-2 :

The two areas showed an intense reaction of adenosine triphosphatase enzyme.

C- Quantitative methods :

a- Layer thickness :

Subgroup III-1 :

Area 17 : (Table 6)

- Layer I thickness ranged from 179.7 um to 190.66 um with a mean of 185.14 um ± 1.8 which was significantly increased than that of the previous group ($P < 0.001$).
- Layers II and III thickness ranged from 279.75 um to 288.45 um with a mean of 284.36 um ± 1.3 which was significantly increased than that of the previous group ($P < 0.001$).
- Layer IV thickness ranged from 276.65 um to 290.0 um with a mean of 283.8 um ± 3.77 which was significantly increased than that of the previous group ($P < 0.001$).
- Layer V thickness ranged from 293.65 um to 303.9 um with a mean of 298.39 um ± 2.6 which was significantly increased than that of the previous group ($P = 0.02$).
- Layer VI thickness ranged from 382.6um to 391.9 um with a mean of 387um ± 1.30 which was significantly increased than that of the previous group ($P = 0.01$).

Area 18 : (Table 7)

- Layer I thickness ranged from 107.92 um to 125.71 um with a mean of 114.77 um ± 1.8 which was significantly increased than that of the previous group ($P < 0.001$).

Table (6): Showing measurements of layers' thickness (um), diameters of the granular cells (um) and the surface areas of the pyramidal and flattened cells (um^2) in all the cortical layers of area 17 in control and treated animals aged 3 months.

Animal	Layer	Thickness of layers (um)		Granular cells (um)		Pyramidal cells (um^2)		Flattened cells (um^2)	
		Subgroup III-1	Subgroup III-2	Subgroup III-1	Subgroup III-2	Subgroup III-1	Subgroup III-2	Subgroup III-1	Subgroup III-2
1		180.4-186.6	176.5-180.5					20.02-36.5	15.85-38.85
2	I	182.7-188.7	180.7-185.15					24.3-44.6	19.45-35.5
3		179.7-185.75	181.7-185.2					22.43-39.5	17.49-36.4
4		183.62-189.7	180.1-186.9					20.4-40.7	17.12-31.62
5		184.62-190.66	185.8-187.8					30.97-47.3	20.82-36.8
Mean		185.14 ± 1.8	183.42 ± 3.2					34.62 ± 1.3	28.15± 1.7
1		283.5-288.45	278.5-282.1	10.6-19.8	4.35-13.45	332.3-347.9	329.6-342.1		
2	II	281.35-285.4	281.8-285.05	11.66-20.7	6.8-13.4	331.7-345.3	330.35-341.5		
3	&	284.8-287.4	284.65-288.9	10.1-18.8	4.5-13.55	335.6-350.8	329.1-336.4		
4	III	282.6-285.45	279.35-283.0	11.2-19.3	6.7-11.1	337.15-350.1	330.7-342.45		
5		279.75-285.0	280.3-283.7	10.3-19.12	9.4-16.45	333.1-345.8	333.85-340.9		
Mean		284.36 ±1.3	282.4 ± 2.9	15.22 ±.71	10.2± 0.85	341.2 ±2.1	335.86± 2.57		
1		277.75-282.8	275.4-278.6	10.05-19.5	6.45-11.75	335.75-348.6	331.2-342.5		
2		283.95-288.9	281.7-284.7	11.3-20.65	9.1-13.9	332.6-346.22	334.95-343.4		
3	IV	283.2-288.35	279.7-282.15	10.9-19.1	8.35-13.6	337.18-349.9	329.7-339.2		
4		276.65-281.3	281.9-287.4	11.0-20.05	7.5-12.15	338.43-353.6	333.5-342.25		
5		285.1-290.0	282.4-286.6	11.2-20.4	10.15-15.6	337.53-351.6	333.55-343.3		
Mean		283.8 ± 3.77	282.4 ± 3.88	15.74±0.87	10.7 ±1.01	343.56± 2.8	329.69± 2.89		
1		298.34-303.9	292.2-297.25	12.6-22.1	9.45-13.9	459.6-471.3	453.5-466.6		
2		299.55-302.4	296.05-299.79	13.1-22.7	9.95-14.3	455.9-467.95	454.2-467.95		
3	V	295.35-298.6	297.3-300.6	10.5-20.1	9.3-13.7	459.9-372.6	452.7-466.6		
4		293.65-298.3	290.25-295.15	12.65-20.7	8.8-12.75	465.64-474.2	458.4-466.05		
5		294.65-299.3	297.2-300.15	12.3-20.56	9.55-15.15	465.12-476.4	458.4-473.05		
Mean		298.39± 2.6	296.62± 2.85	17.0 ±1.36	11.26±0.7	467.42± 3.62	461.48± 0.80		
1		382.6-387.4	382.5-385.4	12.65-22.0	9.1-14.55				
2		385.87-388.1	383.6-386.4	14.2-23.3	9.5-15.75				
3	VI	384.8-389.65	385.6-388.3	12.2-21.7	11.55-16.5				
4		383.35-388.6	387.7-390.5	11.6-20.9	8.1-12.3				
5		386.75-391.9	379.5-382.5	6.5-19.85	12.24-19.2				
Mean		387.0 ± 1.30	385.2 ± 2.22	16.1 ±0.96	12.92±1.6				

Table (7): Showing measurements of layers' thickness (um), the diameters of the granular cells (um) and the surface areas of the lozenge, pyramidal and flattened cells (um^2) in all the cortical layers of area 18 in control and treated animals aged 3 months.

Animal No.	Layer No.	Thickness of layers (um)		Lozenge cells (um^2)		Granular cells (um)		Pyramidal cells (um^2)		Flattened cells (um^2)	
		Subgroup III-1	Subgroup III-2	Subgroup III-1	Subgroup III-2	Subgroup III-1	Subgroup III-2	Subgroup III-1	Subgroup III-2	Subgroup III-1	Subgroup III-2
1		109.73-118.7	108.92-116.68							24.69-36.7	16.1-31.2
2	I	108.4-114.61	111.9-118.24							23.91-36.5	15.91-28.85
3		107.92-125.71	108.35-115.5							26.8-37.12	15.9-32.71
4		112.3-117.58	108.85-116.0							27.9-37.75	19.51-33.95
5		112.2-117.62	108.84-115.44							24.24-35.31	21.6-36.81
Mean		114.77± 1.8	113.09± 1.38							31.56± 1.34	24.44± 2.7
1		190.4-196.23	186.55-194.87	76.85-91.75	61.55-70.35						
2	II	190.8-198.7	184.5-195.75	85.85-97.03	64.72-73.37						
3	&	190.13-197.58	191.55-198.35	74.3-86.25	61.15-69.3						
4	III	188.5-195.62	188.5-195.2	81.7-93.62	64.4-78.28						
5		190.33-196.27	185.4-197.22	67.7-75.38	65.81-78.59						
Mean		193.39± 1.44	192.44± 1.99	83.63± 5.10	68.58 ±2.33						
1		167.85-195.84	186.33-195.07			10.5-18.58	7.6-12.7				
2		184.7-195.5	186.73-195.53			10.5-18.12	7.7-14.41				
3	IV	186.43-194.41	184.5-194.32			10.32-17.14	7.9-11.75				
4		186.46-189.9	184.5-193.45			12.6-20.92	5.89-12.0				
5		183.85-190.77	185.7-194.5			11.8-19.74	5.1-11.42				
Mean		190.26± 0.96	189.97± 1.13			14.99±1.44	9.75±1.12				
1		473.85-485.65	471.5-483.56			10.56-17.76	5.6-10.68	320.6-329.51	311.8-321.3		
2		472.8-485.62	473.72-483.33			11.9-19.55	5.4-10.58	321.75-330.68	313.1-323.7		
3	V &VI	474.7-483.5	475.29-484.39			12.0-20.42	6.5-11.57	321.49-333.74	310.3-318.0		
4		470.9-485.74	477.85-484.39			13.4-20.8	6.53-11.51	323.01-329.84	314.7-320.96		
5		476.6-488.8	477.23-484.57			10.42-17.72	7.07-13.39	321.76331.58	314.7-321.84		
Mean		480.01± 1.29	478.96± 2.31			15.42±3.02	9.05± 0.57	326.45± 1.27	317.01± 1.95		

- Layers II and III thickness ranged from 188.5 um to 198.7 um with a mean of 193.39 um ± 1.44 which was significantly increased than that of the previous group ($P < 0.001$).
- Layer IV thickness ranged from 167.85 um to 195.84 um with a mean of 190.26 um ± 0.96 which was significant increased than that of the previous group ($P < 0.001$).
- Layers V and VI thickness ranged from 470.9um to 488.8 um with a mean of 480.01 um ± 1.29 which was significantly increased than that of the previous group ($P < 0.001$).

Subgroup III-2 :

Area 17 : (Table 6)

- Layer I thickness ranged from 176.5 um to 187.8 um with a mean of 183.42 um ± 3.20 with nonsignificant decrease from that of the previous subgroup ($P = 0.10$).
- Layers II and III thickness ranged from 278.5 um to 288.9 um with a mean of 282.4 um ± 2.9 with nonsignificant decrease from that of the previous subgroup ($P = 0.1$).
- Layer IV thickness ranged from 275.4 um to 287.4 um with a mean of 282.4 um ± 3.88 with nonsignificant decrease from that of the previous subgroup ($P = 0.10$).
- Layer V thickness ranged from 290.25um to 300.6 um with a mean of 296.62 um ± 2.85 with nonsignificant decrease from that of the previous subgroup ($P = 0.1$).
- Layer VI thicknss ranged from 379. 5 um to 390.5um with a mean of 385.2 um ± 2.22 with nonsignificant decrease from that of the previous subgroup ($P = 0.1$).

Area 18 : (Table 7)

- Layer I thickness ranged from 108.35um to 118.24 um with a mean of 113.09um ± 1.38 with nonsignificant decrease from that of the previous subgroup (P = 0.1).
- Laters II and III thickness ranged from 184.5 um to 198.35 um with a mean of 192.44 um ± 1.99 with nonsignificant decrease from that of the previous subgroup (P = 0.1).
- Layer IV thickness ranged from 184.5 um to 195.53 um with a mean of 189.97 um ± 1.13 with nonsignificant decrease from that of the previous subgroup (P = 0.3).
- Layers V and VI thickness ranged from 471.5 um to 484.57 with a mean of 478.96 um ± 2.31 with nonsignificant decrease from that of the previous subgroup (P = 0.1).

b- The cells :

Subgroup III-1 :

Area 17 : (Table 6)

- Layer I : The of surface areas the flattened cells ranged from 20.02um to 47.3um with a mean of 34.62um ± 1.3 which was significantly increased than that of the previous group (P< 0.001).
- Layers II and III : The diameters of the granular cells ranged from 10.1 um to 20.7 um with a mean of 15.22 um ± 0.71 which was significantly increased than that of the previous group (P < 0.001) and the surface area of the pyramidal cells ranged from 331.7 um^2 to 350.8 um^2 with a mean of 341.2 um^2 ±2.1 which was significantly increased than that of the previous group (P < 0.001).

- Layer IV : The diameters of the granular cells ranged from 10.05 um to 20.65 um with a mean of 15.74 um, ± 0.87 which was significantly increased than that of the previous group ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 332.6 um^2 to 353.6 um^2 with a mean of 343.56 um^2 ± 2.8 which was significantly increased than that of the previous group ($P< 0.001$).
- layer V : The diameters of the granular cells ranged from 10.5 um to 22.7 um with a mean of 17.0 um, ± 1.36 which significantly increased than that of the previous group ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 455.9 um^2 to 476.4 um^2 with a mean of 467.42 um^2 ± 3.62 which was significantly increased than that of the previous group ($P < 0.001$).
- Layer VI : The diameters of the granular cells ranged from 6.5 um to 23.3 um with a mean of 16.1 um ± 0.96 which was significantly increased than that of the previous group ($P < 0.001$).

Area 18 : (Table 7)

- Layer I :The surface areas of the cells ranged from 23.91um^2 to 37.75um^2 with a mean of 31.56um^2 ± 1.34 which was significantly increased than that of the previous group ($P < 0.001$).
- Layers II and III : The surface areas of the lozenge cells ranged from 67.7um^2 to 97.03 um^2 with a mean of 83.63 um^2 ± 5.1 which was significantly increased than that of the previous group ($P < 0.001$).

- Layer IV : The diameters of the granular cells ranged from 10.32 um to 20.92um^2 with a mean of 14.99 um $\pm$ 1.44 which was significantly increased than that of the previous group ($P < 0.001$).
- Layers V and VI : The diameters of the granular cells ranged from 10.42 um to 20.8 um with a mean of 15.42 um, $\pm$ 3.02 which was significantly increased than that of the previous group ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 320.6 um^2 to 333.74 um^2 with a mean of 326.45 um^2 $\pm$ 1.27 which was significantly increased than that of the previous group ($P < 0.001$).

Subgroup III-2 :

Area 17 : (Table 6)

- Layer I : The surface areas of the flattened cells ranged from 15.85um to 38.85um with a mean of 28.15um $\pm$ 1.7 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layer II and III : The diameters of the granular cells ranged from 4.35 um to 16.45 um with a mean of 10.2 um, $\pm$ 0.85 which was significantly decreased than that of the previous subgroup ($P = 0.004$) and the surface areas of the pyramidal cells ranged from 329.1 um^2 to 342.45um^2 with a mean of 335.86um^2 $\pm$ 2.57 which was significantly decreased more than that of the previous subgroup ($P = 0.01$).
- Layer IV : The diameters of the granular cells ranged from 6.45 um to 15.6 um with a mean of 10.7 um, $\pm$ 1.01 which was

significantly decreased than that of the previous subgroup ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 329.7 um^2 to 343.4um^2 with a mean of 329.69um^2 $\pm$ 2.89 which was significantly decreased than that of the previous group ($P = 0.02$).

- Layer V : The diameters of the granular cells ranged from 9.3 um to 15.15 um with a mean of 11.26 um $\pm$ 0.7 which was significantly decreased than that of the previous subgroup ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 452.7um^2 to 473.05 um^2 with a mean of 461.48 um^2 $\pm$ 0.8 which was significantly decreased more than that of the previous subgroup ($P = 0.02$).
- Layer VI : The diameters of the granular cells ranged from 8.1 um to 19.2 um with a mean of 12.92 um $\pm$ 1.6 which was significantly decreased than that of the previous subgroup ($P < 0.001$).

Area 18 : (Table 7)

- Layer I : The surface areas of the flattened cells ranged from 15.9um^2 to 36.81um^2 with a mean of 24.44um $\pm$ 2.7 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layers II and III : The surface areas of the lozenge cells ranged from 61.15 um^2 to 78.59 um^2 with a mean of 68.58 um^2 $\pm$ 2.33 which was significantly decreased than that of the previous subgroup ($P < 0.001$).

- Layer IV : The diameter of the granular cells ranged from 5.1um to 14.41 um with a mean of 9.75 um ± 1.12 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layers V and VI : The diameters of the granular cells ranged from 5.4 um to 13.39 um with a mean of 9.05 um ± 0.57 which was significantly decreased than that of the previous subgroup ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 310.3 um^2 to 323.7um^2 with a mean of 317.01 um^2 ± 1.95 which was significantly decreased than that of the previous subgroup ($P < 0.001$).

Group IV :

A- Histological results :

a- HX. and E.:

Subgroup IV-1 :

Area 17 :

It was formed of six layers without increase in the thickness of the layers and in the size of the cells.

- Layer I consisted of few flattened cells and nerv fibers.
- Layers II and III appeared as a single layer and consisted of small granular and pyramidal cells.
- Layer IV consisted of very closely packed granular cells and small pyramidal cells.
- Layer V the density of the cells was less than that of layer IV and it consisted of broad deeply stained pyramidal cells stained and granular cells.

- Layer VI appeared thick and consisted of large granular cells (Fig. 40).

Area 18 :

It was formed of six layers without increase in the thickness of the layers and in the size of the cells.

- Layer I consisted of few flattened cells and nerve fibers.
- Layers II and III appeared as a single layer and consisted of lozenge shaped cells.
- Layer IV consisted of small granular cells of the same density as layer V.
- Layers V and VI appeared as a single layer and consisted mainly of granular cells with few small pyramidal cells (Fig. 41).

Subgroup IV-2 :

Areas 17 and 18 showed a shrinkage of the cells of all layers without change in the thickness of the layers (Fig.42).

b- Toluidine blue :

Subgroup IV-1 :

Areas 17 and 18 showed numerous stained Nissl granules in all the cells of all the layers.

Subgroup IV-2 :

Both areas showed chromatolysis which appeared in all the cells of all the layers.

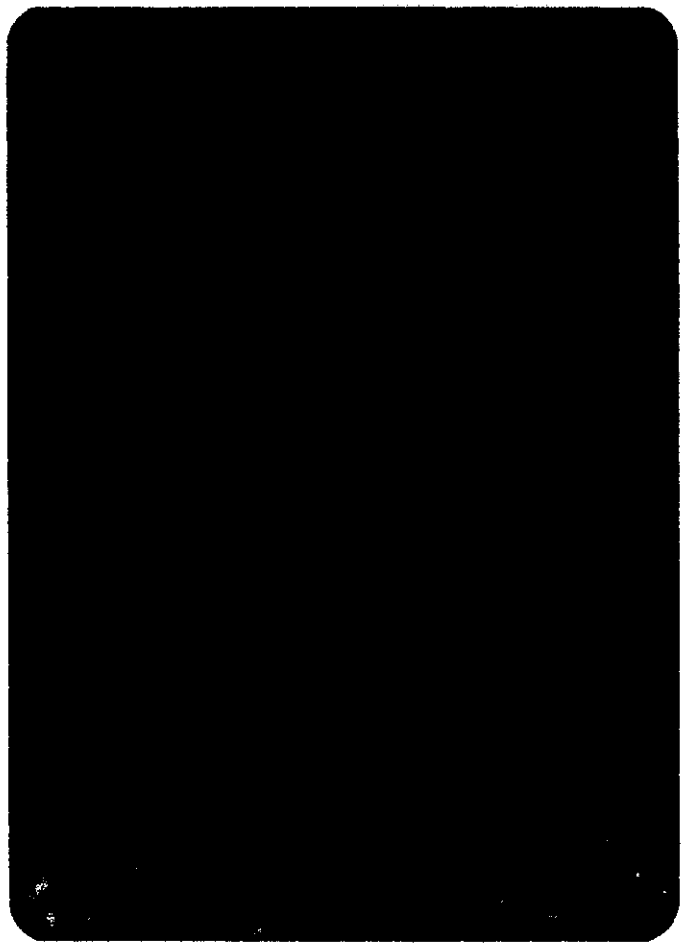

Fig. (40) : A photomicrograph of a section in area 17 of a control rat aged 18 months showing the six layers of area 17.

(Hx & E x 100).

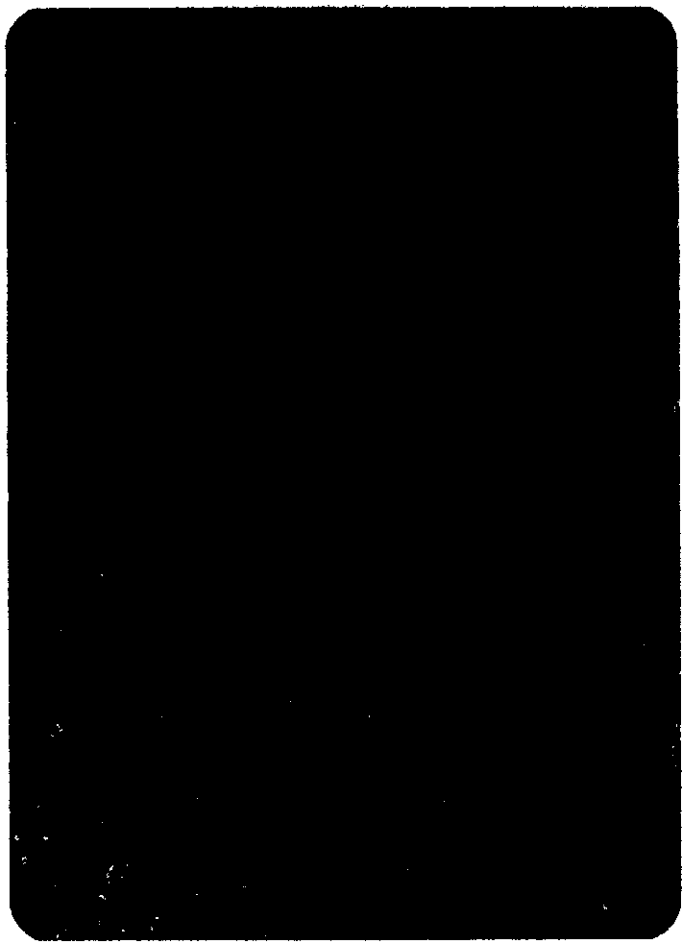

Fig. (41) : A photomicrograph of a section in area 18 of a control rat aged 18 months showing the six layers of area 18.

(Hx. & E. x 100).

Fig. (42) : A photomicrograph of a section in area 17 of a rat aged 18 months and treated with malathion for 15 days showing shrinkage of cells without shrinkage of layers.
(Hx. & E. X 100).

c- Glees's silver stain :

Subgroup IV-1 :

The cells of both areas showed thick network of neurofibrils.

Subgroup IV-2 :

The cells of both areas showed thin and less condensed neurofilaments.

d- Heidenhan's modification of kultschitsky's method :

Subgroup IV-1 :

Area 17 :

There was thick myelinated fasciculi running tangentially in layers V and VI and suppressed in the other layers.

Area 18 :

There were thin myelinated fibers running in layers V and VI and suppresed in other layers.

Subgroup IV-2 :

Areas 17 and 18 showed degeneration of the myelin sheath with a decrease in the thickness of the myelinated fascicles.

B- Histochemical results :

a- Non specific esterase enzyme :

Subgroup IV-1 :

There was a moderate reaction of non specific esterase enzyme in all the layers of both areas.

Subgroup IV-2 :

There was a weak reaction of the enzyme in all the layers of both areas.

b- Acetyl cholinesterase enzyme :

Subgroup IV-1 :

The cells of both areas showed a moderate reaction of acetyl cholinesterase enzyme.

Subgroup IV-2 :

The cells of both areas showed a weak reaction of acetyl cholinesterase enzyme.

c- Adenosine triphosphatase enzyme :

Subgroup IV-1 :

The cells of both areas showed a moderate reaction of adenosine triphosphatase enzyme.

Subgroup IV-2 :

The two areas showed an intense reaction of adenosine triphosphatase enzyme.

c- Quantitative methods :

a- Layers thickness :

Subgroup IV-1 :

Area 17 : (Table 8)

- Layer I thickness ranged from 179.9um to 190.4 um with a mean of 186.2 um ± 1.95 with nonsignificant increase from that of the previous group (P = 0.7).

Table (8): Showing measurements of layers thickness (um), the diameters of the granular cells (um) and the surface areas of the pyramidal and flattened cells (um^2) in all the cortical layers of area 17 in control and treated animals aged 18 months.

Animal	Layer	Thickness of layers (um)		Granular cells (um)		Pyramidal cells (um^2)		Flattened cells (um^2)	
		Subgroup IV-1	Subgroup IV-2	Subgroup IV-1	Subgroup IV-2	Subgroup IV-1	Subgroup IV-2	Subgroup IV-1	Subgroup IV-2
1		182.2-188.2	182.6-186.3					30.05-44.53	20.26-30.5
2		179.9-186.1	183.25-187.2					28.06-44.61	19.44-31.2
3	I	183.02-189.1	184.3-187.1					23.48-44.42	19.45-32.4
4		185.7-189.76	180.1-183.9					20.49-32.51	30.73-45.7
5		187.55-190.4	180.45-184.4					25.74-45.75	16.68-33.6
Mean		186.2 ± 1.95	185.22 ± 1.7					33.16 ±7.28	26.91± 6.4
1		281.6-286.35	280.0-283.9	13.2-18.8	7.8-13.75	335.25-346.1	315.6-325.2		
2	II	283.9-288.7	286.0-290.0	11.2-15.6	8.4-14.7	332.4-343.45	316.0-326.8		
3	&	282.52-287.4	285.45-289.4	11.4-17.3	8.8-15.4	333.9-346.6	320.35-331.1		
4	III	285.05-289.7	281.1-285.1	11.4-16.25	8.3-15.2	331.3-343.9	316.4-325.95		
5		286.44-290.4	283.25-287.2	12.55-17.6	6.4-13.4	332.9-346.5	319.2-329.85		
Mean		286.14± 1.48	285.14± 3.02	14.64±1.02	11.22±0.58	339.48± 0.83	322.64± 0.88		
1		278.6-282.4	278.1-281.95	13.7-19.3	7.7-14.65	337.9-348.05	321.55-330.2		
2		282.9-289.8	280.1-284.0	12.1-17.7	4.4-11.4	339.9-350.7	325.5-335.9		
3	IV	282.7-287.55	282.3-286.2	13.85-17.7	4.95-11.95	333.3-347.1	328.3-334.52		
4		285.6-289.65	283.8-287.4	12.45-17.6	5.55-12.55	335.7-348.5	323.3-334.6		
5		281.0-285.95	284.9-288.0	12.65-17.9	4.8-12.25	333.7-347.5	324.75-335.2		
Mean		284.78± 1.48	283.58± 2.43	15.68±0.79	9.22±1.44	342.06± 1.33	329.69± 2.92		
1		295.65-300.3	293.3-296.6	14.15-20.4	8.55-15.3	460.6-475.7	446.7-471.5		
2		298.7-303.35	296.6-299.95	13.2-18.15	7.7-14.4	453.5-464.1	443.4-457.25		
3	V	295.75-300.4	294.85-298.2	13.75-21.05	9.85-16.7	464.0-479.2	446.1-467.9		
4		298.63-301.9	293.3-297.2	12.25±18.1	5.65-12.25	460.7-475.9	449.35-465.4		
5		297.1-300.85	290.3-300.65	11.6-17.7	4.3-13.7	458.3-488.6	458.4-460.15		
Mean		299.2 ± 1.56	298.8 ± 1.42	16.3 ±1.11	10.6± 2.18	466.54± 2.15	456.29± 3.86		
1		385.95-390.6	382.2-385.8	14.75-20.6	9.65-15.4				
2		382.3-287.1	386.38-389.92	13.3-18.5	4.45-12.8				
3	VI	384.8-388.5	385.1-388.15	14.3-20.2	9.6-16.25				
4		387.7-391.56	384.0-387.1	14.3-21.1	7.5-13.15				
5		382.55-385.5	386.1-390.1	13.75-19.0	7.05-12.9				
Mean		386.82± 2.49	386.42± 1.67	17.2 ±1.12	10.6± 1.8				

- Layers II and III thickness ranged from 281.6 um to 290.4 um with a mean of 286.14 um ± 1.48 with nonsignificant increase from that of the previous group (P = 0.10).
- Layer IV thickness ranged from 278.6 um to 289.8 um with a mean of 284.78 um ± 1.48 with nonsignificant increase that of the previous group (P = 0.10).
- Layer V thickness ranged from 295.65 um to 303.35 um with a mean of 299.2 um ± 1.56 with nonsignificant increase that of the previous group (P = 0.10).
- Layer VI thickness ranged from 382.3 um to 391.56 um with a mean of 386.82 um ± 2.49 with nonsignificant decrease from that of the previous group (P = 0.10)..

Area 18 : (Table 9)

- Layer I thickness ranged from 108.75 um to 121.14 um with a mean of 115.29 um ± 2.33 with nonsignificant increase that of the previous group (P = 0.10).
- Layer II and III thickness ranged from 185.40 um to 199.24um with a mean of 194.18 um ±3.11 with nonsignificant increase from that of the previous group (P = 0.10).
- Layer IV thickness ranged from 182.55um to 195.58 um with a mean of 189.31 um ± 1.15 with nonsignificant decrease from that of the previous group (P = 0.10).
- Layers V and VI thickness ranged from 469.9 um to 485.16 with a mean of 479.29 um ± 1.6 with nonsignificant decrease that of the previous group (P = 0.10).

Table (9): Showing measurements of layers' thickness (um), the diameters of the granular cells (um) and the surface areas of the lozenge, pyramidal and flattened cells ($um^{2)}$ in all the cortical layers of area 18 in control treated animals aged 18 months.

Animal No.	Layer No.	Thickness of layers (um)		Lozenge cells (um^2)		Granular cells (um)		Pyramidal cells (um^2)		Flattened cells (um^2)	
		Subgroup IV-1	Subgroup IV-2	Subgroup IV-1	Subgroup IV-2	Subgroup IV-1	Subgroup IV-2	Subgroup IV-1	Subgroup IV-2	Subgroup IV-1	Subgroup IV-2
1		113.59-119.43	111.45-117.91							21.71-37.75	12.63-25.65
2	I	108.75-115.36	110.72-116.79							18.82-28.81	18.75-28.81
3		113.66-118.35	111.35-116.3							25.5-41.6	20.72-27.63
4		110.15-114.74	110.53-115.48							25.3-40.01	25.91-41.26
5		116.77-121.14	114.7-118.18							25.8-37.9	20.75-35.63
Mean		115.29 ± 2.33	114.37± 1.07							30.36± 4.4	26.1 ± 6.8
1		192.3-198.45	193.5-196.15	78.6-91.89	50.85-73.74						
2	II	194.88-199.24	188.85-193.8	81.58.91.82	69.93-83.53						
3	&	192.9-197.32	188.96-191.88	77.65-84.4	70.5-81.23						
4	III	185.6-190.9	193.55-196.39	84.6-86.65	64.6-80.48						
5		185.4-195.25	191.85-195.3	79.6-84.83	75.8-87.46						
Mean		194.18± 3.11	193.13± 2.05	84.53± 2.64	74.30 ±7.39						
1		186.55-189.91	188.4-193.2			13.1-16.8	4.64-11.6				
2		182.8-195.58	186.9-190.25			12.6-17.84	5.9-11.76				
3	IV	188.62-192.48	186.62-190.58			10.5-18.31	6.3-13.42				
4		186.4-193.37	188.6-192.69			11.53-14.13	6.7-14.17				
5		182.55-192.22	188.86-190.97			11.44-19.58	7.75-14.78				
Mean		189.31± 1.15	189.14± 1.34			15.17±1.12	9.59±1.09				
1		475.4-479.88	477.4-480.13			12.8-17.9	5.5-12.52	319.55-330.2	306.81-314.82		
2		470.7-478.77	476.96-480.15			11.5-17.78	5.68-11.7	322.78.335.58	311.45-319.5		
3	V &VI	479.77-484.92	485.22-490.23			14.9-20.18	7.16-13.18	318.9-338.0	308.86-318.28		
4		469.9-477.92	473.4-479.16			12.86-19.55	6.6-13.96	327.9-338.482	309.72-319.15		
5		478.8-485.16	471.09-477.3			12.5-16.92	7.65-10.65	319.03-338.66	310.5-318.90		
Mean		479.29± 1.6	478.15± 2.4			15.46±0.78	9.40± 0.51	327.8 ± 1.72	313.94± 1.39		

Subgroup IV-2 :

Area 17 : (Table 8)

- Layer I thickness ranged from 180.1 um to 187.2um with a mean of 185.22 um ± 1.7 with nonsignificant decrease from that of the previous subgroup (P = 0.10).
- Layers II and III thickness ranged from 280.0 um to 290.0 um with a mean of 285.14 um ± 3.02 with nonsignificant decrease from that of the previous subgroup (P = 0.10).
- Layer IV thickness ranged from 278.1 um to 288.0 um with a mean of 283.58 um ± 2.43 with nonsignificant decrease from that of the previous subgroup (P = 0.10).
- Layer V thickness ranged from 293.3 um to 300.65 um with a mean of 296.8 um ± 1.42 with nonsignificant decrease from that of the previous subgroup (P = 0.10).
- Layer VI thickness ranged from 382.2 um to 390.1 um with a mean of 386.42 um ± 1.67 with nonsignificant decrease from that of the previous subgroup (P = 0.10).

Area 18 : (Table 9)

- Layer I thickness ranged from 110.72 um to 118.18 um with a mean of 114.37 um ± 1.07 with nonsignificant decrease from that of the previous subgroup (P = 0.10).
- Layers II and III thickness ranged from 188.85 um to 196.39 um with a mean of 193.13 um ± 2.05 with nonsignificant decrease from that of the previous subgroup (P = 0.10).
- Layer IV thickness ranged from 186.62 um to 193.2 um with a mean of 189.14 um ± 1.34 with nonsignificant decrease from that of the previous subgroup (P = 0.10).

- Layers V and VI thickness ranged from 471.09 um to 490.23 um with a mean of 478.15 um ± 2.4 with nonsignificant decrease from that of the previous subgroup (P = 0.10).

b- The cells :

Subgroup IV-1 :

Area 17 : (Table 8)

- Layer I : The surface areas of the flattened cells ranged from 20.49um to 45.75um with a mean of 33.16um ± 7.28 with nonsignificant decrease from that of the previous group (P = 0.10).
- Layers II and III : The diameters of the granular cells ranged from 11.2 um to 18.8um with a mean of 14.64 um, ± 1.02 with nonsignificant decrease from that of the previous group (P = 0.33) and the surface areas of the pyramidal cells ranged from 331.3 um^2 to 346.6 um^2 with a mean of 339.48 um^2 ± .83 with nonsignificant decrease from that of the previous group (P = 0.10).
- Layer IV : The diameters of the granular cells ranged from 12.1 um to 19.3 um with a mean of 15.68 um ± .79 with nonsignificant decrease from that of the previous group (P 0.93) and the surface areas of the pyramidal cells ranged from 333.3 um^2 to 350.7um^2 with a mean of 342.06 um^2 ± 1.33 with nonsignificant decrease from that of the previous group (P = 0.10).
- Layer V : The diameters of the granular cells ranged from 11.6 um to 21.05um with a mean of 16.3 um ± 1.11 with

nonsignificant decrease from that of the previous group (P = 0.68) and the surface areas of the pyramidal cells ranged from 453.5 um^2 to 488.6um^2 with a mean of 466.54 um^2 ± 2.15 with nonsignificant decrease from that of the previous group (P = 0.10).

- Layer VI : The diameter of the granular cells ranged from 13.3 um to 21.1 um with a mean of 17.2 um ± 1.12 with nonsignificant increase from that of the previous group (P = 0.92).

Area 18 : (Table 9)

- Layer I : The surface areas of the flattened cells ranged from 18.82um to 41.6um with a mean of 30.36um ± 4.4 with nonsignificant decrease from that of the previous group (P = 0.10).
- Layers II and III : The surface areas of the lozenge cells ranged from 77.65 um^2 to 91.89 um^2 with a mean of 84.53um^2 ± 2.64 with nonsignificant increase from that of the previous group (P = 0.10).
- Layer IV : The diameters of the granular cells ranged from 10.5 um to 19.58 um with a mean 15.17 um ± 1.12 with nonsignificant increase from that of the previous group (P = 0.1).
- Layers V and VI : The diameters of the granular cells ranged from 11.5 um to 20.18 um with a mean of 15.46 um ±.78 with nonsignificant increase from that of the previous group (P = 0.10) and the surface areas of the pyramidal

cells ranged from 318.9 um^2 to 338.66 um^2 with a mean of 327.8 um^2 $\pm$ 1.72 with nonsignificant increase from that of the previous group (P = 0.10).

Subgroup IV-2 :

Area 17 : (Table 8)

- Layer I : The surface areas of the flattened cells ranged from 16.68um^2 to 45.7um^2 with a mean of 26.91um^2 $\pm$ 6.4 which was significantly decreased than that of the previous subgroup (P < 0.001).
- Layers II and III : The diameters of the granular cells ranged from 6.4 um to 15.4 um with a mean of 11.22 um $\pm$ .58 which was significantly decreased than that of the previous subgroup (P < 0.001) and the surface areas of the pyramidal cells ranged from 316.0 um^2 to 331.1 um^2 with a mean of 322.64 um^2 $\pm$ 0.88 which was significantly decreased than that of the previous subgroup (P < 0.001).
- Layer IV : The diameters of the granular cells ranged from 4.4 um to 14.65 um with a mean of 9.22 um $\pm$ 1.44 which significantly decreased than that of the previous subgroup (P < 0.001) and the surface areas of the pyramidal cells ranged from 321.55 um^2 to 335.9um^2 with a mean of 329.69 um^2 $\pm$ 2.92 which was significantly decreased wless than that of the previous subgroup (P < 0.001).
- Layer V : The diameters of the granular cells ranged from 4.3 um to 16.7 um with a mean of 10.6 um $\pm$ 2.18 which was significantly decreased than that of the previous

subgroup ($P < 0.001$).and the surface areas of the pyramidal cells ranged from 443.4 um^2 to 471.5um^2 with a mean 456.29 $um^2 \pm 3.86$ which was significantly decreased than that of the previous subgroup ($P < 0.001$).

- Layer VI : The diameters of the granular cells ranged from 4.45 um to 16.25 um with a mean of 10.6 um $\pm$ 1.8 which was significantly decreased than that of the previous subgroup ($P < 0.001$).

Area 18 : (Table 9)

- Layer I : The surface areas of the flattened cells ranged from 12.63um^2 to 41.26um^2 with a mean of 26.1$um^2 \pm 6.8$ which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layers II and III : The surface areas of the lozenge cells ranged from 50.85 um^2 to 87.46 um^2 with a mean of 74.3 $um^2 \pm 7.39$ which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layer IV : The diameters of the granular cells ranged from 4.64 um to 14.78 um with a mean of 9.59 um $\pm$ 1.09 which was significantly decreased than that of the previous subgroup ($P < 0.001$).
- Layers V and VI : The diameters of the granular cells ranged from 5.5 um to 13.96 um with a mean of 9.49 um $\pm$ .51 which was significantly decreased than that of the previous subgroup ($P < 0.001$) and the surface areas of the pyramidal cells ranged from 306.81 um^2 to 319.5 um^2 with a mean of 313.94 $um^2 \pm 1.39$ which was significantly decreased than that of the previous subgroup ($P < 0.001$).