

Serotonin – the violence ~~neuropeptide~~

low central serotonergic activity is linked to

- increased aggression
- or impulsive behavior.
- men who carry out impulsive, unplanned violent behavior have decreased 5-HIAA concentrations compared to the population's average

Macaques

CSF concentrations

- free testosterone positively correlated with overall aggressiveness
- low 5-HIAA is related to impulsive and unrestrained aggression

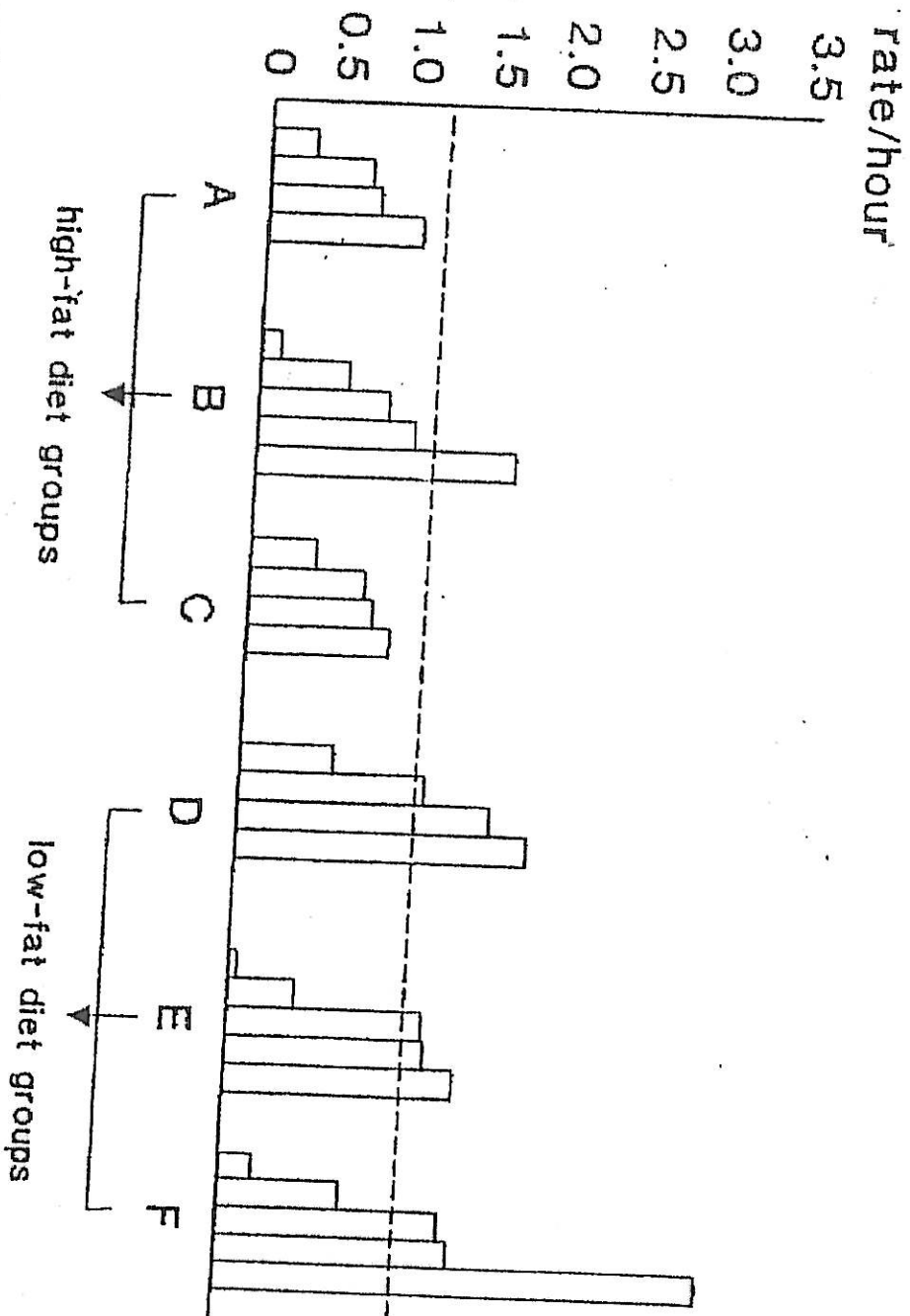


Figure 1. Average number of incidents of contact aggression initiated per hour by each monkey over 22 months. Each contiguous set of bars represents one social group. From Kaplan, Manuck, and Shively.

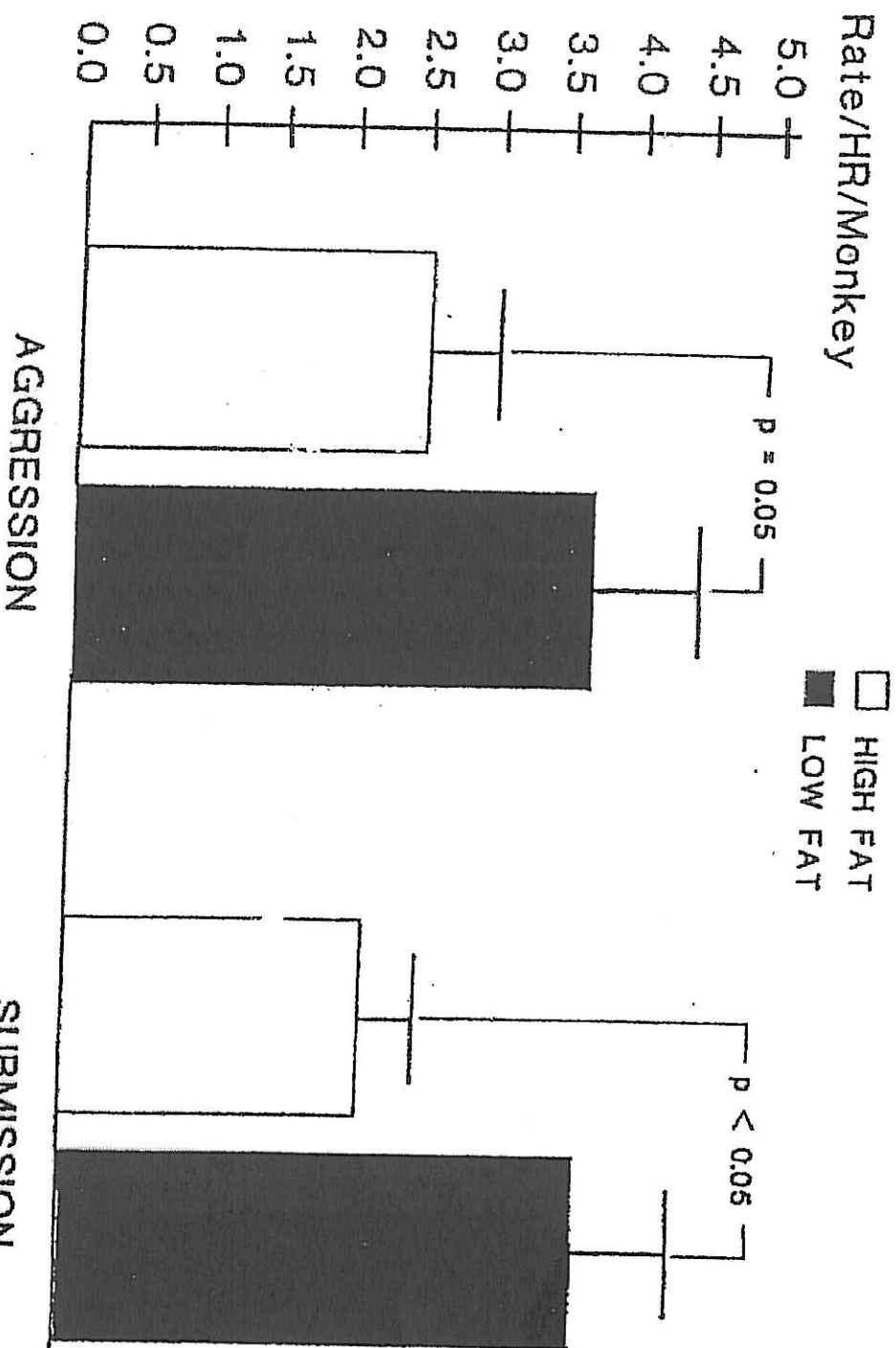


Figure 2. Monthly rates (mean \pm SEM) of aggression and submission among monkeys ($n=23$) living in stable social groups that first ate a high-fat diet (open bars) and then a low-fat diet (black bars). From Kaplan and coworkers.⁵⁰

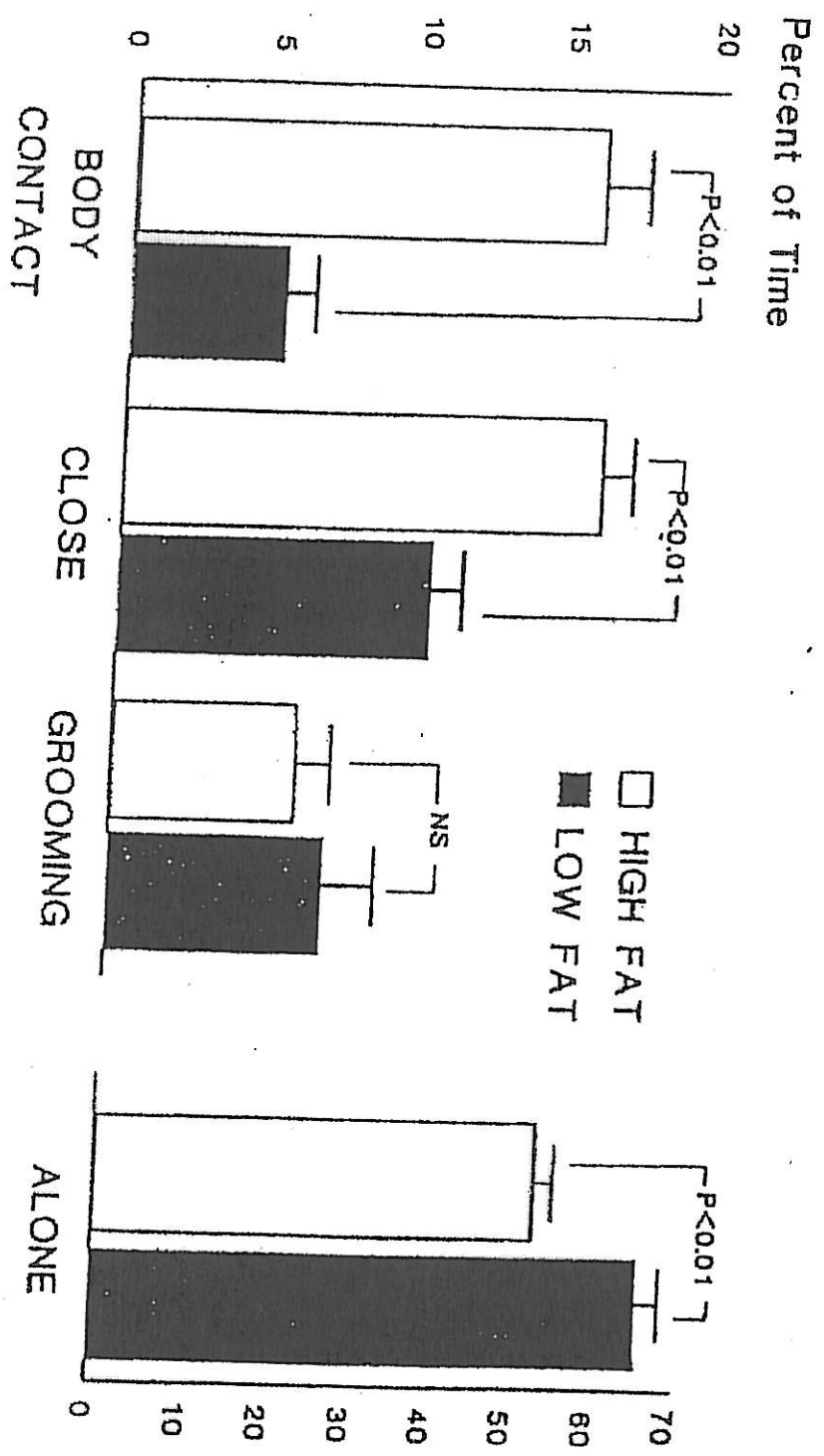


Figure 3. Percentage of time (mean \pm SEM) in which animals (the same monkeys shown in Figure 2) exhibited particular behavioral states. From Kaplan and coworkers, 50

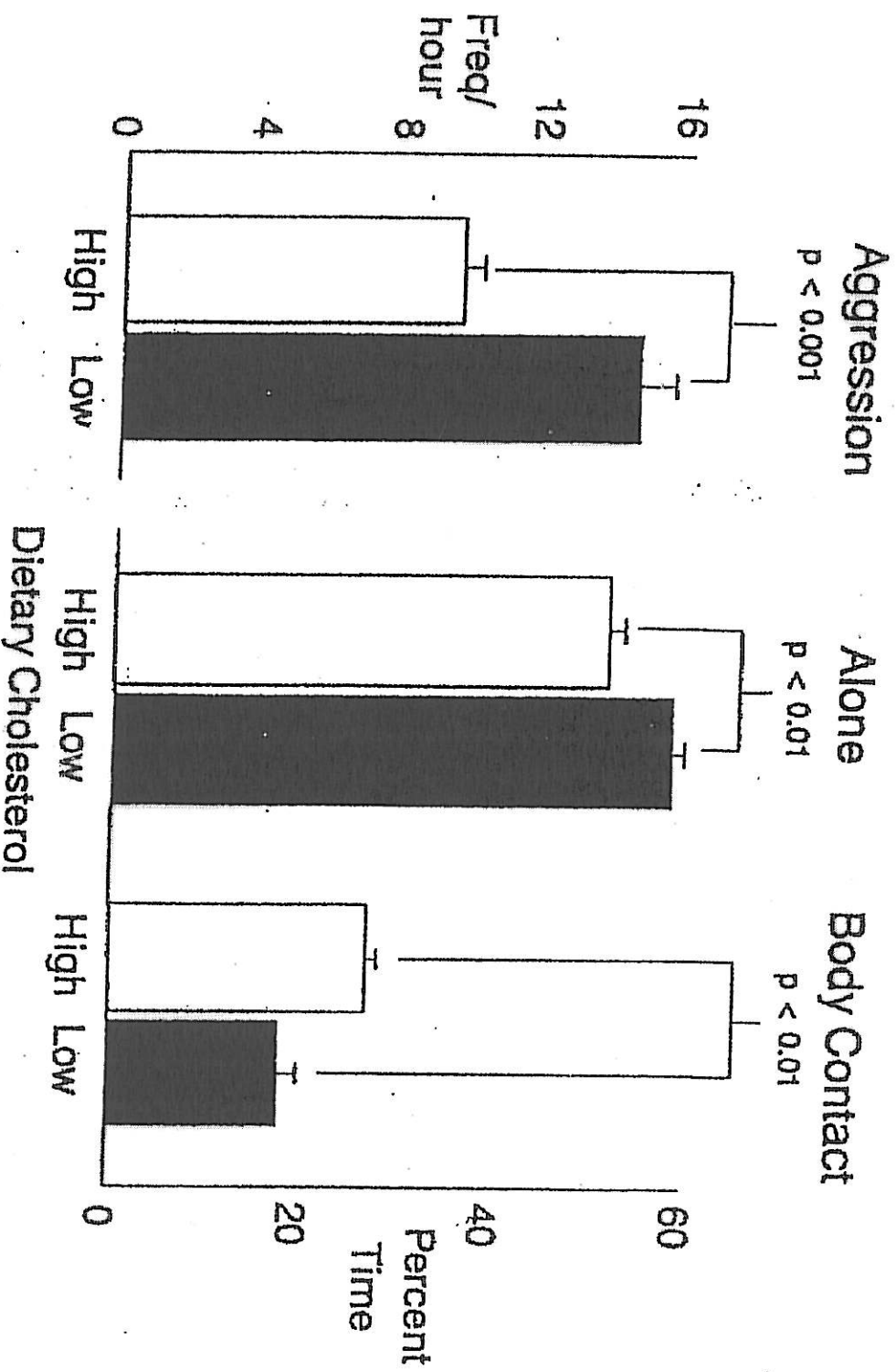


Figure 5. Cerebrospinal fluid metabolites of the same monkeys as in Figure 4. Each bar represents a grand mean (\pm SEM), consisting of the mean of two samples per monkey. 5-HIAA = 5-hydroxyindoleacetic acid; HVA = homovanillic acid; MHPG = 3-methoxy-4-hydroxyphenylglycol. From Kaplan and coworkers.⁶⁶

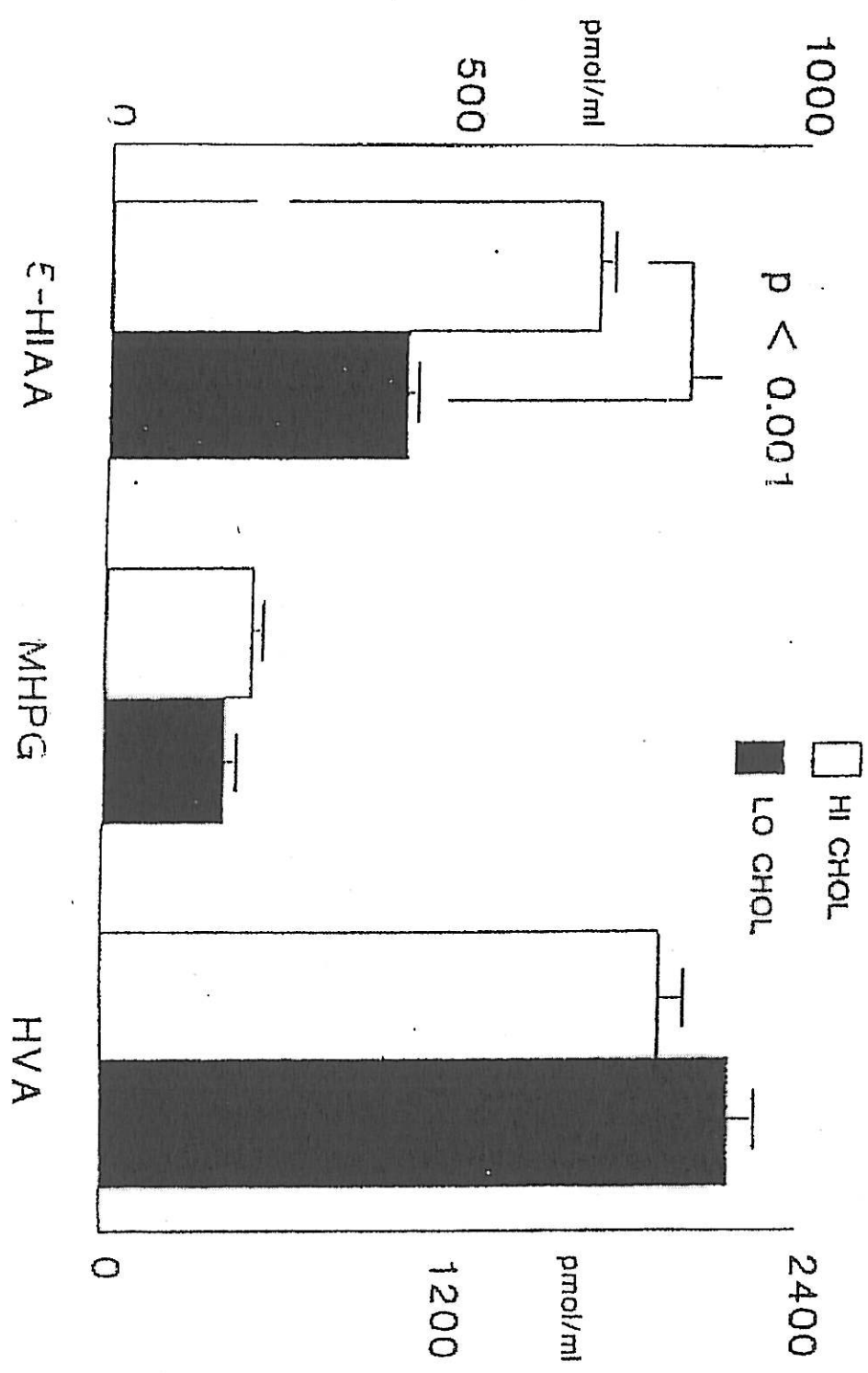


Figure 4. Behavioral characteristics (mean \pm SEM) of juvenile monkeys given a high-cholesterol or low-cholesterol diet. From Kaplan and coworkers.⁸⁰

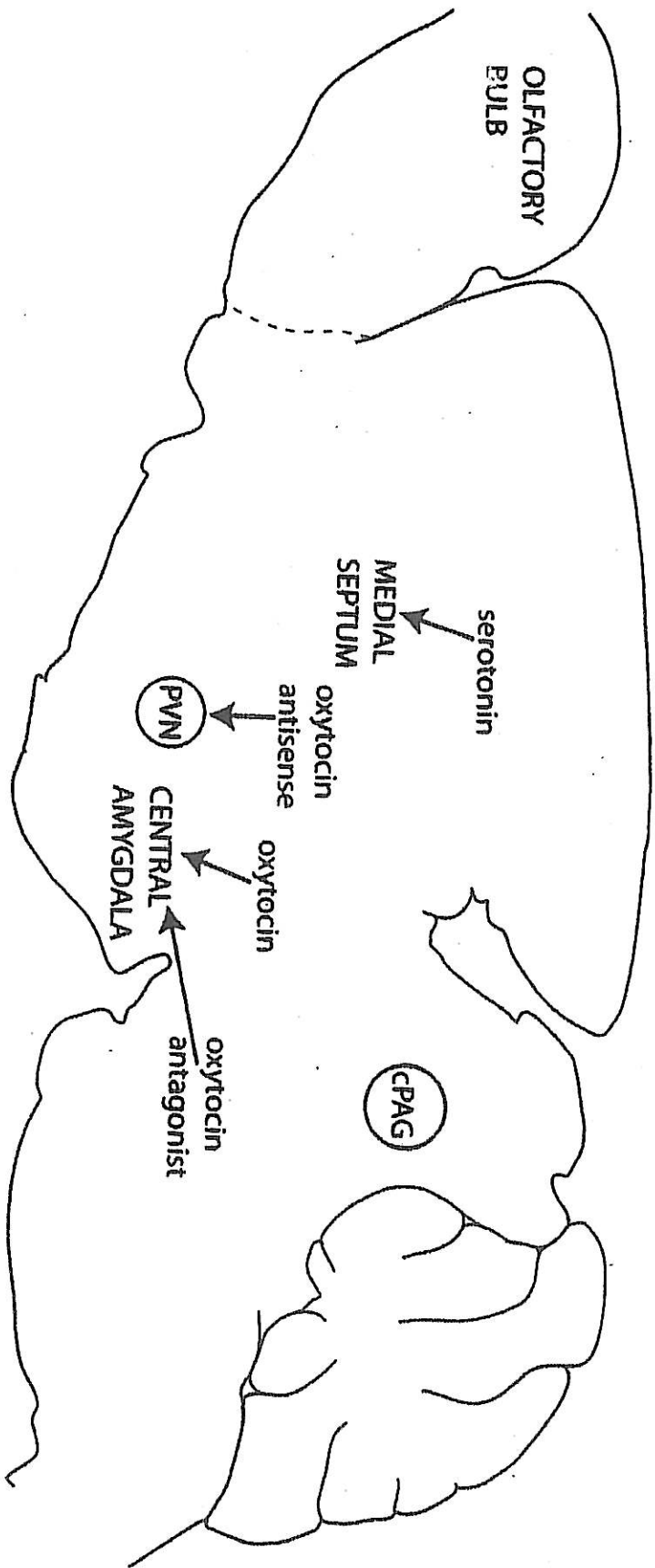


FIGURE 11.4 Schematic sagittal section of the rodent central nervous system highlighting either sites of lesions (open circle) or direct injections (arrow) that trigger *increases* in maternal aggression.

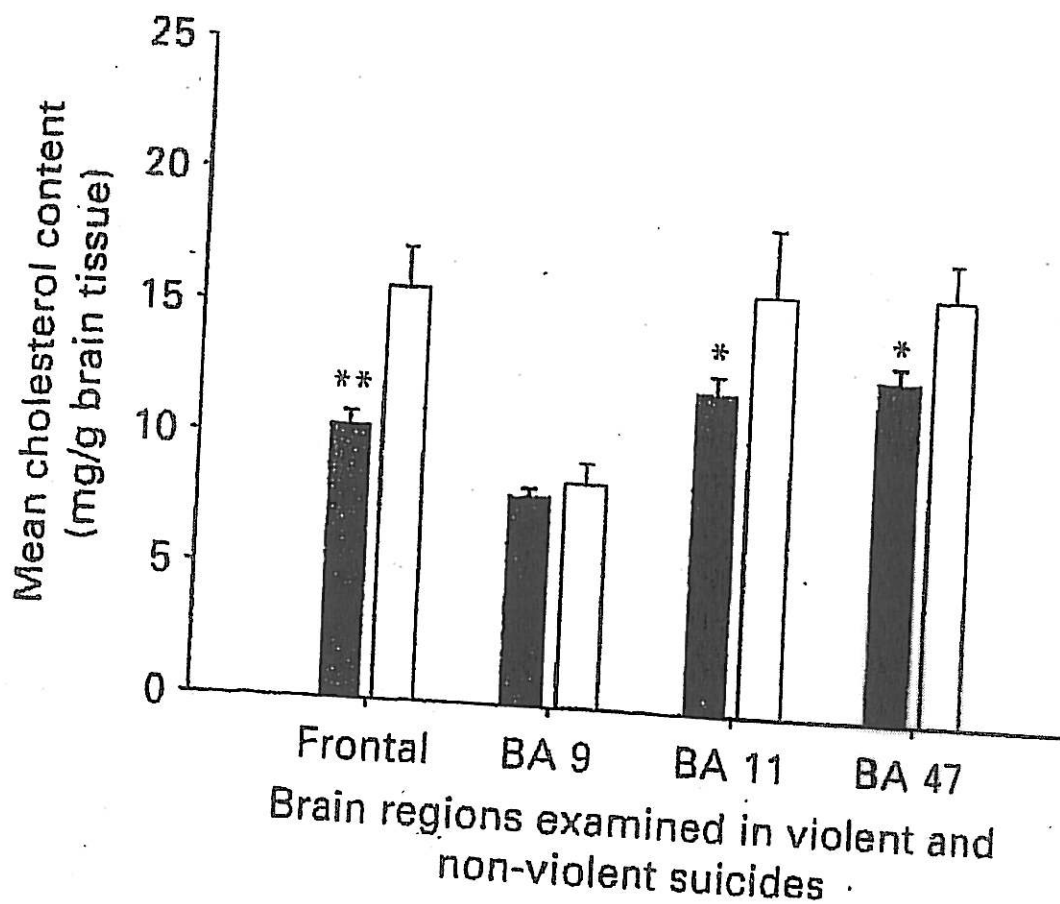


Figure 1. Comparison of cholesterol content in grey matter from the frontal lobe, and from specific areas of the frontal cortex (dorsolateral prefrontal cortex = BA 9, orbitofrontal cortex = BA 11 and ventral prefrontal cortex = BA 47) in suicide completers using violent (■) and non-violent (□) methods. * Denotes significance at $p \leq 0.05$; ** denotes significance at $p \leq 0.0005$.

TABLE 2. Correlations Between Behavioral and Physiological Measures for Free-Ranging Adolescent Male Rhesus Macaques

Behavioral Measure	CSF Norepinephrine		CSF 5-HIAA	
	r	df	r	df
Average age at emigration	0.52	13	0.60*	13
Mean number of neighbors closer than 5 m	0.46*	21	0.61**	21
Duration of giving grooming	0.33	21	0.43*	21
Duration of receiving grooming	0.30	21	0.11	21
Duration of proximity to another individual (within arm's length)	0.35	21	0.43*	21

* $p \leq 0.05$. ** $p \leq 0.01$.

TABLE 3. Relation of Escalated Aggression and Long Leaps to Age at Emigration and Frequency of Grooming Others for Free-Ranging Adolescent Male Rhesus Macaques

Behavioral Measure	Age at Emigration From Natal Group			Frequency of Giving Grooming		
	Age (months)			Events per 3.5 Hours		
	Mean	SD	N	Mean	SD	N
Escalated aggression						
Yes	51.7	15.3	7	1.1 ^a	2.1	12
No	52.6	11.6	10	4.4	4.1	14
Long leaps						
Yes	47.4 ^b	12.1	11	2.1 ^c	2.5	17
No	61.0	9.3	6	4.2	5.0	9

^aSignificant difference between groups with and without escalated aggression ($z = -2.30$, $df = 24$, $p = 0.02$) (Mann-Whitney U test, z corrected for ties).

^bSignificant difference between groups with and without long leaping ($z = -2.20$, $df = 15$, $p = 0.03$; Mann-Whitney U test, z corrected for ties).

^cNearly significant difference between groups with and without long leaping ($z = -1.43$, $df = 24$, $p = 0.08$) (Mann-Whitney U test, z corrected for ties).

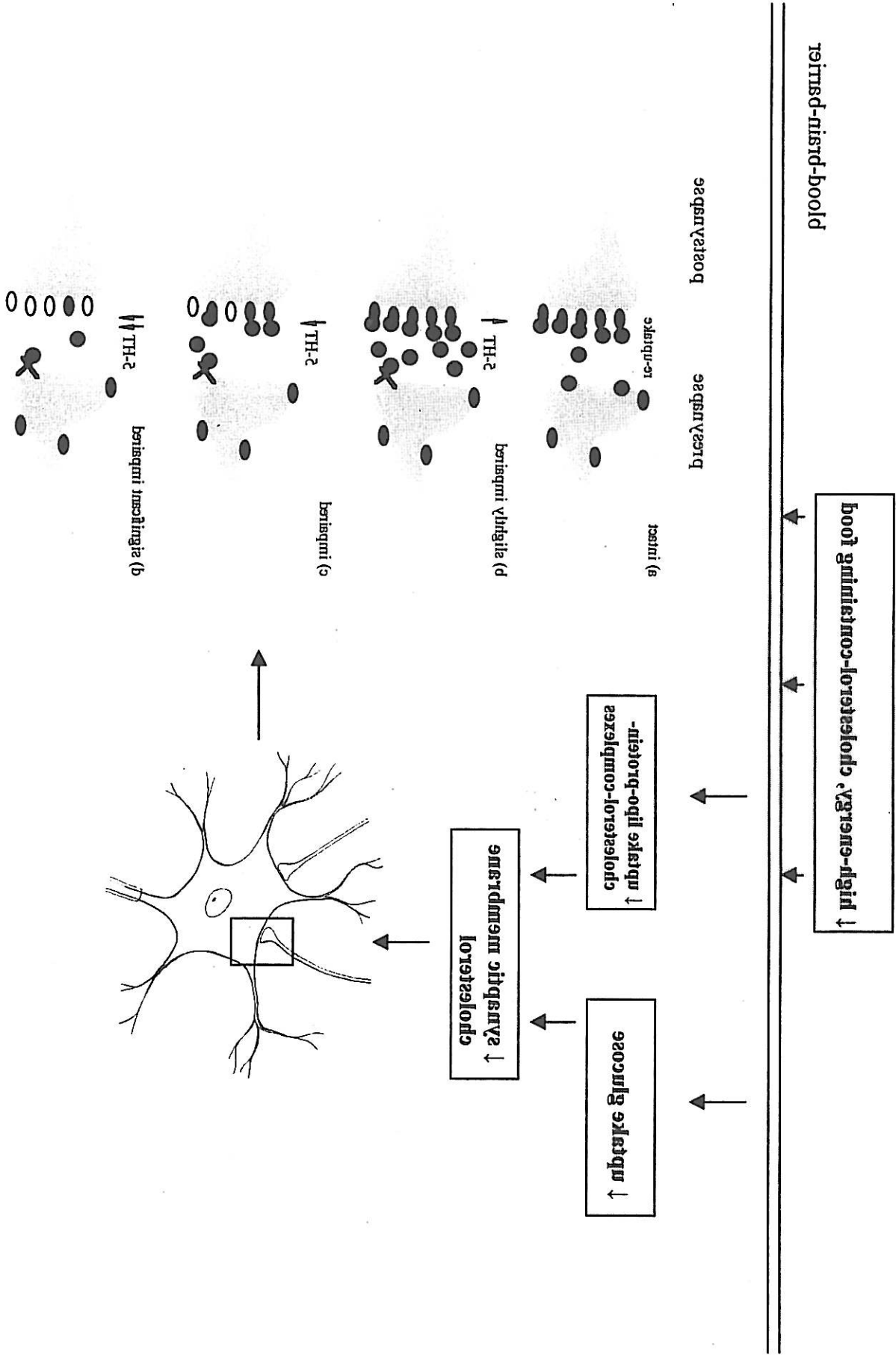


Figure 5