

# Sleep apneas are Increased in Mice Lacking Monoamine Oxidase A

Article by: Real et Al.

Source: Pubmed

Presented by: Megan Iida

# Mice Types

- Mutant Transgenetic mice (**Tg8**)- lacks MAOA enzyme
  - MAOA- enzyme that depletes neurotransmitters including serotonin
- Wild Mice (**C3H**)- not genetically altered

- 80 mice
- 5 different groups

- 80 mice
- 5 different groups
  - Group 1: electrode implants, no drugs

- 80 mice
- 5 different groups
  - Group 1: electrode implants, no drugs
  - Group 2: electrodes and treated with saline and **clorgyline** (MAOA inhibitor)

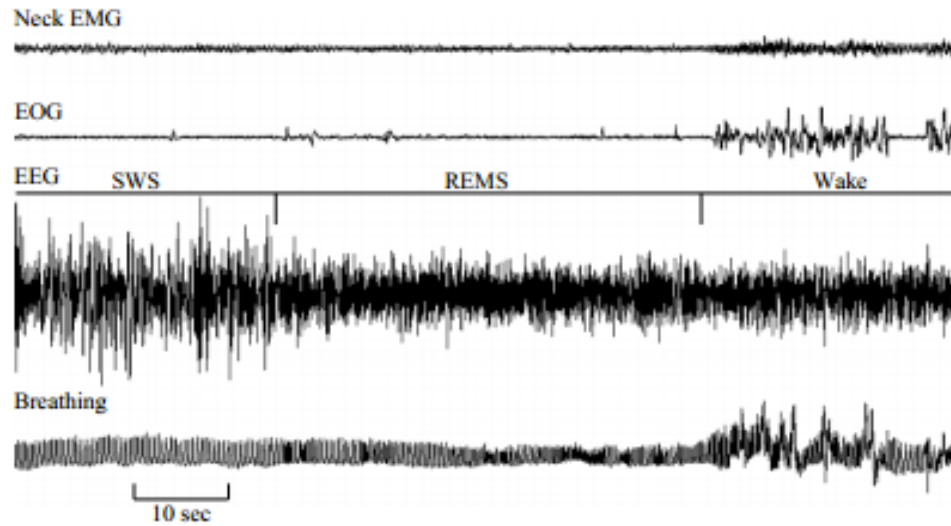
- 80 mice
- 5 different groups
  - Group 1: electrode implants, no drugs
  - Group 2: electrode and treated with saline and **clorgyline** (MAOA inhibitor)
  - Group 3: electrodes, treated with saline and **PCPA** (reduces brain concentration of serotonin)

- 80 mice
- 5 different groups
  - Group 1: electrode implants, no drugs
  - Group 2: electrodes and treated with saline and **clorgyline** (MAOA inhibitor)
  - Group 3: electrodes, treated with saline and **PCPA** (reduces brain concentration of serotonin)
  - Group 4: no surgery, no drugs

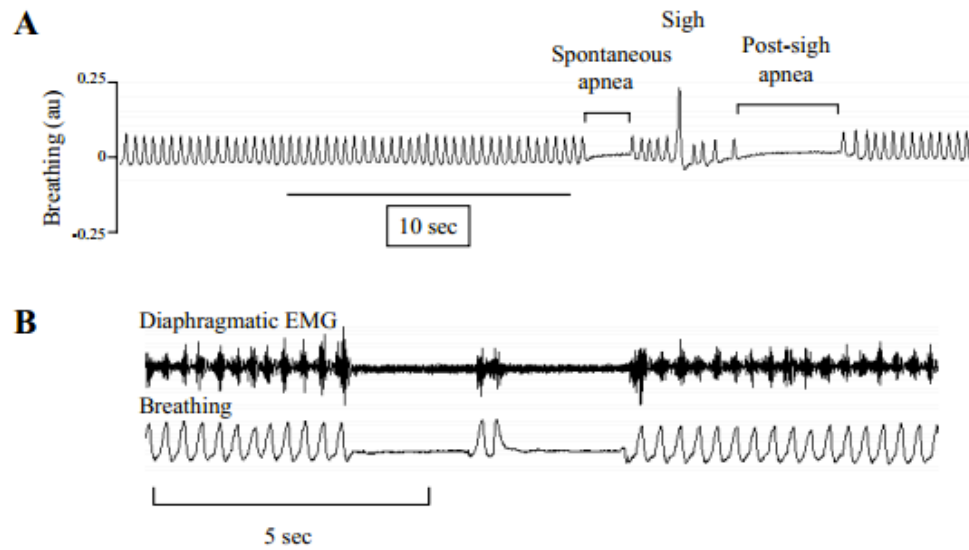
- 80 mice
- 5 different groups
  - Group 1: electrode implants, no drugs
  - Group 2: electrodes and treated with saline and **clorgyline** (MAOA inhibitor)
  - Group 3: electrodes, treated with saline and **PCPA** (reduces brain concentration of serotonin)
  - Group 4: no surgery, no drugs
  - Group 5: no surgery, treated with either saline or PCPA



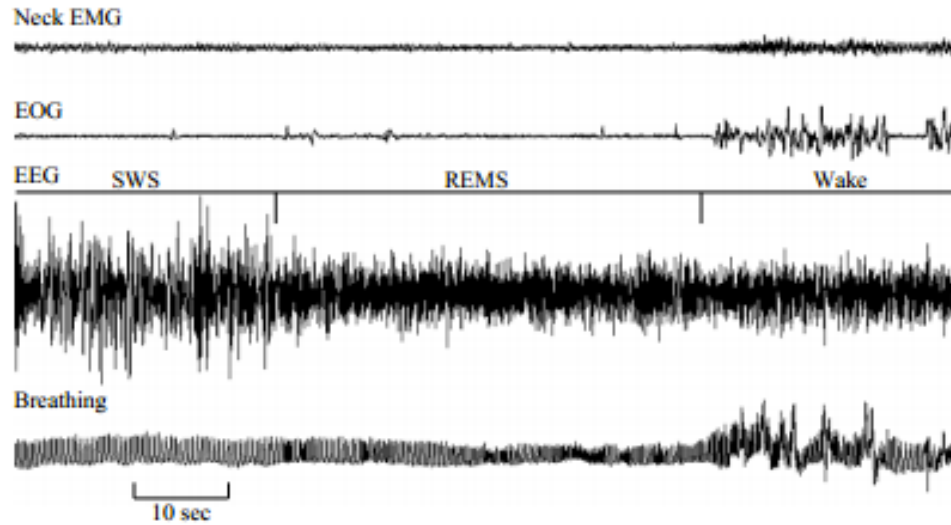
Wild Mouse



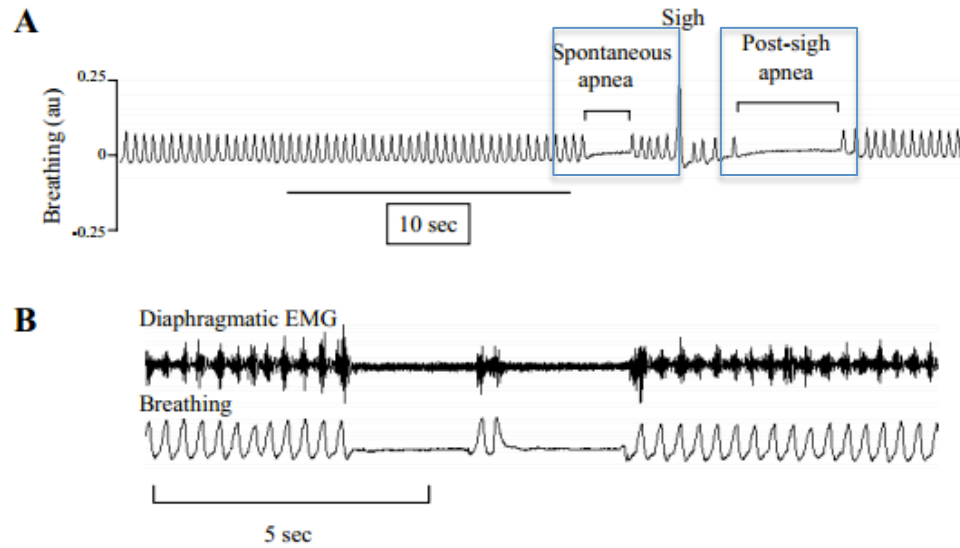
Mutant Mouse



Wild Mouse



Mutant Mouse



## Group 1:

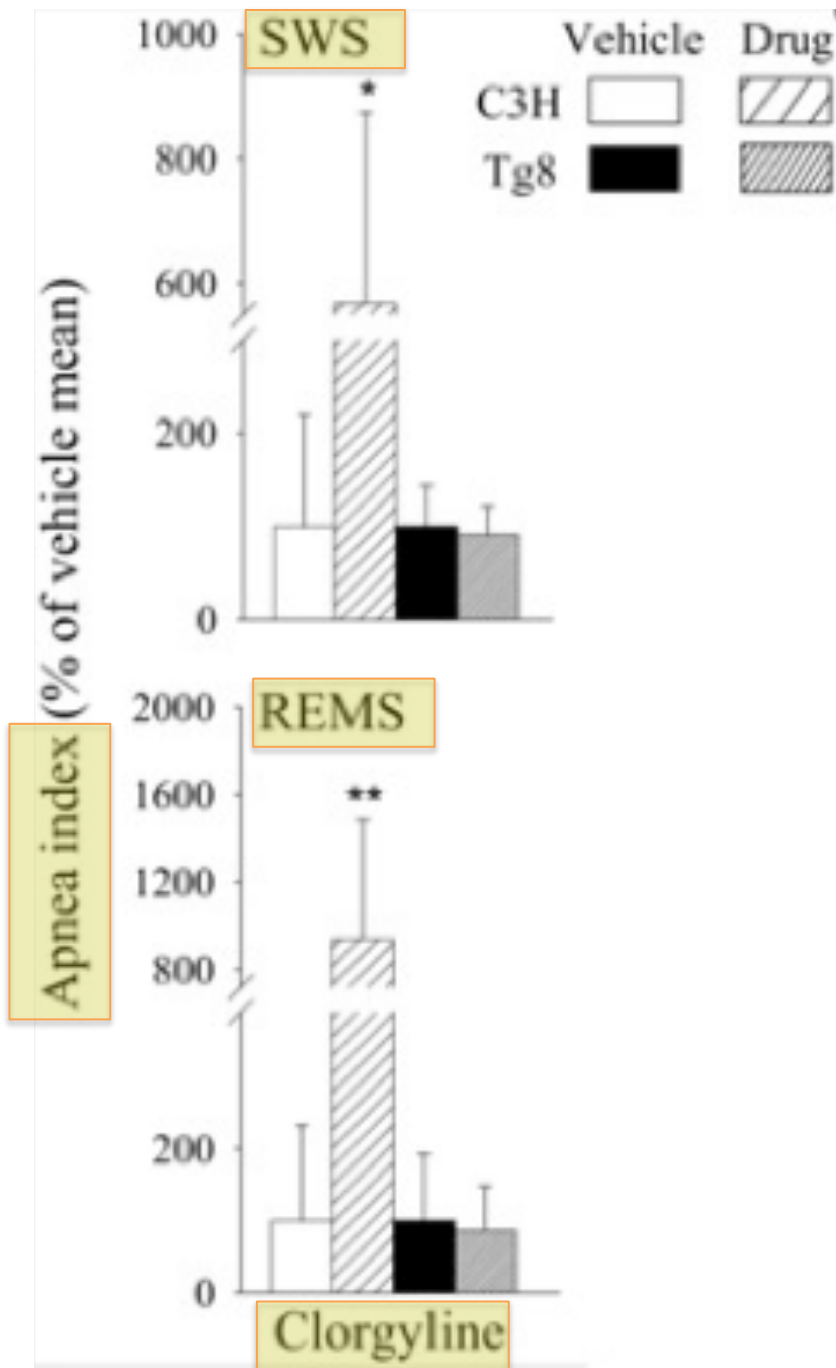
**Table 1—MAOA-Deficient (Tg8) Males Show Wild-Type (C3H) Amounts of Vigilance States**

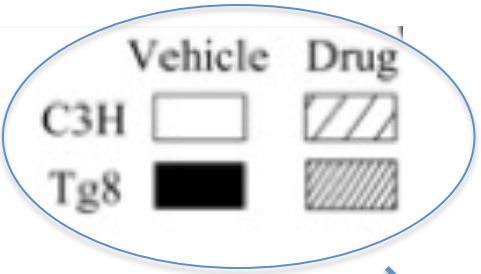
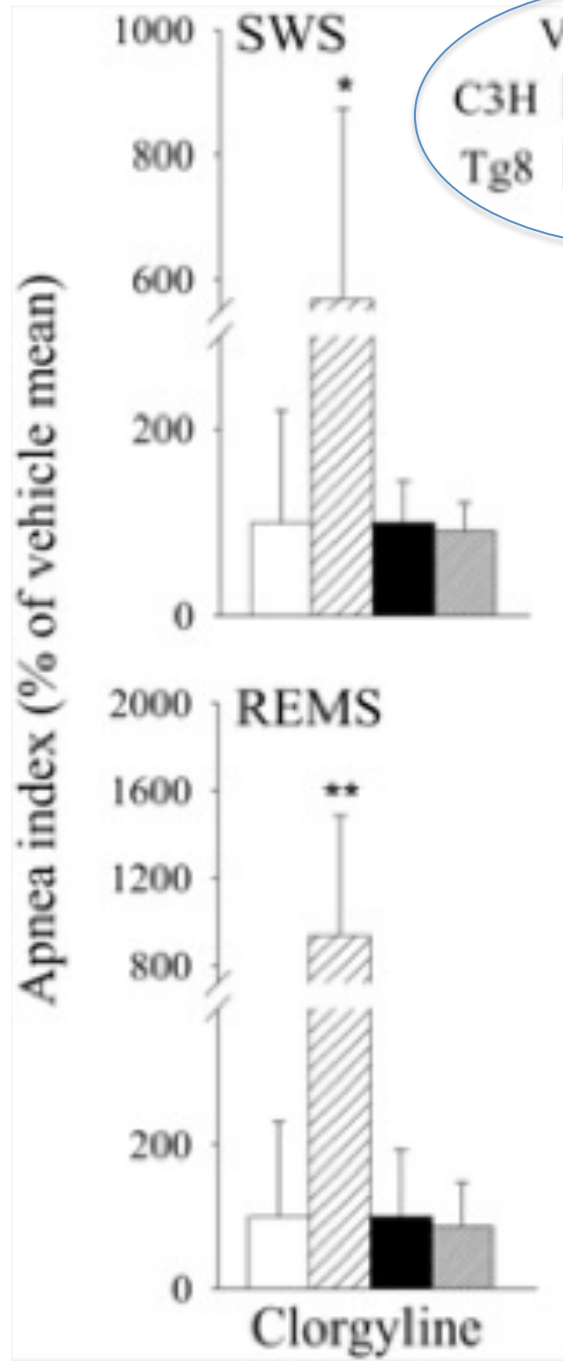
Genotype	Vigilance state (%)		
	Wake	SWS	REMS
C3H	30.4 ± 10.3	65.0 ± 9.6	4.6 ± 1.7
Tg8	36.5 ± 9.1	57.3 ± 9.2	6.3 ± 2.8

**Table 2—MAOA-Deficient (Tg8) Males Show Higher Indices of Sleep Apnea Than Wild Type (C3H) Males**

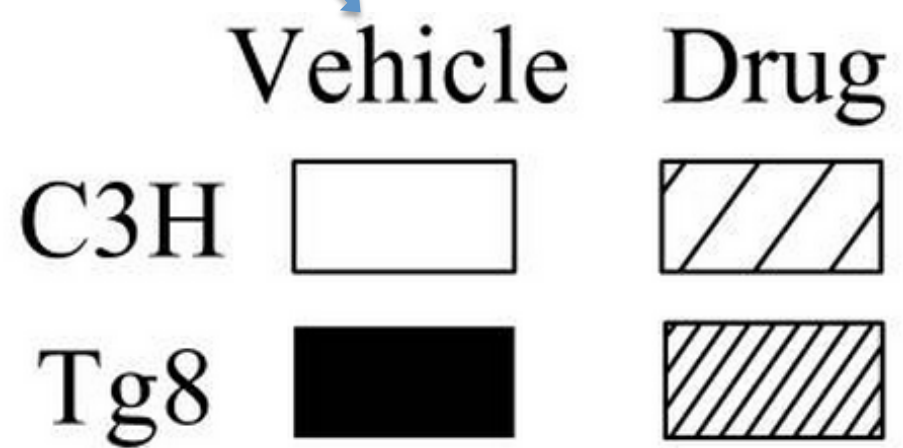
Genotype	Sleep	Apnea index			Sigh index
		Total	Spontaneous	Post-sigh	
C3H	SWS	2.6 ± 2.0	0.8 ± 0.9	1.7 ± 1.3	22.5 ± 10.4
Tg8		8.4 ± 4.5#	2.9 ± 1.7#	4.9 ± 2.9#	26.9 ± 4.4
C3H	REMS	4.9 ± 4.9	4.9 ± 4.9	0.0 ± 0.0	0.5 ± 1.2
Tg8		13.9 ± 8.4#	13.3 ± 8.6	0.6 ± 1.1	1.5 ± 2.1

- Group 2:
- Clorgyline (MAOA inhibitor)





- Group 2:
- Clorgyline (MAOA inhibitor)



# Group 1:

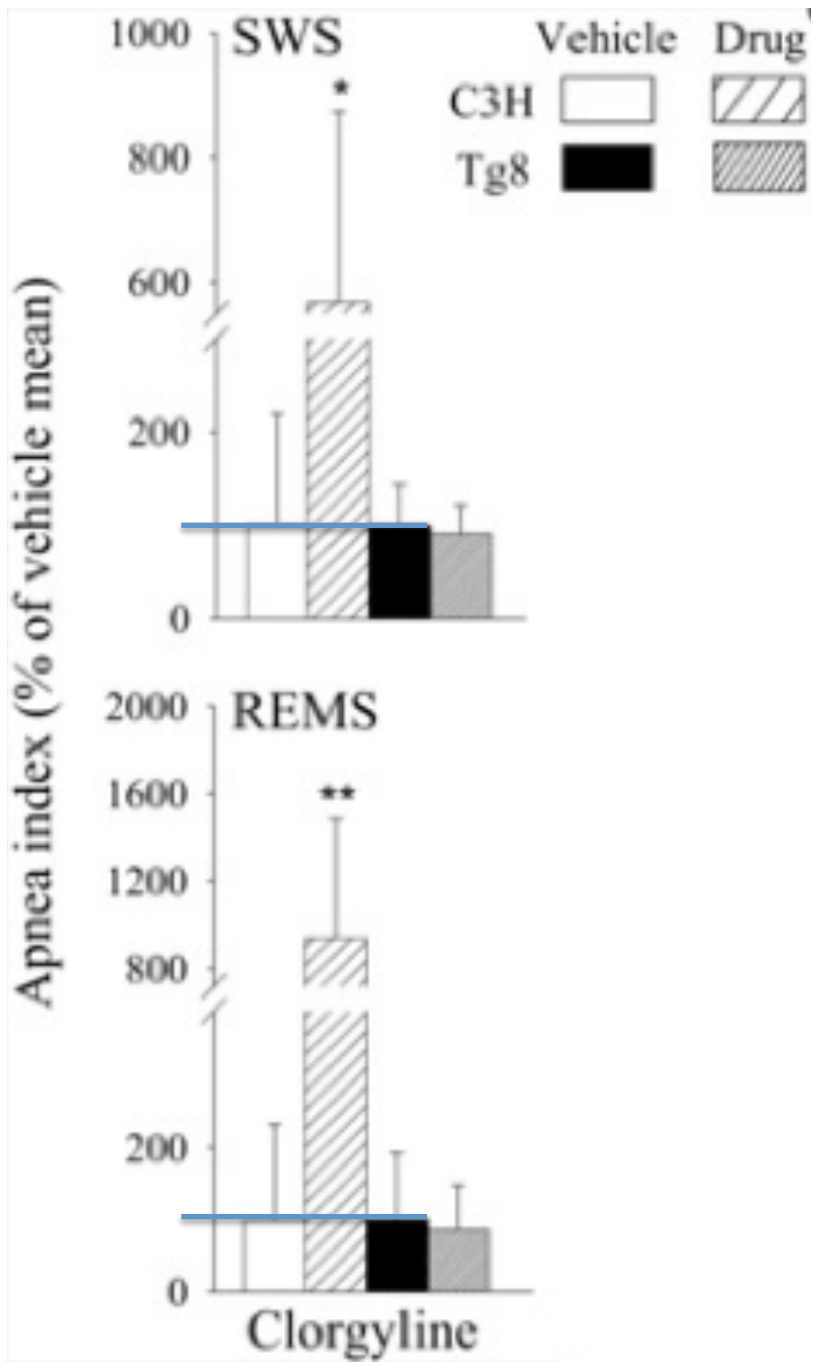
**Table 1—MAOA-Deficient (Tg8) Males Show Wild-Type (C3H) Amounts of Vigilance States**

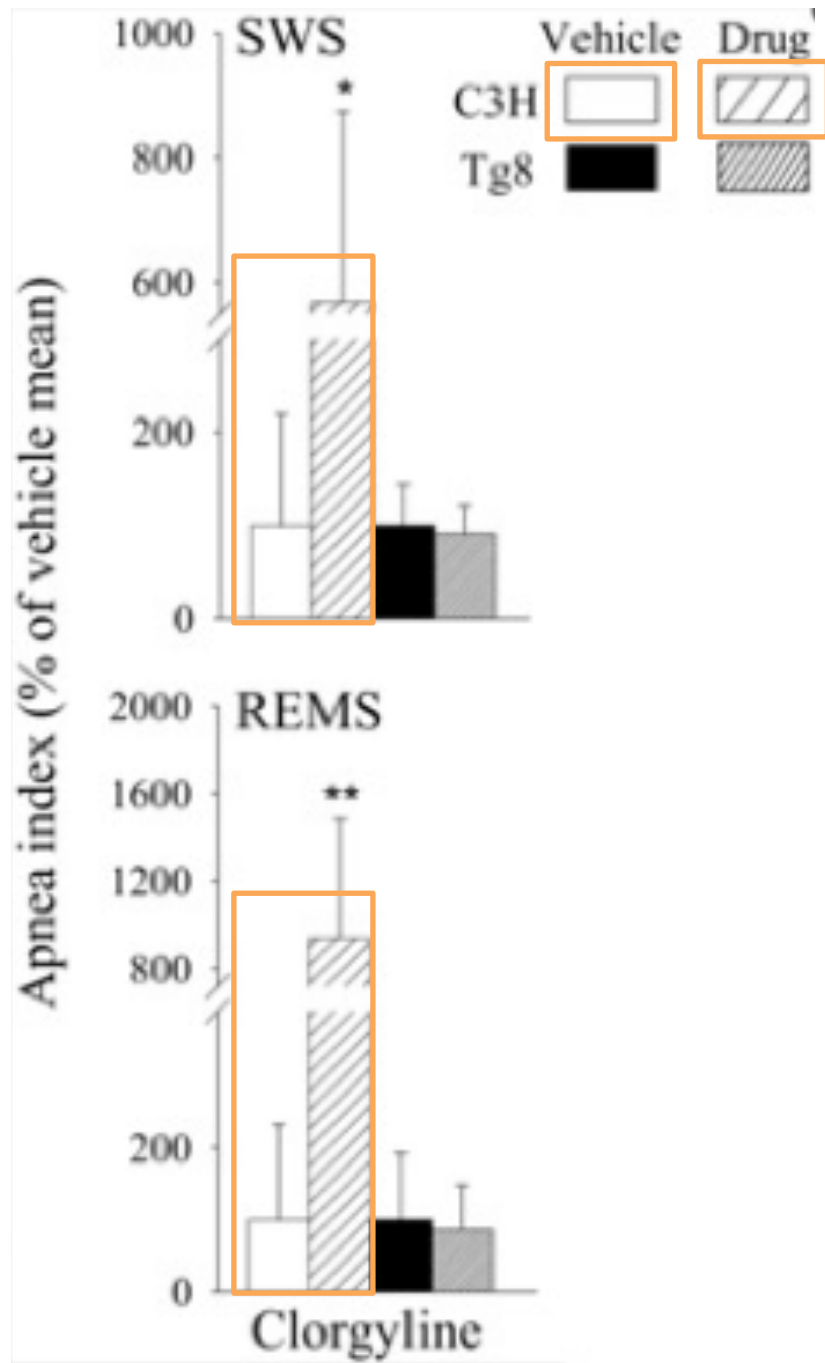
Genotype	Vigilance state (%)		
	Wake	SWS	REMS
C3H	30.4 ± 10.3	65.0 ± 9.6	4.6 ± 1.7
Tg8	36.5 ± 9.1	57.3 ± 9.2	6.3 ± 2.8

**Table 2—MAOA-Deficient (Tg8) Males Show Higher Indices of Sleep Apnea Than Wild Type (C3H) Males**

Genotype	Sleep	Apnea index			Sigh index
		Total	Spontaneous	Post-sigh	
C3H	SWS	2.6 ± 2.0	0.8 ± 0.9	1.7 ± 1.3	22.5 ± 10.4
Tg8	SWS	8.4 ± 4.5#	2.9 ± 1.7#	4.9 ± 2.9#	26.9 ± 4.4
C3H	REMS	4.9 ± 4.9	4.9 ± 4.9	0.0 ± 0.0	0.5 ± 1.2
Tg8	REMS	13.9 ± 8.4#	13.3 ± 8.6	0.6 ± 1.1	1.5 ± 2.1

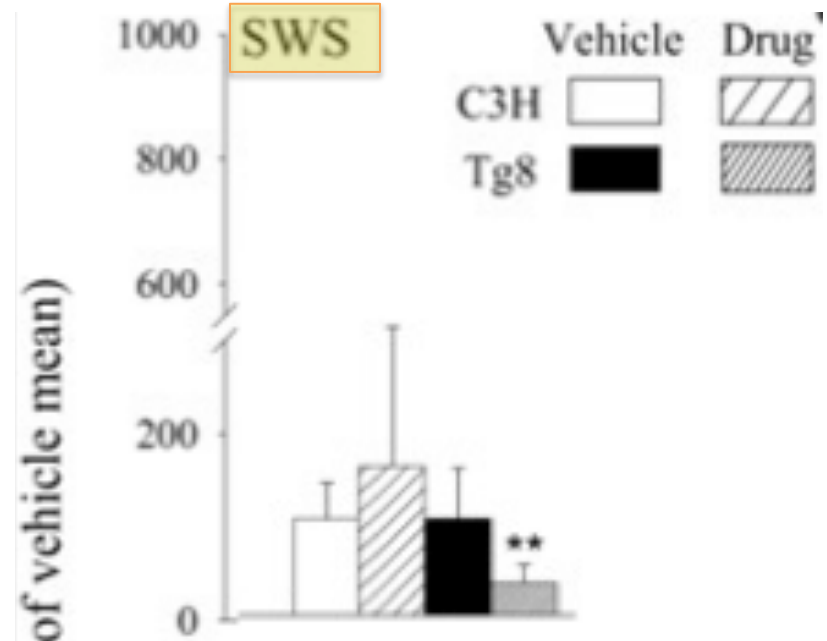
- Group 2:
- Clorgyline (MAOA inhibitor)



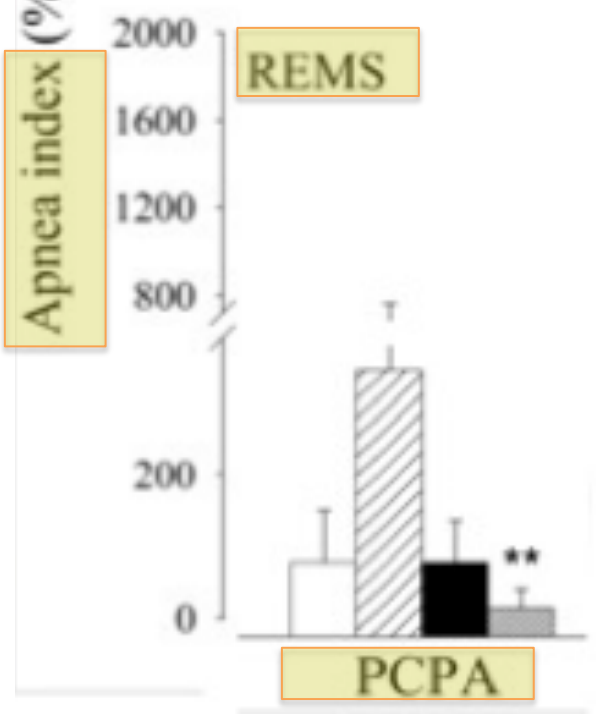


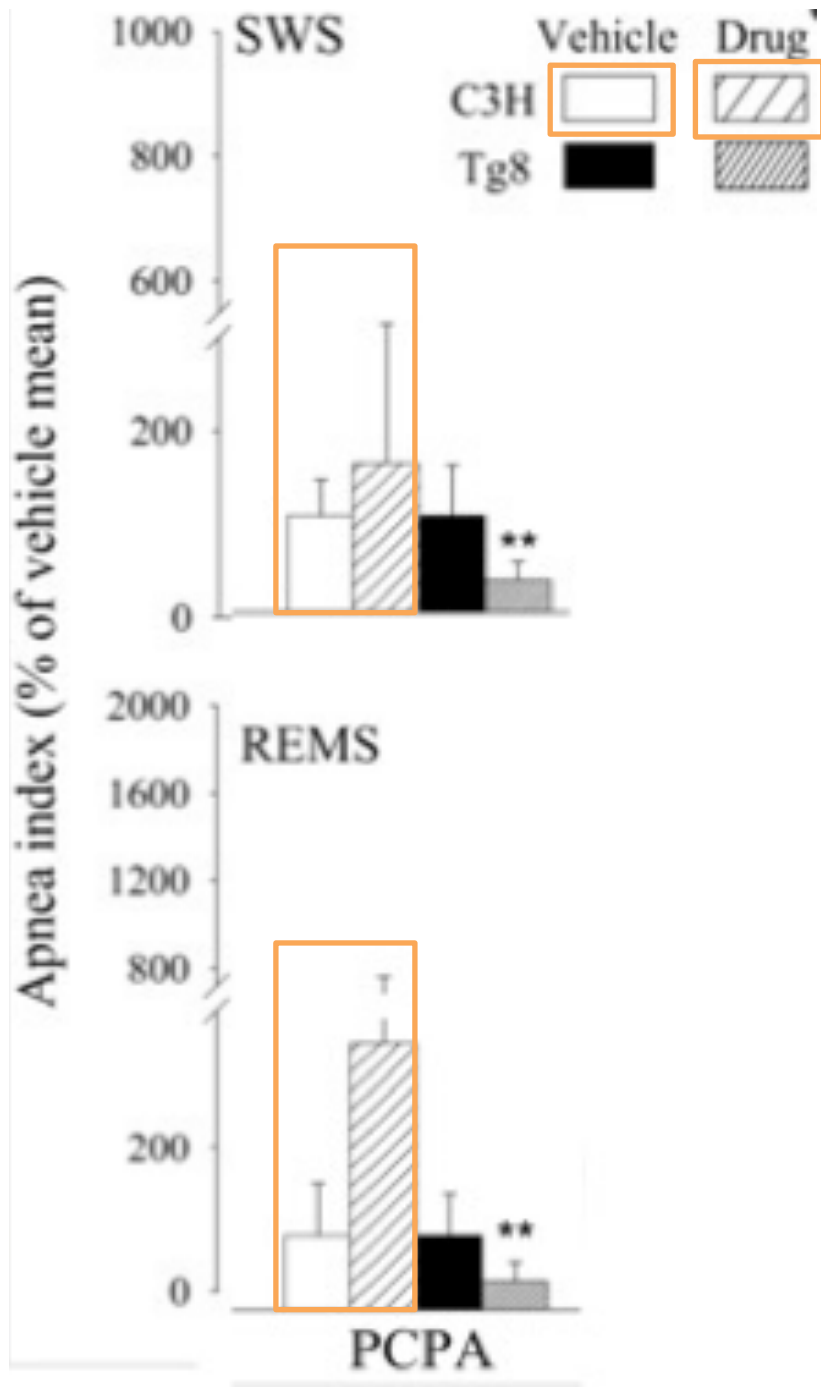
- Group 2:
- Clorgyline (MAOA inhibitor)



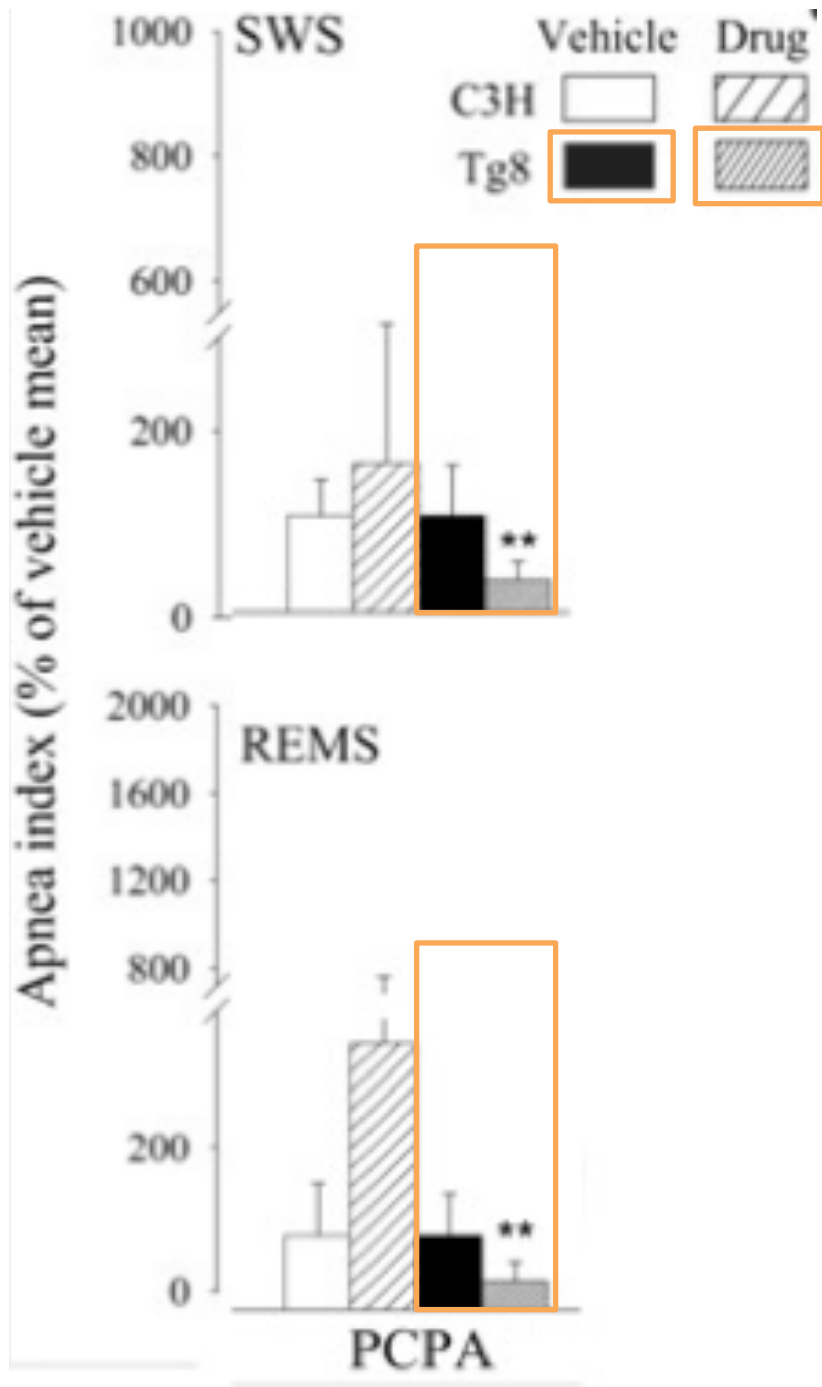


- Group 3:
- PCPA (reduces brain concentrations of serotonin)





- Group 3:
- PCPA (reduces brain concentrations of serotonin)



- Group 3:
- PCPA (reduces brain concentrations of serotonin)

# Inferences

- MAOA deficiency linked to greater sleep apnea
- Too little or too much serotonin contributes to greater sleep apnea

# Significance of this study?

- Sleep apnea in the US
  - 2% of women
  - 4% of men
- Known to reduce daytime vigilance
- Linked to an increased risk of cardiovascular diseases
- “Patients with obstructive apnea syndrome showed therapeutic response to mirtazapine.”
  - <http://www.ncbi.nlm.nih.gov/pubmed/17310863>