A specific role for GABA in the parabrachial nucleus in enhancing taste palatability

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Whole body CDP increases licking to appetitive & aversive tastants:
- in brief-access (15s) tests
- in long-term (1h) tests
- indicates taste-mediated effects

Identify CNS areas responsible for increased taste palatability
SURGICAL TECHNIQUES

Whole brain application of GABA_A agonist
- Third Ventricular injection
- L-838 more specific agonist
SURGICAL TECHNIQUES

Site specific application of $\text{GABA}_A$ agonist
- Intra-PBN application of $\text{GABA}_A$ agonist - CDP

PARABRACHIAL NUCLEUS (PBN)
Integration of:
- taste input
- gut feedback
- cortical/motivational input
- **Appetitive & Aversive Tastants**
- **Meals:** group of licks defined by 10 minute break
- **Burst:** group of licks defined by 2 second pause

EXPERIMENTAL DESIGN
LICK PATTERN ANALYSIS

Latency to Meal

<table>
<thead>
<tr>
<th>Lick Burst</th>
<th>Pause &gt;2 s</th>
<th>Meal Terminated</th>
<th>Break &gt;10 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lick Burst</td>
<td>Pause &gt;2 s</td>
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0 min (session start time) ➔ (session end time) 60 min
EXPERIMENT 1 ~ GABA\textsubscript{A} AGONIST

WHOLE-BRAIN VS. PBN

**L-838 injected into 3V**

- DMSO
- L1nM
- L10nM
- L100nM

**CDP injected into PBN**

- aCSF
- 50nM CDP
- 100nM CDP

**Meal Licks**

**Meal Duration**
EXPERIMENT 1 ~ GABAA AGONIST
WHOLE-BRAIN VS. PBN

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EXPERIMENT 1 ~ GABA_A AGONIST

WHOLE-BRAIN VS. PBN

L-838 injected into 3V

CDP injected into PBN

Number of Bursts

Pause Duration [s]

DMSO  L1nM  L10nM  L100nM

aCSF  50nM CDP  100nM CDP
EXPERIMENT 2
Intra-PBN administration of CDP

- Licking analysis of 6 different tastants (appetitive & aversive)

PBN is a critical site for the modification of taste and feeding behaviors
EXPERIMENT 2 ~ INTRA-PBN CDP
SACCHARIN = Appetitive

TASTE-MEDIATED

- Meal Licks
  - Saccharin (M): 0.010 (aCSF: 4000, CDP: 4500) vs 0.050 (aCSF: 3500, CDP: 4000)
  - Modest increase

MOTIVATION-MEDIATED

- Meal Duration (s)
  - Saccharin (M): 0.010 (aCSF: 3000, CDP: 3500) vs 0.050 (aCSF: 2500, CDP: 3000)
  - No effect

- Licks / Burst
  - Saccharin (M): 0.010 (aCSF: 100, CDP: 150) vs 0.050 (aCSF: 50, CDP: 100)
  - No effect

- Number of Bursts
  - Saccharin (M): 0.010 (aCSF: 40, CDP: 40) vs 0.050 (aCSF: 20, CDP: 40)
  - No effect
EXPERIMENT 2 ~ INTRA-PBN CDP
SODIUM CHLORIDE = Aversive

TASTE-MEDIATED

MOTIVATION-MEDIATED

- **Meal Licks**
  - Increase at 0.300 M NaCl with CDP
  - No effect at 0.500 M NaCl with CDP

- **Meal Duration (s)**
  - No effect at both 0.300 and 0.500 M NaCl

- **Licks / Burst**
  - No effect at both 0.300 and 0.500 M NaCl

- **Number of Bursts**
  - No effect at both 0.300 and 0.500 M NaCl
EXPERIMENT 2 ~ INTRA-PBN CDP
OTHER LICK PATTERN VARIABLES

SACCHARIN

**Average Lick Rate (Rate/Second)**
- Saccharin (M): 0.010 and 0.050
  - 0.010: No effect
  - 0.050: Modest increase

SODIUM CHLORIDE

**Average Lick Rate (Rate/Second)**
- NaCl (M): 0.300 and 0.500
  - 0.300: Modest increase
  - 0.500: Decrease

**Pause Duration (s)**
- Saccharin (M): 0.010 and 0.050
  - 0.010: Modest decrease
  - 0.050: Decrease

- NaCl (M): 0.300 and 0.500
  - 0.300: Decrease
  - 0.500: Decrease
EVALUATING INTEGRITY OF THE PBN CONDITIONED TASTE AVersion

Conditioning

Sucrose + LiCl

Aversion Test

Sucrose

Trial 1

24 h

Trial 2

Graph showing percent aversion (Session Licks) with a mean of 26%.
Next step: *Histological confirmation of PBN target*

- GABA in the PBN appears to be capable of enhancing licking to both appetitive and aversive tastants
- **HYPOTHESIS:** Benzodiazepines affect taste palatability through PBN GABA$_A$ receptors

**NEXT EXPERIMENTS:**
- Replication of CDP intra-PBN using *new* L-838 agonist
- Block systemic CDP + intra-PBN GABA$_A$ antagonist
- Measure effect of GABA$_A$ stimulation on afferent taste neural coding signals in the PBN
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Department of Psychology, Amherst College

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