Influence of high-fat diet on the detection threshold for avoiding linoleic acid following a conditioned taste aversion in obesity prone and obesity resistant rat strains.

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Why Study the Taste of Fat?
- Obesity rates have risen over the last 10 years across all age groups
- Currently:
  - 58% US population is overweight
  - 21% US population is obese (44.3 million)
  - In 2000, being overweight was the second leading cause of preventable death accounting for 16.6% of those deaths.

Understanding the role of fat
- Linoleic acid
  - Liquid, polyunsaturated essential fatty acid
  - Most common of all polyene acids
  - Present in all vegetable fats (Gunstone, 1996)
- Previous research from our lab suggests that rats can taste linoleic acid

How Genetics Impacts Diet
- Obese-resistant Osborne-Mendel
- Obese-prone
  - 50% heavier on regular diet
  - Twice as heavy on high fat diet

What we want to know
- Does a high-fat diet influence the ability to detect linoleic acid?
- Does a high-fat diet differentially effect the obese-resistant and obese-prone rat strains?

Subjects
- 20 adult male rats total tested in 2 phases
- 10 OM rats and 10 SSB rats
- Half of each strain were experimental (taste aversion) or control (no taste aversion) groups
- The rats were on a high-fat diet for four weeks prior to testing and during testing.
Conditioning a Taste Aversion (CTA)

- Four days prior to conditioning, the rats were trained to lick water in the Davis Rig.
- For three consecutive days, the rats were given access to linoleic acid for ten minutes.
- We measured the consumption of linoleic acid both before and after it was consumed in which the bottles were measured in grams.
- Fifteen minutes after conditioning, the rats were given the assigned LiCl (CTA) or saline (control) injections.

Testing Phase

- All testing was conducted in the MS-160 Davis Rig. The Davis Rig measured the licking behavior and latency of each presentation of the taste stimuli.
- Presented each testing day there were 5 presentations of linoleic acid (100, 50, 20, 5, 1 micromolar concentrations) and one of water.
- In random order, the 6 concentrations were presented in 4 blocks equaling a total of 24 trials.

Analyzing the data

- When analyzing the data, we took the average number of licks to the stimulus and divided it by the average number of licks to water.
- For example, if the ratio of licks to stimulus and licks to water was equal to one then no taste aversion was present.
- If the ratio was less than one, the rats showed avoidance and therefore a taste aversion was present.

Linoleic acid consumption during the 3 conditioning days.

In the graphs, the x-axis represents the concentration of linoleic acid (100, 50, 20, 5, 1 micromolar), and the y-axis represents the CS Consumption (g). The graphs show the consumption for Day 1, Day 2, and Day 3 for different conditions: OM-LiCl, OM-Saline, S5B-LiCl, and S5B-Saline.
**Implications**

- The rats that received a high fat diet became desensitized to the free fatty acid, linoleic acid compared to rats on a normal diet.
- Applying our animal research to humans implies that when one eats high-fat foods, our taste system may become less sensitive to the presence of fat. This could lead to increased consumption of fat in your daily diet.

**Future Research**

- Compare the neural responsiveness to a variety of tastants and fatty acids in animals that are on either regular or high-fat diets.