Podcast Script #2: Does frugivory have an evolutionary role in our appetite for ethanol?

Group #3: Patrick Maloney, Brandy DeRudder (& Laura Klaver)

Evolutionary Psychology 403

Podcast Script #2: (SKIT) Does frugivory have an evolutionary role in our appetite for ethanol? SETTING: Brandy and Patrick are sitting at a table with glasses of wine and fruit. (In the opening scene, Brandy and Patrick are having a glass of wine (cranberry juice)...)

BRANDY: Have you ever wondered where our preference for alcohol originated?

- PATRICK: Of course! Robert Dudley, from the University of California, Berkeley, suggests that our frugivorous primate ancestors have an evolutionary role in our appetite for ethanol, the primary ingredient in alcoholic beverages.
- BRANDY: Frugivores are primates whose diet consists of fruit. Ripe fruit is advantageous because it is high in caloric value, due to its high sugar content.
- PATRICK: Ethanol is a naturally occurring substance that results from the fermentation of fruit sugars by yeast. Yeast is one of the primary agents of fruit decay, it occurs both inside and outside of fruits.

BRANDY: The association between yeast and fruit to yield the production of ethanol dates back to the Cretaceous era. The riper the fruit, the greater the concentration of ethanol. (*Patrick picks up the Apple, the ripe fruit*)

PATRICK: Ripe fruit is sought out by frugivores because of its heightened sugar levels. However, overly ripe, or decomposing fruit, is not preferred by frugivores as it contains a lower sugar content when compared to ripe fruit.

(Patrick picks up the Banana, the unripe fruit)

BRANDY: This is because the sugar in fruit is converted into ethanol through the fermentation process. For example, ethanol concentrations in ripe fruit range from trace quantities to values ranging between 0.6 to 0.9 %. Whereas, overly ripe fruit contains ethanol concentrations up to 4.5%.

- PATRICK: As a dispersal mechanism, fruit advertises its ripeness by changing color, softening in texture, and giving off aromas in the form of ethanol plumes. These changes in the appearance, feel, and smell of fruit are what attract frugivores to ripe fruit, allowing them to locate these nutritional rewards.
- BRANDY: Olfactory sensitivity to various alcohols, such as ethanol in fruit, is well developed in primates. Rapid localization and consumption of ripe fruit would have been selected for when in competition with other frugivores for nutritional resources.
- PATRICK: Frugivores prefer ripe fruit because it contains a higher sugar content, which has a higher caloric value. Overly ripe and decaying fruit contains a higher concentration of ethanol than ripe or unripe fruit, but is not preferred by frugivores. This is because it contains less sugar, subsequently providing less caloric value. Therefore, ripe fruit is consumed more for its caloric value, rather than for its ethanol content.
- BRANDY: At low concentrations, ethanol can be beneficial. Ingestion at low concentrations can provide metabolic adaptations that maximize physiological benefits. However, exposure to higher concentrations of ethanol can cause harm.
- PATRICK: Dudley's study suggests that because humans are ancestrally derived from frugivorous primates, patterns of alcohol use by humans today may be a result of the nutritional rewards that were used by frugivores.
- BRANDY: Natural selection may have acted on our primate ancestors to associate ethanol with these nutritional resources.
- PATRICK: And that's why Dudley argues that the human preference for alcohol consumption may result from a pre-existing sensory bias that resulted from this association between ethanol and nutrient rich resources.

- BRANDY: There may also be a pleasurable physiological effect or "buzz" experienced because of the ethanol ingested during fruit consumption. Dudley is not suggesting that there is a selection pressure for alcohol consumption. Rather, he is suggesting that because the selection of nutrient rich fruit was adaptive for primates, this could have made alcohol use a by-product of the sensory bias for fruit.
- PATRICK: So alcoholism may be a by-product of the adaptive behavior of obtaining fruit.
- BRANDY: Although fruit consumption is an adaptive behavior, with it comes a pre-existing sensory bias for fruit, which may develop the maladaptive trait of alcoholism.
- PATRICK: Therefore, Dudley's hypothesis is suggesting that during the course of primate frugivory, the selection for obtaining fruit, which also happens to contain ethanol, may have been a subtle, yet pervasive evolutionary influence on modern humans.

## **References:**

- Dudley, R. (2000). Evolutionary origins of human alcoholism in primate frugivory. *The Quarterly Review of Biology*, *75*, 3-15.
- Dudley, R. (2004). Ethanol, fruit ripening, and the historical origins of human alcoholism in primate frugivory. *Integrative and Comparative Biology, 44,* 315-323.