

# Ilex Paraguariensis (Yerba Mate) Infusions and Risk of Oral Cancer: A Structured Literature Review

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## Abstract

Yerba Mate (*Ilex paraguariensis* infusion, referred to as mate) is a popular drink consumed throughout the world, especially in South America, that is widely considered a healthy alternative to coffee. However, recent research has discovered a possible link between the consumption of mate and oral cancer. As such, the objective of this analysis is to investigate the association between oral cancer and habitual consumption of *Ilex paraguariensis* infusions. A structured literature review was conducted using PubMed, Scopus, ScienceDirect and CINAHL. Primary research through 2015 was included; all reviews were excluded. Keywords used were “*illex paraguariensis*”, “yerba mate”, “yerba”, “cancer”, “neoplasm”, “neoplasia”, “tumor”, and “tumour”. Articles investigating associations between *Ilex paraguariensis* infusion consumption and non-oral cancers were excluded.

## Background & Rationale

Since the emergence of widespread globalization, several food and beverage choices traditionally isolated to a single culture have spread across national/cultural lines. One such export is a traditional South American beverage called mate, an infusion made from the *Ilex paraguariensis* plant that is consumed widely in Argentina (where it is defined by law as the official national infusion), Uruguay, Paraguay, Brazil, and southern Chile. Recently, infusions of *Ilex paraguariensis* have become increasingly popular in the United States, Canada and some parts of the Middle East including Lebanon and Syria. Advocates note that it contains antioxidants and a variety of vitamins<sup>2</sup>. Furthermore, mate contains a variety of phenolic constituents<sup>4</sup>. However, it is possible that the beverage causes more ill than good, as it is frequently associated with various oral cancers.

## Purpose

- To investigate the association between oral cancer and habitual consumption of *Ilex paraguariensis* infusions among adults between 18-55 years of age

## References

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## Results

Author & Title	Study	Outcomes
Deneo-Pellegrini et al. (2013) Maté consumption and risk of oral cancer: Case-control study in Uruguay	Case Control Study	After adjusting for confounding variables, mate consumption was not associated with risk of oral cancer (OR 1.08, 95% CI 0.72–1.61). However, risk greatly increased when interaction terms for smoking (pack years) and alcohol years (OR=2.37; 95% CI, 1.45–4.75 and OR=3.47; 95% CI, 1.60–7.52, respectively) were introduced. Risk was increased the mate was consumed hot/very hot
De Stefani et al. (2011) Maté Consumption and Risk of Cancer: a Multi-site Case Control Study in Uruguay	Multi-Site Case-Control Study	Ever drinkers of mate esophageal cancer OR=2.66, (95 % CI 1.74-4.05); OR 3.09, 95 % CI 1.95-4.91 for heavy drinkers ; over 50 years of consumption associated with cancers of UADT (OR 1.41, 95 % CI 1.12-1.79), esophagus (OR 2.88, 95 & CI 1.88-4.41), larynx (OR 1.57, 95 % CI 1.07-2.31). Cancers of the esophagus more closely associated with hot mate drinking (OR 2.88, 95 % CI 1.88-4.41).
Ferreira et al. (2009) Maté attenuates DNA damage and carcinogenesis induced by diethylnitrosamine and thermal injury in rat esophagus	Randomized Controlled Trial (Wistar Rats)	Mate intake reduced the levels of DNA damage in peripheral blood leukocytes and esophageal carcinogenesis induced by diethylnitrosamine/thermal injury protocol
Gonzalez de Mejia. (2005): Effect of Yerba Mate ( <i>Ilex paraguariensis</i> ) Tea on Topoisomerase Inhibition and Oral Carcinoma Cell Proliferation	In Vitro Study	Mate is rich in phenols which can inhibit oral cancer proliferation. Mate exhibited dose and origin dependent cytotoxicity against all squamous cell lines tested
Pintos et al. (1994) Maté, coffee, and tea consumption and risk of cancers of the upper aerodigestive tract in southern Brazil	Case-Control Study	Consuming between 1-3 mates per day was associated with increased risk of oral cancer (RR=1.9; 95% CI=1.1-3.3) and laryngeal cancers (RR=2.2; 95% CI=1.1-4.5). No evidence of different effects based on temperature of mate when consumed.
Sewram. (2003) Mate Consumption and the Risk of Squamous Cell Esophageal Cancer in Uruguay	Case-control Study	Individuals drinking over 1L/day increased risk of esophageal cancer (RR=2.84; 95% CI, 1.41–5.73), Individuals drinking hot mate at a much greater risk even after accounting for consumption (OR=1.87; 95% CI, 1.17–3.00)
Szymanska et al. (2010) Drinking of maté and the risk of cancers of the upper aerodigestive tract in Latin America: a case-control study	Case Control Study	Esophageal cancer strongly associated with mate consumption (OR 3.81 (95% CI 1.75–8.30). Temperature at consumption not strongly associated with increased or decreased risk.

## Discussion

According to the literature, habitual consumption of *Ilex paraguariensis* infusions seem to increase the risk of developing oral cancer. Most of the studies found were case control studies<sup>1,2,5,6,7</sup>. Overall, four of the studies analyzed showed increased risk for oral neoplasms, especially in the esophagus<sup>2,5,6,7</sup>. Deneo-Pellegrini et al. suggested that the association only exists when interaction terms for tobacco and alcohol use are included. This may indicate that the carcinogenic effects of mate may be attenuated by alcohol or tobacco. However, evidence was not so clear when attempting to discern the effects of hot vs cold mate; two studies indicated that temperature had little effect on increased/decreased risk<sup>5,7</sup>, while three studies indicated a significant effect<sup>1,2,6</sup>. Furthermore, two studies actually showed that mate can have an inhibitory effect on oral cancer cells<sup>3,4</sup>; however, these studies are limited by their designs (Animal trial and *in vitro* study, respectively). Human studies did not show this inhibitory effect.

## Methods

A structured literature review was conducted by searching four databases (PubMed, Scopus, ScienceDirect and CINAHL) using the phrase “(“ILEX PARAGUARIENSIS” OR “YERBA MATE” OR “YERBA”) AND (CANCER OR NEOPLASM OR NEOPLASIA OR TUMOR OR TUMOUR)”. For the PubMed search, the quotations were omitted from the words “*illex paraguariensis*” in order to access articles under the MeSH heading of that name.

Inclusion Criteria	Exclusion Criteria
Intervention	
<i>Ilex paraguariensis</i> infusion consumption	Other methods of consuming <i>Ilex paraguariensis</i> ; Other infusions
Outcome	
Oral Cancers	Non-oral cancers; Non-cancerous oral diseases
Study Characteristics	
Primary Research	Review Articles
Accessibility	
Full text available through uOttawa Library network; English language	Non-english Articles; Full text unavailable

Pubmed: n=54  
Scopus: n=81  
ScienceDirect: n=272  
CINAHL: n=3  
Total: n=410

Inclusion Criteria Applied to Titles: n=29 → 381 excluded

Inclusion Criteria Applied to abstract: n=9 → 20 excluded

Full-Text Articles Only (Final): n=7 → 2 excluded

## Conclusion

Upon analysis of the 7 studies considered, habitual consumption of *Ilex paraguariensis* infusions seems to increase the risk of developing oral cancer. However, it is unclear whether the associated risk changes depending on the temperature of the mate infusion.