

Mechanisms underlying methamphetamine-related dental disease

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The emergence of methamphetamine (meth) as a commonly used recreational drug has brought greater scrutiny to its health effects.¹ A dominant thread of the clinical and media narratives of meth's negative health consequences has been the description of the rampant dental disease often observed in people who use meth habitually—a condition colloquially referred to as “meth mouth.” Beginning in the early 2000s, results of a growing number of case reports, case-series, and small cohort studies began to portray the meth mouth condition, frequently using extreme, graphic examples to depict the dental aftermath of meth use. The alarming dental imagery became a recurring theme in the media coverage of the meth problem,² and it was incorporated readily into national antidrug campaigns. For example, the nationally recognized “Faces of Meth” project³ used longitudinal snapshots chronicling facial wasting and dental deterioration to emphasize and dramatize the negative aspects of meth use.⁴ Yet, the largely anecdotal nature of the dental reports and the general lack of an empirical basis for the claims prompted several researchers^{5,6} to question the scientific soundness of the meth mouth condition.

To furnish a scientific basis for the dental disease patterns reported, our group carried out systematic, case-control studies involving a broad range of people who used meth.^{7,8} We clarified the differential rates and



Supplemental material is available online.

ABSTRACT

Background. The authors clarified the causal mechanisms underlying the high prevalence of dental disease encountered in people who habitually use methamphetamine (meth).

Methods. Using a stratified sampling approach, the authors conducted comprehensive oral examinations and psychosocial assessments for 571 study participants who used meth. Three calibrated dentists, who used National Health and Nutrition Examination Survey (NHANES) protocols, characterized the study participants' dental disease. The authors also collected data related to study participants' history of meth use and other attributes linked to dental disease.

Results. Study participants who used meth manifested higher rates of xerostomia and caries experience compared with NHANES control participants. Participants who used meth had a higher level of daily consumption of sugary beverages compared with NHANES control participants. Smoking meth did not increase caries experience over other modes of intake. Dental hygiene was a significant determinant of dental health outcomes.

Conclusions. Mode of intake and frequency of meth use have a minimal impact on dental health outcomes. Behaviors, such as sugary beverage consumption and poor oral hygiene, better explain dental health outcomes.

Practical Implications. Having a better understanding of the causal mechanisms of “meth mouth” sets the stage for clinicians to provide more personalized interventions and management of dental disease in people who use meth.

Key Words. Methamphetamine; caries; xerostomia; oral health; statistics.

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patterns of dental disease in people who used meth by means of comparing them with demographically similar control participants selected from participants in the National Health and Nutrition Examination Survey (NHANES).⁹ A logical next step was to examine the various explanations of the mechanisms of the meth mouth condition.

One proposed mechanism for the increased dental disease is a combination of meth-induced dry mouth (xerostomia) and the frequent sipping of high-sugar soft drinks to relieve the sensation of dry mouth.^{10,11} An alternate explanation, known as the “contaminant theory,” is that corrosive contaminants in smoked meth cause acid erosion of the enamel¹² and accelerate dental caries.¹³ Using a NHANES cohort as a control group, we posed the following questions:

- Do people who use meth have higher rates of xerostomia and caries experience compared with demographically similar control participants?
- Do people who use meth tend to consume more sugary drinks than demographically similar control participants?
- Does smoking meth produce greater rates of caries and xerostomia than snorting or injecting meth?
- Are oral health behaviors important dental disease determinants among people who use meth?

METHODS

We and our colleagues⁹ have previously described the details of the overall study design and settings. In brief, we recruited a broad community sample of 571 people from Los Angeles County in California who used meth over a 2-year period. To accomplish this, we used a stratified sampling protocol that balanced the study participants across meth use patterns. Meth use pattern categories included mild (fewer than 10 days of use in the last 30 days), moderate (10 to 15 days of use in the last 30 days), and heavy use (16 to 20 days of use in the last 30 days). The primary study sites were dental clinics associated with 2 large community health centers: the AIDS Project Los Angeles center, which primarily serves a sociodemographically diverse group of people with human immunodeficiency virus (HIV) and AIDS, and the Mission Community Hospital in Panorama City, CA, in the San Fernando Valley, which caters to a large, underserved migrant population. Approximately 69% of the study participants were recruited from the AIDS Project Los Angeles clinic and the remainder from Mission Community Hospital. We screened potential study participants and admitted them to participate in the study if we determined that they were at least 18 years old, spoke English or Spanish, had described themselves as someone who used meth (as determined by their responses to an extensive 10-year drug history questionnaire) and had used meth in the past 30 days, and were able to undergo a detailed dental examination and psychosocial

assessments. We obtained written informed consent using procedures approved by the University of California, Los Angeles (UCLA) Institutional Review Board, and they obtained a certificate of confidentiality from the National Institute on Drug Abuse, National Institutes of Health, to protect participants’ privacy.

Data collection. For this study, 3 experienced dentists, who were trained and calibrated by the national trainer and reference examiner (Bruce Dye) for NHANES, conducted standardized intraoral examinations. An ongoing quality assurance program ensured procedural adherence and the maintenance of high interexaminer and intraexaminer concordances of caries assessments.¹⁴ To maximize comparability with national data sets, we chose to use assessments for dental caries status that adhered to NHANES examination protocols.^{15,16} We recorded the presence and absence of study participants’ teeth and assessed their dental caries at the surface level using Radike criteria¹⁷; we determined that we would assess evidence of dental caries visually, by means of using a dental explorer, for each tooth surface. Participants also completed a set of interviewer-facilitated questionnaires covering various behavioral issues, substance use, medications, and dietary attributes linked to the development of dental disease (Appendix, available online at the end of this article).

We assessed the subjective perception of dry mouth by means of using a 4-question inventory described by Fox and colleagues.¹⁸ Two of the questions were intended to probe participants’ difficulties with swallowing by means of inquiring about behaviors related to relieving or avoiding oral dryness, 1 item related to the feeling of dryness during eating, and the last item related to the amount of saliva. On the basis of the participant’s “yes” or “no” responses, we assigned each participant to the following groups: no xerostomia (0 positive responses), mild xerostomia (1 positive response), moderate xerostomia (2 positive response), or severe xerostomia (3 or more positive responses). We also collected information related to which dry mouth-inducing medications the participants had taken, including antidepressants, anticholinergics, diuretics, and antihypertensives.¹⁹ We assessed the impact of the dental disease and dry mouth on the participants’ oral health-related quality of life by means of using their responses to select items from the Oral Health Impact Profile.²⁰

We evaluated dietary intake, particularly the consumption of sugary drinks, using 2 standard dietary

ABBREVIATION KEY. **DMFS:** Decayed, missing, and filled surfaces. **DMFT:** Decayed, missing, and filled teeth. **DS:** Decayed surface. **Dx:** Decayed component. **HIV:** Human immunodeficiency virus. **meth:** Methamphetamine. **NHANES:** National Health and Nutrition Examination Survey. **UCLA:** University of California, Los Angeles.

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