

## Letter to the Editor

### Teeth as a Source of DNA to Identify Mass Disaster Victims

Editor,

DNA analysis plays an important role in the identification of victims of mass disasters such as earthquakes, airplane crashes, floods, tsunami, and fire, train, and bus accidents.<sup>[1,2]</sup> Preferentially, soft tissues or blood is best suitable for DNA analysis. However, when the body is decomposed, teeth or bone is preferable.<sup>[3]</sup> DNA obtained from tooth of victims can be compared with samples obtained from the victims' personal objects such as toothbrushes or from stored blood/biopsy specimen/cervical smear or from immediate family members.<sup>[2,4,5]</sup> However, it should be borne in mind that DNA analysis is expensive and cannot differentiate between identical twins.<sup>[6]</sup>

DNA can be usually extracted from two vital teeth – canines/molars.<sup>[7]</sup> Molar teeth are more preferable.<sup>[8]</sup> Raimann *et al.* in their study suggested that molars and premolars were good candidates to obtain DNA profiles irrespective of the type of the laboratory procedure used or the time the recovered body was decomposed.<sup>[9]</sup> In addition, use of concentration columns yielded increased amount of DNA.<sup>[9]</sup> Although the use of isopropanol yielded lower DNA concentration, the DNA obtained was of high purity.<sup>[9]</sup>

Baby teeth stored in a small box at room temperature for 1 year is observed to provide reliable DNA profiles.<sup>[8]</sup> DNA analysis can also identify the sex of the victim.<sup>[4]</sup> Teeth is particularly resistant to incineration, decomposition, humidity, high temperature, microbial action and hence is an excellent source to collect DNA.<sup>[4,5]</sup> DNA in the teeth can be obtained from odontoblastic processes of dentin, cellular cementum, neurovascular tissues of pulp, radicular canals, periodontal ligament, and alveolar bone.<sup>[10,11]</sup> DNA is present in adequate quantity in the crown body, root body, and root tip of the teeth. However, high quantity of DNA can be specifically obtained from root body.<sup>[5]</sup> Pulp tissue is commonly used for the purpose of extracting DNA for identification since it is likely not to be contaminated by nonhuman DNA and is protected from external environment by dentin and by the highly mineralized enamel which is also the hardest structure of the human body.<sup>[10]</sup> However, pulp tissue can undergo putrefaction in moist environment leading to its complete destruction.<sup>[12]</sup> Teeth retained within the jaw socket are protected by alveolar bone and hence are less prone to contamination.<sup>[13]</sup> This point should be borne in mind while sampling teeth for extracting DNA. Teeth can be sectioned horizontally at cemento-enamel junction or vertically till the root tip, scraped, aspirated, endodontically accessed; or through conventional access, cavity preparation, tooth-crushing and cryogenization, or silica-based DNA extraction methods can be used for extracting the DNA.<sup>[5,10]</sup> Increased quantity of DNA is obtained through endodontic access using low speed than that obtained through tooth-crushing.<sup>[13]</sup>

Higgins *et al.* studied cementum sampling from human third molar teeth for DNA recovery.<sup>[12]</sup> Cementum can be

conveniently sampled from the teeth using scalpel, without the requirement of special equipment.<sup>[12]</sup> The study samples yielded sufficient quantities of nuclear DNA from as little as 20 mg cellular cementum tissue for providing full short tandem repeat (STR) profiling.<sup>[12]</sup> They concluded that cellular cementum, especially that found in apical root ends and at furcation area, can be used for obtaining DNA samples from individuals in situations requiring rapid sampling; for example, in mass disasters.<sup>[12]</sup> The study suggested that decontamination procedures such as bleaching with sodium hypochlorite should be used with caution since it can destroy DNA.<sup>[12]</sup> Simple cleaning procedures such as brushing, light scraping, and wiping with DNA-free water could be sufficient than using harsh decontamination chemicals.<sup>[13]</sup> However, it should be borne in mind that advanced periodontitis can lead to destruction of cellular cementum due to physical loss of cementum and cementocytes death.<sup>[13]</sup> Hence, care should be taken to get samples only from healthy teeth. Teeth found near the ground surface are more suitable for DNA sampling than teeth found buried deep in the ground or submerged in water.<sup>[13]</sup> Dentinal tubules containing odontoblastic processes are rich in mitochondrial DNA.<sup>[13]</sup>

Chelex 100 method is efficient in isolating/extracting DNA from dental pulp, even from incinerated teeth.<sup>[5]</sup> DNA is then amplified using polymerase chain reaction technique.<sup>[5]</sup> DNA profiling is then done through DNA typing systems such as STR typing, mitochondrial DNA analysis, single nucleotide polymorphism, analysis of variation in the X-Y homologous amelogenin genes.<sup>[5]</sup> Disaster victim identification team should have thorough knowledge that teeth constitute an excellent source of DNA in identifying victims of mass disasters. Further, they should know from which teeth/area of teeth the samples should be judiciously taken for getting adequate quantities of pure DNA.

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#### CONFLICTS OF INTEREST

There are no conflicts of interest.

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