

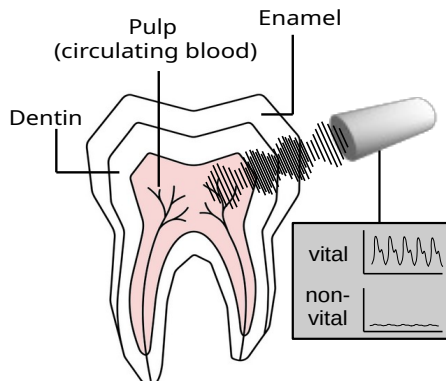
## SONOVITA

### Development of an innovative ultrasound methodology for the objective vitality assessment in dentistry

#### BACKGROUND

Assessing tooth vitality plays a pivotal role in dentistry when determining whether a tooth remains vital or has sustained irreversible damage. Based on this assessment, therapeutic decisions are made between conservative tooth preservation and invasive interventions such as root canal treatment. Currently, the most prevalent diagnostic approach is sensibility testing: a cotton pellet saturated with refrigerant spray is applied to the tooth, and the clinician relies on the patient's subjective report of stimulus perception.

However, this method is highly dependent on individual factors and prone to misinterpretation. Particularly in pediatric or geriatric populations, as well as following dental trauma, false-positive or false-negative results may occur. This leads to significant diagnostic uncertainty, potentially resulting in unnecessary or delayed interventions. At present, there is no established clinical procedure that provides a consistently reliable and objective assessment of pulpal vitality.



#### PROJECT GOALS

The objective of the project is the development and validation of an objective method for assessing dental vitality. The innovative core of this approach lies in the application of high-frequency ultrasound waves, which exhibit high sensitivity to blood flow due to their distinct interaction with erythrocytes. This allows for the detection of minimal flow rates within the microvasculature of the dental pulp, serving as an objective indicator of tooth vitality. Within the scope of this project, the following goals are to be achieved:

- Determination of physiological pulp vitality parameters and the acoustic properties of dental hard tissues.
- Definition of clinical and technological requirements for vitality diagnostics.
- Demonstration of perfusion levels in extracted teeth

#### KEY ACTIVITIES

To achieve the project objectives, the following milestones are pursued within the scope of the project:

- Elaboration of a design concept based on key diagnostic considerations and clinical requirements, including usability, examination time, sterilization capability, and ergonomics.
- Development of an ex-vivo demonstrator for extracted teeth consisting of: (1) a perfusion model, (2) a bench-top setup of an ultrasound probe.
- Development of adaptive and self-learning signal processing strategies for low-perfusion measurement and selective depth-profile analysis, including AI-driven approaches.

#### Responsible Body

TUBAF Innovation Fonds (TIF)

#### Duration

2026 – 2027

#### Collaborators

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