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Current status and future prospects of stomatology research

Key words: Stomatology; Dental medicine; Systemic Diseases; Materials; Innovative techniques

Research Summary

This review mainly focused on research in stomatology (dental medicine) to expand globally and is oriented towards solving clinical issues, focusing on the following aspects:

- **Understanding the association between oral diseases and systemic diseases facilitates the early detection and effective prevention of systemic diseases.**
- **Innovative materials and technologies enhance solutions to several clinical challenges**
- **AI, 5G, and big data techniques create a new paradigm of clinical treatment, education, and research**

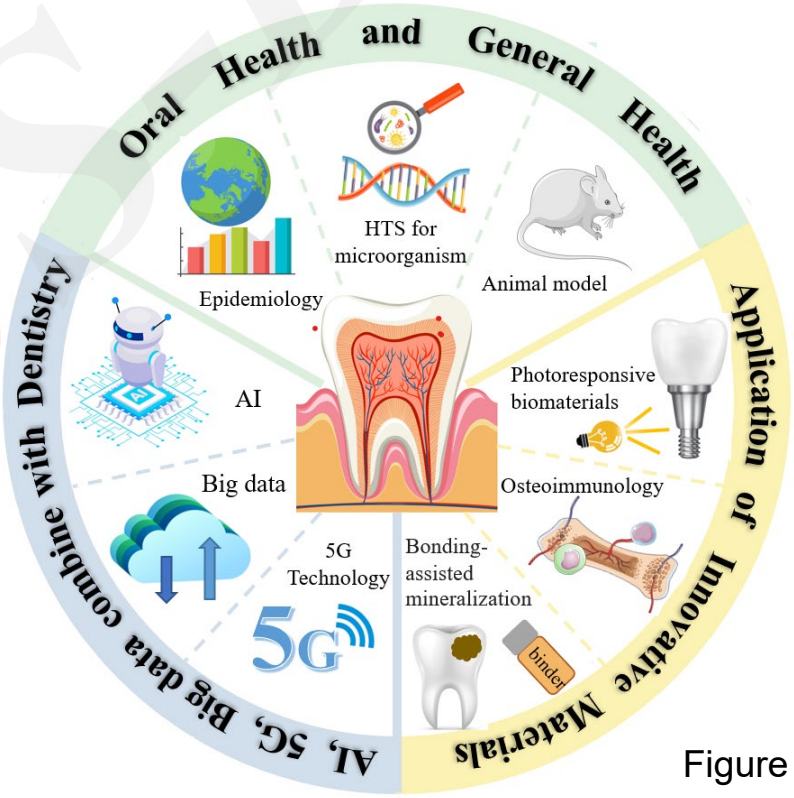

Figure 3

Innovation points

- **Introduction of the association of oral diseases with systemic diseases**
- **Summary of the following aspects:**
  - Clinical epidemiology associates oral and systemic connections
  - High-throughput sequencing promotes the identification of oral-systemic connections
  - Animal modelling reveals the specific molecular mechanism of oral-systemic connections

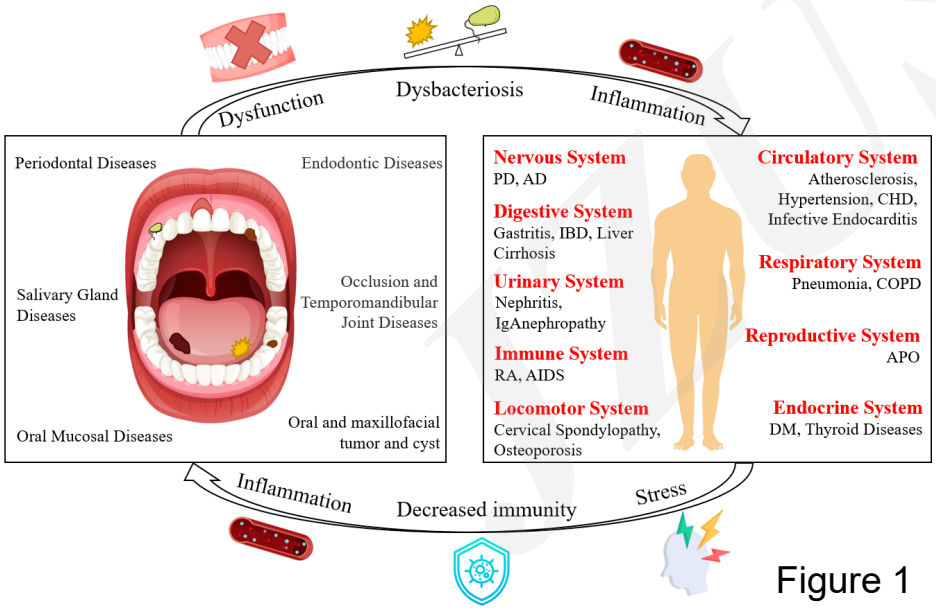

Figure 1

Table 1 | Dominant Microbes Detected in Oral Diseases

Table 2 | Association between Systemic Diseases and Oral Dominant Microbes

Table 3 | Some animal models of oral-systemic connections

Innovation points

- **Introduction of innovative materials and technologies in stomatology**
- **Summary of the following aspects:**
  - Cell-sheet engineering promotes implant osseointegration
  - Physical and component modifications of materials modulate osseointegration via osteoimmunology
  - The bionic mineralization combined bonding technique: a fresh approach to repairing dental tissue defects

Table 4. Immunomodulation of osseointegration by altering biomaterial properties

Implant materials	Methods	Mechanism	Ref
Titanium implant	Change the porosity and pore size	Larger porosity and pore size reduces the inflammatory response and facilitates osseointegration.	(Taniguchi et al., 2016; Wang et al., 2016)
Titanium implant	Change the titanium surface particle roughness	As the roughness increases, macrophages become more malleable on the material surface and are more likely to secrete inflammatory factors such as IL-6 and TNF-α.	(Refai et al., 2004)
Titanium implant	Change the hydrophilicity and hydrophobicity of materials	A hydrophilic TiO_2 film surface promotes M2-type polarization of macrophages. Decreased hydrophobicity can lead to lower IL-6 and TNF-α levels.	(Hotchkiss et al., 2016)
Titanium implant	Nanomorphol-ogy	Nanomorphs regulate endogenous bone morphogenetic protein expression and signalling pathways to induce osteoblast differentiation and downregulate MCP-1, IL-6, and IL-8 expression.	(L et al., 2016)

Innovation points

- **Introduction of AI, 5G, and big data techniques create a new paradigm of clinical treatment, education, and research**
- **Summary of the following aspects:**
  - Innovative techniques make dental practice more intelligent, precise and personalized
  - Innovative techniques can reform the model of stomatological education
  - Innovative techniques propel research on stomatology to a new level

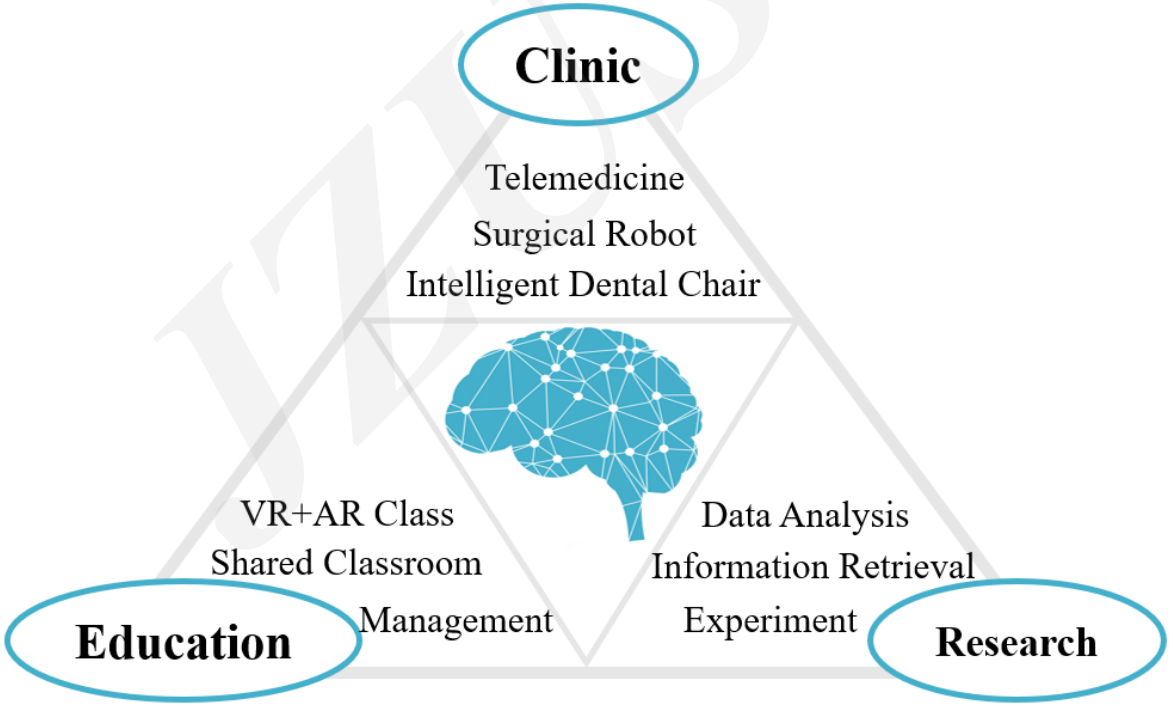

Figure 2