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BIOCOMPATIBILITY OF ORTHODONTIC MATERIALS: A SYSTEMATIC REVIEW.

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Aim The biocompatibility of an orthodontic material is measured by evaluating short- and long term effects of the material's contact with the biological components of the tissues through 1. in vitro tests 2. in vivo tests 3. tests on animal models and clinical trials¹. The biocompatibility of a metallic alloy is directly dependent on its corrosion effect, which seems to be minimal in nickel-free alloys and maximum in stainless steel due to oxidation of the surface layers. Biocompatibility tests would require models that reproduce the physical-chemical conditions of the oral cavity, the corrosive ability of saliva, exposure to bacterial biofilm, immune reactivity, exposure times related to the duration of orthodontic treatments. The results should also be compared with the systemic absorption of residues^{1,2}. To date, biocompatibility studies with heterogeneous methods and purposes have been carried out making comparison difficult. Purpose of this study was review assessing of the biocompatibility of most used intraoral dental appliances materials³.

Methods PubMed was searched using various combinations of the following keywords: "orthodontic appliances" and "corrosion", "toxicity test", "cytotoxicity", "hypersensitivity", "biocompatibility" or "safety" inclusion criteria: Original articles published in English from 2011/06 to 2021, assessing potential effects of orthodontic appliances material on oral tissues or systemic health. Exclusion criteria: articles not in English; articles on experimental materials and never used before in the commercial production of orthodontic appliances; articles expressing relative ratios without absolute values, articles not available online.

Results and conclusions 166 potentially relevant articles have been identified with multiple searches. All abstracts have been read, 87 were excluded for lack of consistency with the research, 32 for application of the inclusion/exclusion criteria, 9 because duplicated. The selected articles were read in full, the tests performed in each work and whether the tests were positive, or negative were considered. It was also considered whether a threshold for toxicity or reversibility of the effects was verified. 39 studies testing the following effects were selected: corrosion=14, leaching=1, cytotoxicity=24 and genotoxicity=4, sensitivity=5 (Table 1). 28/39 articles reported slight or moderate positivity to the tests and 6 of them verified reversibility of the effects over time. Human studies are scarce (Table 2). Coated surfaces seem to be a solution to excessive corrosion but may interfere with elasticity of materials. Lowest levels of corrosion are confirmed for coated NiTi alloys and lowest cytotoxicity for nickel-free alloys. Experimental models, since in vitro studies cannot accurately reproduce the conditions of the oral cavity, any toxic effects and hypersensitivity should be investigated by implementing retrospective cohort studies or prospective observational studies.

Bibliography

- de Souza Costa CA, Hebling J, Scheffel DLS, Soares DGS, Basso FG, Ribeiro APD. Methods to evaluate and strategies to improve the biocompatibility of dental materials and operative techniques. *Dent Mater*. 2014;30(7):769-784. doi:10.1016/j.dental.2014.04.010
- Ikadi A, Koletsu D, Papageorgiou SN, Elades I. Safety Considerations for Thermoplastic-Type Appliances Used as Orthodontic Aligners or Retainers: A Systematic Review and Meta-Analysis of Clinical and In-Vitro Research. *Materials* (Basel). 2020 Apr 14;13(8):1843. doi: 10.3390/ma13081843. PMID: 32295305; PMCID: PMC7115465
- Martin-Cameán A, Ios Á, Mellado-García P, Iglesias-Linares A, Solano E, Cameán AM. In vitro and in vivo evidence of the cytotoxic and genotoxic effects of metal ions released by orthodontic appliances: A review. *Environ Toxicol Pharmacol*. 2013;40(1):86-113. doi:10.1016/j.etap.2015.05.007

DENTO-SKELETAL EFFECTS

67	MONTENEGRO VALENTINA	COMPARISON OF THE CRANIO-CERVICAL EFFECTS OF DIFFERENT ORTHODONTIC THERAPIES	↓
165	MONTEROSSO ALFREDO SALVATORE	DISTAL-JET ON SKELETON-ANCHORED: DESCRIPTION OF A CLINICAL CASE ^{1,2}	↓
61	MORETTI SOFIA	CHANGES OF GINGIVAL MARGINS DURING ORTHODONTIC TREATMENT WITH INVISALIGN FIRST	↓
77	MORIN EUGENIA	ANALYSIS OF THE OVERCORRECTIONS TO BE INCLUDED DURING THE INITIAL PLANNING OF CLEAR ALIGNER THERAPY: A RETROSPECTIVE STUDY	↓
128	MOSCA ARIANNA	AGENESIS OF THE MAXILLARY LATERAL INCISOR: SPACE CLOSURE OR SPACE OPENING?	↓
130	MOSCA ARIANNA	PREVALENCE, ETIOLOGY, DIAGNOSIS, TREATMENT AND COMPLICATIONS OF SUPERNUMERARY PREMOLARS	↓
131	MOSCA ARIANNA	EVALUATION OF DEEP BITE CORRECTION WITH CLEAR ALIGNERS: A LITERATURE REVIEW	↓