

## RESPONSE REACTIONS STUDY OF THE ORAL TISSUES TO THE DENTAL ALLOYS

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### ABSTRACT

**Aim of the study:** the study on the allergic, inflammatory and toxic reactions of the dental alloys. **Material and method:** Oral clinical examination followed the presence of reactions due to some release elements in the oral environment. Morphopathological examination allowed to assess the reactivity of oral tissues who were in direct contact with dental materials. **Results:** the subjective symptoms incriminated was: metallic taste, burning sensations, decrease in taste sensitivity, etc. association with general status. Objective symptoms was: allergic, inflammatory, and chimico-toxic mechano-irritative reactions. Mophopatologic examen show atrophic aspects of oral mucosa with decrease dimension and papiles brides, or hipertrophic aspect, with inflammatory infiltration in the corion and dystrophic lesions with to break off epithelium integrity. **Conclusions:** metallic restorations may determine unfavorable interactions between alloys and oral adjacent structures with severe clinical implications.

**Key words:** dental alloys, response reactions, oral tissue

### INTRODUCTION

Nowadays, we can find on the market over 3000 different dental alloys and many technologies which are applied in order to use these dental alloys. Fixed denture prosthesis made of metal alloys is used to reestablish the morphology and functions of the stomatognath system improving or losing the system's dysfunctions and, in the same time, assuring a greater stability and longevity of the restoration in the oral cavity. The continuous perfecting of dental medicine imposed individualized alloys conceiving, adapted to the diverse clinical situations such as: noble, semi noble or ennoble alloys, materials which are sometimes accompanied by the appearance of some oral manifestations with diverse origins: traumatic, irritative, chemical and toxic or even psychosomatic (5, 6, 11).

Recent studies showed that alloys reactions can appear at the metal restorations

contact and that they assign the existent symptoms to the alloy components released in the oral cavity while functioning (8, 9).

Reports on the clinical adverse reactions predominance towards any material frequently utilized in the dental practice, show that their frequency is relatively low compared to the great number of existent restorative treatments.

### MATERIAL AND METHODS

The study group was represented by a number of 63 patients of the Clinical Service of Oro-dental diagnosis (27 female and 36 male) aged between 30- 60 years, which wore fixed denture prosthesis made of Cr- Co, Cr-Ni Palladium, associated or not with dental ceramics, composite and dentures made of Cu alloys.

The meticulously realized local clinical examination was centered on the presence of

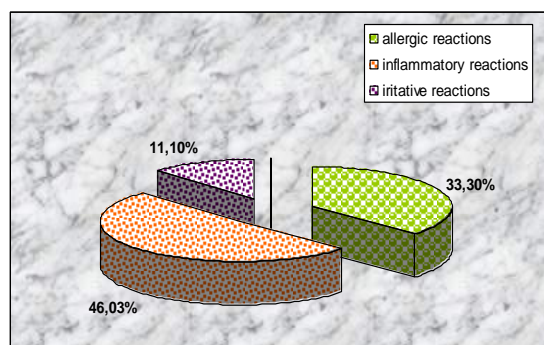
different types of specific reactions of ions release in the oral cavity.

In order to determine the soft oral tissues reactivity, the morphopathological examination of the mucosal affected areas was made during the preprosthetic surgical interventions or the abutment tooth extractions.

We used a control group of 18 patients for comparison. The patients presented dental prosthesis made of the same type of material, but which did not show any adverse reaction to the dental material.

## RESULTS AND DISCUSSIONS

Regarding the subjective symptomatology, we observed the metal taste sensation, especially in the morning, after waking-up in a number of 27 cases (42,8%), reflex sialorrhea which frequently accompanies this symptom of 19 patients (30,1% cases) and the dry mouth sensation, especially in the allergy cases, sensibility disorders (burn, paresthesias), usually on the tongue edges in contact with the prosthesis in 12 cases (19,04%) and even more intense pain in the case of severe reactions where the chemo-toxic or mechanical irritative cause actions, irrespective of the alloy. A great variety of subjective complaints were reported by the patients as adverse effects to the dental materials based on Cu, suggesting their replacement (figure 1).



**Figure 1. The subjective symptoms classified**

Subjective complaints like those reported

in this study were described in the medical literature regarding singular studies on patient groups (5). The general complaint frequency and type (cephalea and asteny) was similar in many cases.

Regarding the response reaction of the oral tissues, associated with subjective symptoms we observed the allergic phenomena (33,3%), inflammation (46,03%) and just 11,1% presented mechanical irritative reactions, with a severity that grows with the prosthesis seniority. Most the patients with allergic reactions declared the existence of an allergic ground and the subjective and objective symptomatology yielded after restorations removal to reappear with a large intensity at a new utilize (11).

We observed an allergic phenomena predominance at the prosthesis made of Cu alloys, followed by Cr- Ni alloys and Cr- Co. Ni reactions can be produced by the toxicity of this alloy component. Ceramics allergic reactions were not shown, but, it determined inflammatory modifications. The same inflammatory phenomenon were observed in the case of dental restorations made of Cr-Co, Cr- Ni and Palliag.

Objective intraoral manifestations were: congestion, tumefaction, ulceration or atrophy of the oral mucosa in vicinity of the restorations. Ulcerations frequency related to Cu dental alloys can be motivated by the increased number of patients which presented the symptoms.

The present study shows that the most evident reaction of the dental alloys corrosion products on the soft tissues is encountered in case of  $\text{Cu}^{2+}$ ,  $\text{Zn}^{2+}$  and  $\text{Ag}^{2+}$  ions contact which have medium influence, relatively low effects being observed in the tissues complied to the  $\text{Co}^{2+}$  and  $\text{Ni}^{2+}$  ion influence although  $\text{Ni}^{2+}$  toxicity is known. The fact that some subjects who aren't hypersensitive to Ni or Cr can become partially tolerant to the mucosa exposure at those alloys is also added. Cr- Co

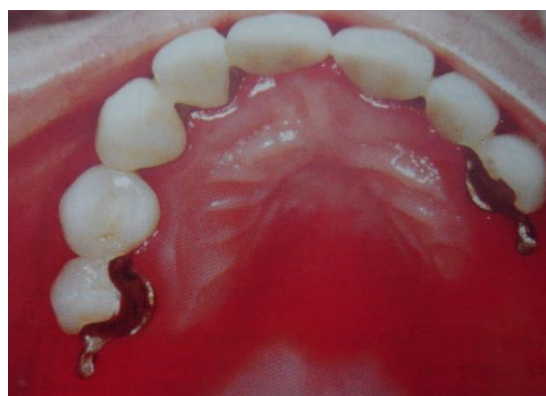
alloys used in dental restorations did not induce allergic reactions, although cutaneous distance reactions are described (2, 3, 10).

Metal cations alloys (Pallag) are continuously released in saliva and stored in tissues. It seems that Palladium like Mercury has high levels of galvanic current densities when near other metals, with the current densities of Pd alloys approx. 10 times higher than for high noble alloys. This causes extensive migration of mercury and palladium to saliva starting the galvanism phenomenon. It seems that Palladium is also often involved in important reactions, encountering in practice lichenoid vicinity reactions (1, 10).

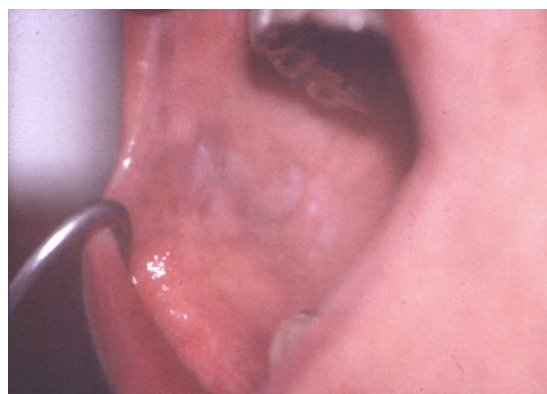
All dental materials, especially the monocomponent ones, have certain saliva solubility. The oral mucosa sensibility threshold at toxic agents is way lower than the one of the cutaneous epithelium because of the oral mucosa anatomical and physiological properties (low fatty tissue, salivary flux influence, high resorption capacity). The majority or total absence of the cornel layer could interfere with the rapid removal, degradation or fermentative transformation of the resulted compounds. Thus, the majority of the present allergic reactions are actually contact reactions, with symptoms strictly localized in areas moistened by the saliva, manifested by erythema and rarely by erosions or ulcerations which are usually strictly localized in the contact areas, rarely being interested areas like the labial, lingual or jugal mucosa (figure 2, figure 3, figure 4).



**Figure 2. Tumefactions, inflammatory and changes Cu alloys**



**Figure 3. Allergic reactions to the Cr- Co alloys**



**Figure 4. Lichenoid reactions to Pallag**

Furthermore, along with the inflammatory phenomenon, there were some chemo- toxic mechanical irritative reactions (oral mucosa tumefactions, erosions and ulcerations, especially under the pontic body and the dorsal face of the tongue) often associated with these inflammatory phenomenon of the conjunct prosthesis. Inflammatory changes

are added to the allergic reactions, determined by the ischemia, subjacent mucosa compression and infectious phenomenon caused by the microbial flora from the rich bacterial plaque and it is hard to remove from the surface of the mucoseal face of restoration (ecological niches figure 5).

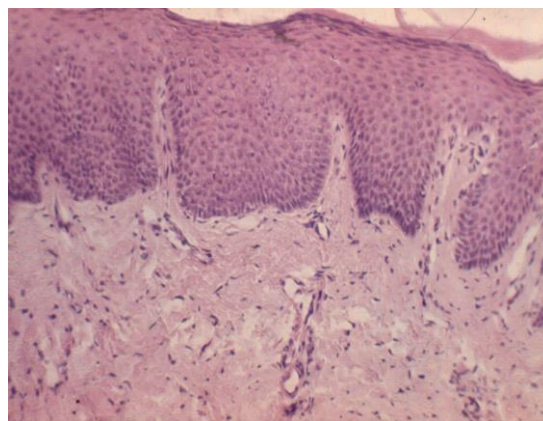
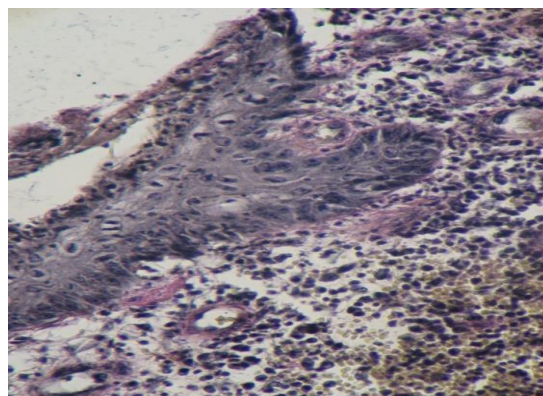


**Figure 5. Ecological niches**

The erosive or ulcerative lesions associated with the subjective causes (metal taste) are determined by the galvanic phenomenon which break out when some different metals are in contact (electrical circuits between Palliag or Cr- Co and amalgam restorations). Patients with such galvanic couples don't present evident objective signs but, there are possible some neurological disorders. The symptomatology is classified according to nowadays knowledge in the psychoneurological intolerances frame of reference, when psychoneurogen factors having an important role (10, 11).

It is evident the fact that, biologically, the consequences shouldn't be neglected; the micro galvanic currents are often involved in the present burn sensations and in the corrosion process in the oral cavity. A simple calculation shows that, taking into account their maximum intensity of  $10^{-4}$  A and their maximum potential difference of 1 V, we have a power of  $10^{-4}$  W which determines a growth of the local temperature with less than  $1/100000$  C in one second, which means 10 C/3h (8, 9).

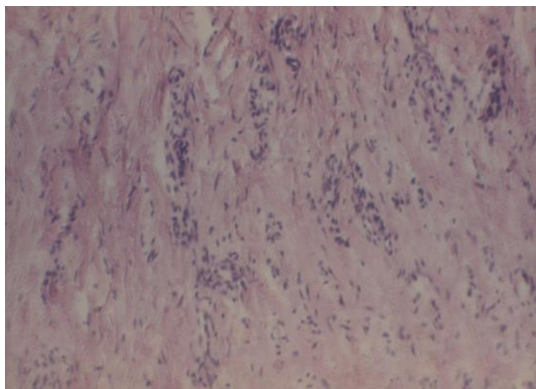
When studying the morphopatological preparations, we observed the advent of an atrophic epithelial feature, thickness reduced, while it's papillary comb are numerically reduced, thick, plated, with intensified chorion so that the chorio- epithelial limit is faded. The cellular layer's number from the spiny coat is reduced, presenting plated cells and the intercellular spaces are small; this imagine is encountered in many restorations with assessed age which compensate the subjacent mucosa. The pontic body, traumatized (figure 6).



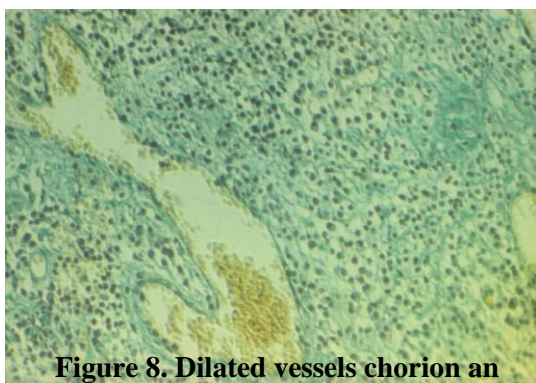
**Figure 6. Atrophy and chronic inflammation**

In the case of edematous and often hypertrophic mucosa, which is characteristic one commune alloys (Fe-Cr-Ni, Cr- Ni), the epithelium is hypertrophic and often presents superficial erosions, great intercellular spaces and even absent superficial layer here and there. The haemosiderin granules, principally localized at the chorio- epithelial limit are

present in the dilated vessels chorion with greater perivessel lympho- plasmocyte inflammatory infiltrate, infiltration areas in different stages, more or less extended (figure 7, 8).



**Figure 7. Chorion inflammatory infiltrate and haemosiderin granules**



**Figure 8. Dilated vessels chorion an**

### **perivessel infiltrate**

The acanthotic or dyscherathotic mucosa changes are sometimes at limit with the mucosal normal features: flat, slick, bourgeon like, bleeding mucosa, with a discontinued or divided keratin layer heading towards the alloys toxic components involvement

### **CONCLUSIONS**

One may affirm that a dental material should be as less harmful as possible, should not contain diffusible toxic substances in the bloodstream or potential allergic elements and should not present immediate or in time unfavorable effects. This issue becomes challenging knowing that esthetics, longevity and restorations biocompatibility highly depends on their resistance at the corrosion in the oral cavity.

The different alloys restorations existence can develop unfavorable interactions between alloys and the surrounding structures, having sometimes distinguished clinical involvements.

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