



RESEARCH ARTICLE

CIRCADIAN RHYTHMS AND DENTAL CARIES

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ABSTRACT

Introduction: Circadian rhythm is defined as the oscillations of biological variables at regular intervals of time. In mammals numerous clock genes have been described, whose function is to control all the circadian activity of those animals. We think that the progression of caries can be influenced by some circadian rhythms. The objective of this work is to review the circadian rhythms and establish which of them is the most influential in the formation of dental caries. **Material and methods:** A revision was made in Medline and Scielo medical databases, in order to select relevant information related to the object of this study. **Results:** they are in tables 1 and 2. **Conclusion:** Among the studied circadian rhythms, salivary is the one that has the most influence on the progression of caries.

INTRODUCTION

Circadian rhythm is defined as the oscillations of biological variables at regular intervals of time. There are many works that describe biorhythms in the human body and the influence that some external factors have on them. It is known, for example, that the dream period of astronauts is reduced in space flights in comparison to what happens on Earth, and this is attributed to the effect of microgravity (Gundel *et al.*, 1997). The levels of testosterone and cortisol in saliva have a circadian rhythm with maximum values at 8:00 hours and minimum at 22:00 hours (López Calbet *et al.*, 1993), but some routine dental procedures, such as extractions provoke an adrenal response to stress, with an increase in blood cortisol level (Miller *et al.*, 1995). Melatonin also has a circadian production in the pineal gland with a 24-hour rhythm synchronized with the light-dark cycle (light suppresses its production while darkness increases it) (Puigdevall Gallego and Laudo Pardos, 1994). A circadian rhythm has also been described in the tooth eruption, related to hormonal fluctuations and its effect on the periodontal ligament (Lee and Proffit, 1995; Risinger and Proffit, 1996). In the case of human premolars, the peak of eruption coincides with the peak secretion of growth hormone and thyroid hormone (Risinger and Proffit, 1996; Risinger *et al.*, 1996).

The salivary flow, the concentration of salivary proteins and electrolytes have a circadian rhythm throughout the day and it is fundamental in the maintenance and protection of oral tissues. Saliva lubricates and cleanses the oral cavity, aids chewing, swallowing and digestion, buffering the pH, it also has antibacterial, antiviral and antifungal properties. It also contributes to the maintenance and remineralization of the teeth (López Jornet and Bermejo Fenoll, 1996). In mammals numerous clock genes have been described (Per1, Per2, Per3, Cry1, Cry2, Clock, Bmal1, Casein kinase, Rev-Erb), whose function is to control all the circadian activity of those animals. The experimental lesion of some of these genes causes a loss of circadian rhythm, in addition to developing different types of cancer. External factors influence clock genes and these, through neurotransmitters and neuromodulators, act on peripheral effectors (Hernández Rosas and Santiago García, 2010). We think that the progression of caries can be influenced by some circadian rhythms. The objective of this work is to review the circadian rhythms and establish which of them is the most influential in the formation of dental caries.

MATERIALS AND METHODS

A revision was made in Medline and Scielo medical databases, in order to select relevant information related to the object of this study.

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RESULTS

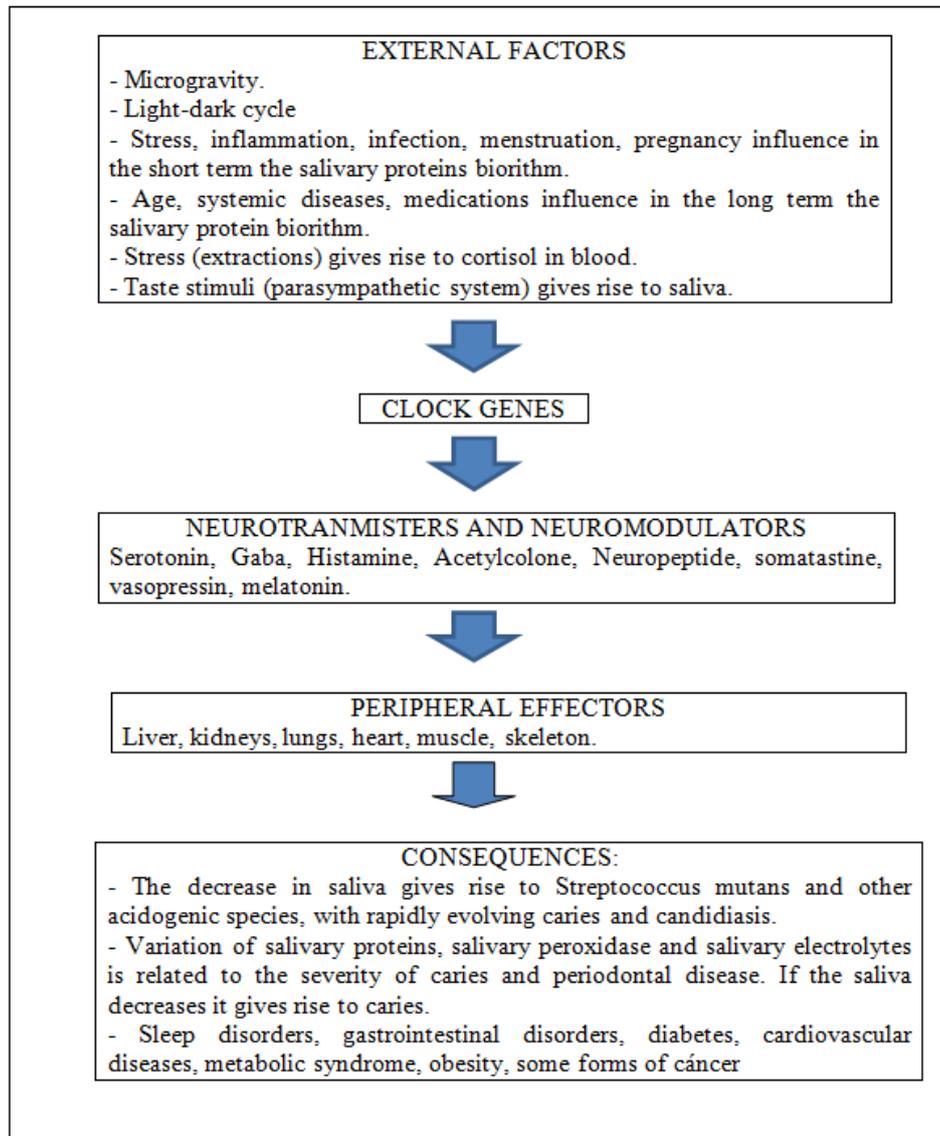


Table 1. Consequences caused by external factors on circadian rhythms

CIRCADIAN RHYTHMS
- Testosterone and cortisol: maximum at 8:00 hours and minimum at 22:00 hours.
- Melatonin: light decreases production, darkness increases it.
- Peak of growth hormone and thyroid hormone coincides with an eruption peak of human premolars.
- Salivary flow: maximum between 6-14 years and decreases after 20 years. It is more in men, more by day and less by night.
- Respiratory rhythm: every 6 seconds.
- Heart rate: every 1 second.
- Menstruation: 28 days

Table 2. Several circadian rhythms studied

DISCUSSION

Circadian rhythms can influence the development of different pathologies. With this in mind, treatments adapted to these circadian rhythms (chronotherapy) were established. In this way, the amounts of a drug that are released over 24 hours is done taking into account the circadian presentation of the disease, in order to improve the therapeutic efficacy of the drug.

This is proposed, for example, in the case of anticancer drugs (Hernández Rosas and Santiago García, 2010). It is therefore reasonable to try to see if any circadian rhythm can influence the progression of caries, because a treatment adapted to that rhythm could be made. It is known that people without saliva show an increase of *Streptococcus mutans* and other acidogenic species, favoring the appearance of caries of very rapid evolution and candidiasis (López Jornet and Bermejo Fenoll, 1996; Rudney, 1995; Anonymous, 1996; Blanco Carrión and

Otero Rey 2014; Bagán Sebastián 1995). The decrease in saliva at night also favors the progression of caries. It also tends to increase caries in non-usual areas such as interproximal areas of lower anterior teeth and incisal surfaces (López Jornet and Bermejo Fenoll, 1996). The treatment of caries could be adapted to that circadian rhythm, but there is the disadvantage that external factors can cause changes in the short and long term by modifying the concentration of salivary proteins (Table 1) (Rudney, 1995; Karjalainen *et al.*, 1992). In fact, individual variations of proteins and salivary electrolytes are related to the extent or severity of oral disease, especially with caries and periodontal disease (Rudney, 1995). Although most proteins in parotid saliva do not have antimicrobial activity, proline-rich proteins play a role in the regulation of bacterial attachment to the tooth surface (Dodds *et al.*, 1997). Other circadian rhythms, such as cortisol, have not been directly related to the progression of caries. However, the hormonal changes that occur during the second part of the menstrual cycle are related to inflammation of the gums.

Conclusion

Among the studied circadian rhythms, salivary is the one that has the most influence on the progression of caries.

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