

原文題目(出處)：	Melatonin in the oral cavity: physiological and pathological implications. J Periodont Res 2015; 50: 9-17
原文作者姓名：	Reiter RJ
通訊作者學校：	Department of Cellular and Structural Biology, UT Health Science Center, 7703 Floyd Curl Drive, San Antonio, TX USA
報告者姓名(組別)：	林秀蔓 Intern J 組
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內文：

(一) Melatonin has multiple, diverse physiological functions.

1. mediated by specific receptors in the membranes of most cells
經細胞膜上「接受器」產生作用
2. receptor-independent free radical scavenging actions
有獨立受體清除自由基的功能
3. indirect protective functions against reactive oxygen (ROS) and reactive nitrogen species via its ability to stimulate antioxidative enzymes.
有刺激抗氧化酶能力，可以抗活性氧和活性氮(間接保護作用)

(二)

Bodily fluids

褪黑激素在不同體液中濃度的變化量很大，在唾液中的濃度較採集的血液樣本中低。

Cells

在細胞中褪黑激素也不均勻分布在胞器中，通常濃度會高於血液樣本。

在肝細胞中，細胞膜>粒腺體>細胞核>胞液

Oral cavity

1. melatonin rhythm expressed in the saliva
2. levels of melatonin in the saliva are roughly 1/4 to 1/3 those in the general circulation
(ranging from 1 to 5 pg/mL in the day and up to 50 pg/mL at night)
3. the quantity of melatonin that enters the oral cavity is proportional to salivary flow
4. The salivary glands may themselves synthesize melatonin.
(1) Shimozuma et al.: immunohistochemically identified the expression of the enzymes that mediate the serotonin-to-melatonin transformation in the major salivary glands of the rat and in the human submandibular gland.
免疫組織化學確定了大鼠的主要唾液腺和在人頷下腺有介導血清素轉化成褪黑色素的酵素的表達

(三)

1. Tablets, capsules and liquid products containing melatonin are widely available
輔助睡眠，抗抑鬱劑，晝夜節律調節劑，抗氧化劑等等，使用時褪黑激素在口腔中的濃度會在短期內大幅度增加，他的抗氧化性和抗發炎活性可以促進口腔健康。
2. 食物中也含有褪黑激素，目前也有研發出一些含褪黑激素的牙膏和漱口水以及緩慢釋放褪黑激素的凝膠(可以有效減少口腔粘膜病變)
3. in the gingival crevicular fluid:濃度較唾液低
4. Cutando et al.: the association between daytime salivary melatonin levels and the severity of the inflammatory status in periodontal disease
白天唾液褪黑激素水平和牙周疾病的炎症狀態的嚴重程度關係: 血漿和唾液

中褪黑激素水平和牙周炎的嚴重程度之間為逆相關

→ more severe periodontitis could have been a result of reduced secretion of melatonin into the saliva.

5. Sjogren's disease expected to have little melatonin in the oral cavity and poorer oral health.
6. Cutando et al. and Almughrabi et al : lower melatonin levels in both the saliva and crevicular fluid → chronic or aggressive periodontitis

(四) Melatonin receptor-mediated and receptor-independent actions in the oral cavity

1. 細胞表面接受器有二種，ML1 和 ML2。其中只有 ML1 已經確定存在於口腔的黏膜細胞。

2. lamina propria of the gingiva 和 periodontium 含有大量的免疫活性細胞，也會產生褪黑激素

(五) Evidence supporting the function and use of melatonin in the oral cavity

1. Oral herpes infections

Boga and colleagues: antagonistic actions of melatonin on viral infections.

(1) 促進先天和適應性免疫

(2) 限制發炎介質的產生(cytokines and leukotrienes)

(3) 自由基清除能力

2. Gingivitis and periodontitis

Kara et al.: placed a ligature in a subgingival position on the mandibular first molar teeth in rats

After 4 wk, the ligatures were removed and the animals were given intraperitoneal placebo or melatonin (15 mg/kg) daily for 15 d

(1) reduced serum levels of the proinflammatory cytokines, interleukin-1B and tumor necrosis factor- alpha, and lowered the amount of 8-hydroxy-20-deoxyguanine (氧化損傷的DNA產物)

(2) stimulated the production of glutathione (細胞內抗氧化劑)

3. Oxidative damage and inflammation

(1) Melatonin and its metabolites can protect each of the categories of molecules from oxidative damage

(2) P. intermedia is a major contributor to inflammation of the periodontium

(3) Melatonin interfered with actions of LPS → aid in alleviating gingivitis/periodontitis

4. Prosthodontic benefits

(1) melatonin prevents activation of metalloproteinase-9(牙周膜崩解和支撐骨的侵蝕)

(2) 促進間質幹細胞的成骨細胞分化和增強骨形成

(3) 提升type I collagen的合成及bone sialoprotein的表達

(4) reduced the normal period of osteoblast differentiation from 21 to 12 d

(5) interferes with the capacity of osteoclasts to break down bone

(6) melatonin promoted all aspects of bone growth and stabilized the implants.

(7) By limiting the tissue damage, melatonin would curb the negative consequences of tooth removal and encourage more rapid healing of the wound.

5. Methacrylate toxicity

(1) Incomplete polymerization of the monomers could exhibit toxicity (cytotoxicity or genotoxicity)

(2) Blasiak et al.: human gingival fibroblasts exposed to a dental adhesive

- containing 45% 2-hydroxyethyl methacrylate and 55% bisphenol A-diglycidyl dimethacrylate
- (3) 褪黑激素減少DNA雙鏈斷裂和fibroblast apoptosis
 - (4) slowed DNA repair was improved
6. Chlorhexidine toxicity
 - (1) A disinfectant, not only destructive to bacteria but also damaging to other oral cavity cells (excessive free radical generation)
 - (2) Melatonin: free radical scavenging activities & antioxidative actions
 7. Oral cancer
 - (1) reducing mitochondrial damage in the mucosal cells
 - (2) Melatonin is a known protector against ionizing radiation. melatonin has both potent antioxidant and anti-inflammatory activity
 8. Dental caries
antibacterial properties
- (六) Conclusions and perspectives
1. reduce inflammatory responses in the gingiva and periodontium→aid in preserving and promoting alveolar bone growth.
 2. the antioxidant and anti-inflammatory capabilities may reduce pathogenetic processes

題號	題目
1	下列那些激素在人體內，夜間分泌比日間高？ (A) 褪黑激素 (Melatonin)、生長激素 (Growth hormone) (B) 動情素 (Estrogen)、生長激素 (C) 甲狀腺素 (Thyroxine)、褪黑激素 (D) 甲狀腺素、動情素
答案(A)	出處：Campbell Reece Biology (7th Edition)
題號	題目
2	與睡眠有關的調節分子褪黑激素 (Melatonin) 及 5-羥色胺 (Serotonin)，是何種胺基酸之代謝產物？ (A) 色胺酸 (Tryptophan) (B) 酪胺酸 (Tyrosine) (C) 苯丙胺酸 (Phenylalanine) (D) 組織胺酸 (Histidine)
答案(A)	出處：Campbell Reece Biology (7th Edition)