

# Periodontics

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## SAFETY OR BEAUTY? YOUR CHOICE

### Abstract

#### || Brief Background

Melanin is a dark, sulfur-containing pigment normally found in the hair, skin, ciliary body, choroid of the eye, pigment layer of the retina, and certain nerve cells. Though it has got similar chemical structure, it plays distinct roles at different sites. It has photoprotective role in skin, it acts as sound absorbing material when present in ear, in neurons it acts as a chelator for metal ions and hence protect the nerves from toxic metals. As melanin has got such diverse roles in different species and even at different sites, it also plays immunoregulatory role when present in gingiva. This study intends to evaluate a role of melanocytes in the defence mechanism of gingiva.

#### || Materials and Methods

The study was carried out on patients from outpatient department of Periodontics, Nair Hospital Dental College. Informed written consent was obtained from patients prior to the commencement of study. A proforma was prepared to collect the data regarding the presence of melanin pigmentation and gingival inflammation using gingival index using Loe and Silness in patients having plaque score 2 (acc. to Silness and Loe). The data obtained was subjected to statistical evaluation to come to a conclusion.

#### || Discussion

Melanin is present in many parts of the body including oral mucosa, especially gingiva. As it has got similar chemical structure, it plays distinct roles at different sites even in different species.

#### || Summary and Conclusions

Severity of gingivitis was compared with the presence or absence of melanin pigmentation and it was found that there is positive correlation ( $r=0.38$  and  $p<0.003$ ) between absence of melanin pigmentation and severity of gingivitis, which concludes that presence of melanin pigmentation, may be responsible for reduction in inflammation in gingiva.

#### || Key Words

Melanin, pigmentation, gingivitis, melanocytes, melanophore, immunocompetent, inflammation

**"A Comparative Evaluation of Gingival Disease Status in Patients with or without Melanin Pigmentation -- An Epidemiological Study."**

**|| Introduction**

During recent years much interest has developed in the subject of pigment cell, as a result of joint efforts of geneticists, chemists, physicists, and cytologists. A great deal of information and new literature is available. However, in the dental literature little is found about this subject.

Frequently, patients present themselves with pigmented areas in different areas of oral mucosa. These areas like those in the skin are due to presence of pigment known as melanin.

Pigmentation of skin and mucous membrane is of considerable interest and importance due to its clinical, metabolic and pathologic significance. Since the gingiva has not been closely investigated in regard to pigmentation as compared to skin and oral mucosa, not much information is available on its role in the protection of gingiva as in other tissues. Hence, carrying out a study to evaluate its role in the defence mechanism of gingiva was thought worthwhile.

Melanin is a dark pigment that imparts colour to the skin and hair. Like skin it is present in ciliary body, choroid of the eye, pigment layer of the retina, certain nerve cells, oral mucosa including gingiva. Though it has got similar chemical structure, it plays distinct roles at different sites. Its role in different tissues is shown below:

Recent research by J.D. Simon et al. (Pigment Cell Research, 2004, 17: 262-269) suggests that melanin may serve a protective role other than photoprotection. According to the study, melanin is able to effectively ligate metal ions through its carboxylate and phenolic hydroxyl groups, in many cases much more efficiently than the powerful chelating ligand ethylenediaminetetraacetate (EDTA). It may thus serve to sequester potentially toxic metal ions, protecting the rest of the cell. This hypothesis is supported by the fact that the loss of neuromelanin observed in Parkinson's disease is accompanied by an increase in iron levels in the brain.

Melanin pigment also has essential role in other animals. Melanins have very diverse roles and functions in various organisms. They can protect microorganism, such as bacteria and fungi, against

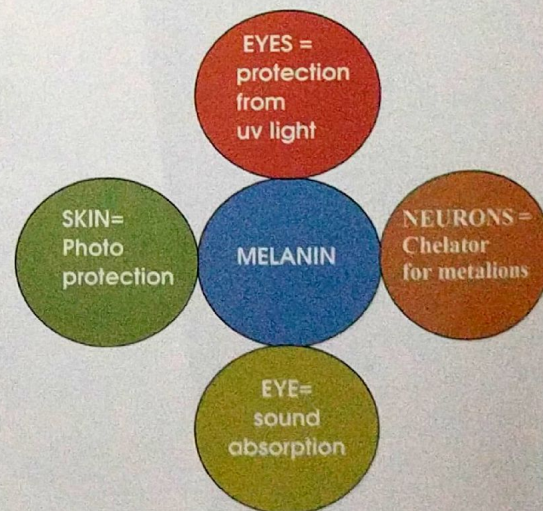
stresses that involve cell damage by solar UV radiation or generation of reactive oxygen species. Therefore, in many pathogenic microbes (for example, in *Cryptococcus neoformans*) melanins appear to play important roles in virulence and pathogenicity by protecting the microbe against immune responses of its host. A potentially novel role of melanin as a photosynthetic pigment in some fungi enabling them to capture gamma rays, and harness its energy for growth, has recently been described. In invertebrates, a major aspect of the innate immune defence system against invading pathogens involves melanin.

As melanin has got such diverse roles in different species and even at different sites, it also plays immunoregulatory role when present in gingiva. In gingiva, melanocytes are not only professional melanin producing cells but also immunocompetent cells.

**|| Study Design**

**Aims and objectives**

1. To evaluate the role of melanocytes in the defence mechanism of gingiva.
2. To know the influence of melanin pigmentation



on gingival health.

**|| Methods and Materials**

Patients for this study were selected from the outpatient Department of Periodontics, Nair Hospital Dental College, whose informed written consent was taken prior to the study.

**|| Clinical Protocol**

**Inclusion criteria**

A total number of 100 patients were selected using the following selection criteria:

1. Patients having plaque score 2 [Using Plaque index by Silness and Loe]
2. Patients with or without melanin pigmentation.

**Exclusion criteria**

1. Patients who are smokers.
2. Patients who have systemic diseases, e.g., diabetes, hypertension, epilepsy.

**Experiment Design**

Patients were selected using above criteria. They were subjected to detailed case history, examination and counselling. Patients were then divided into two groups depending upon presence or absence of melanin pigmentation, each group containing 50. Patients with gingival status were then noted using gingival index given by Loe and Silness.

**|| Results**

When patients with gingival status (severity of gingivitis) were compared with presence or absence of melanin pigmentation, it was found that absence of melanin pigmentation showed positive correlation ( $r=0.38$  and  $p<0.003$ ) with severity of gingivitis which concludes that the presence of melanin pigmentation may be responsible for reduction in inflammation in the gingiva.

Severity of melanin pigmentation was compared with the presence or absence of melanin pigmentation =

When the data was compared, it was found that only 4% of patients with melanin pigmentation showed severe gingivitis and 14% of patients showed mild gingivitis while in patients without melanin pigmentation 28% showed severe gingivitis and only 4% of patients had mild gingivitis. It indicates that patients without melanin pigmentation showed severe form of gingivitis than in patients with melanin pigmentation.

**|| Discussion**

Melanin is a water-insoluble polymer of various compounds derived from the amino acid tyrosine. It is one of the two pigments found in human skin and hair and adds brown colour to the skin. Various degrees of pigmentation found in the skin of human beings are directly related to the number, size, and distribution of melanosomes within the melanocytes and other cells.

Pigmentation in gingiva, melanoblasts, and Langerhans cells has been studied in dental literature by Laidlaw, Kahn and others. But the development of the pigment cell, which is a biochemical process, is not yet well understood. Hence even the exact function of this melanin pigment is still unclear.

Rawl states that there is dependence of the potential activity of melanoblasts on the adjacent tissue substrates. There must be a relationship between the behaviour of melanoblasts and biochemical components of surrounding tissue.

**Distribution of melanin pigment in epithelium**

Martin Cattoni, who studied melanoblasts, found that pigment density is the greatest in the lowermost cells and at the tips of connective tissue papillae.

GINGIVAL INDEX SCORE (BY SILNESS AND LOE)	PATIENTS WITH MELANIN PIGMENTATION (N=NUMBER OF SUBJECTS)	PATIENTS WITHOUT MELANIN PIGMENTATION (N=NUMBER OF SUBJECTS)
0.1-1 Mild gingivitis	N=7	N=2
1.1-2 Moderate gingivitis	N=41	N=34
2.1-3 Severe gingivitis	N=2	N=14

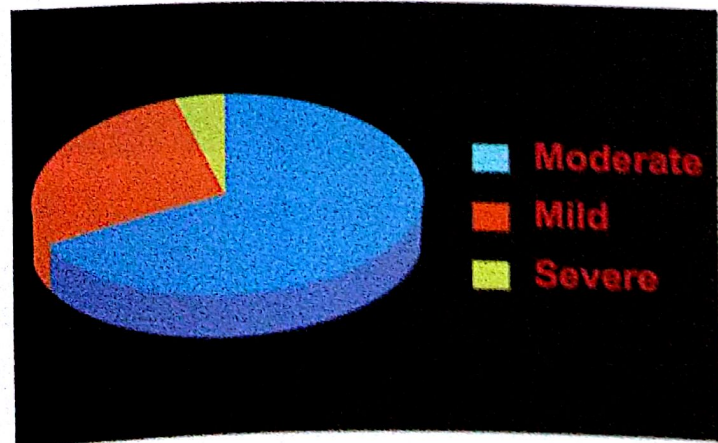
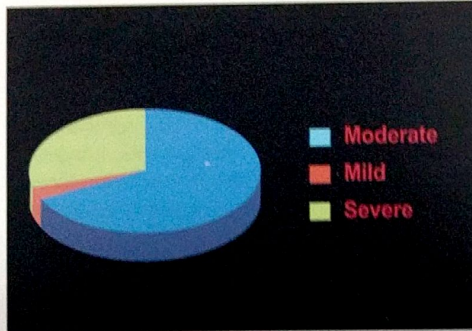


Fig. 03(a) Patients with melanin pigmentation



Fig\_03 (b) Patients without melanin pigmentation

In the germinative cells small round granules are localised around the nucleus and scattered in the cytoplasm. In the underlying connective tissue it is scattered among the fibres. The melanoblasts which are found are dopa positive. But in case of inflammation, melanoblasts lose their dopa activity; also melanophores are found in abundant quantities indicating their role during inflammation.

Patsakas, who studied the distribution of melanin pigment in different anatomical areas to relate the density of melanin granules to the degree of inflammation, found that the "Number of melanophores of gingival epithelium per unit area is directly correlated with the severity of inflammation in the subjacent connective tissue."

Yan Lu and Chang Ten stated that the dendritic nature, strategic location, and expression of important surface markers such as intercellular adhesion molecule 1 and CD 40 suggest that they are not only professional melanin producing cells but are also immunocompetent cells.

All these studies do indicate that melanoblasts not merely produce pigment and give colour to the tissues but, more importantly, protect the tissues by expressing different surface markers.

#### || Limitations

This epidemiological study proved an association between melanin pigmentation and inflammation but histological and biochemical studies are needed to be carried out to strengthen the association.

#### || Summary

There is a definite influence of inflammation on melanoblasts that affect melanin pigmentation.

It is shown that inflammation is less intense in patients with melanin pigmentation.

As its an era of cosmetics where depigmentation is becoming a popular treatment to improve an esthetics. And as we now know melanin is found to be protective in nature, the choice is in your hand

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