

PLASMA CELLS AND LYMPHOCYTES IN THE HEALTHY HUMAN GINGIVA*

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The gingiva is a part of the oral mucous membrane surrounding the teeth and covering the adjacent alveolar process. It is immovably and firmly attached to the periosteum of the alveolar bone by a very dense connective tissue. During mastication it is subjected to strong forces of friction and pressure. Such anatomic and physiologic peculiarity of the gingiva makes it vulnerable to a large number of irritants which do not have access to the other part of the oral mucous membranes (*Orban*, 1949 and 1953). It is therefore quite reasonable that an exudative nonspecific inflammation following surface injury is very commonly observed in the gingival tissues (*Ramfjord*, 1952). For this reason *Bernier* (1950) claims that a slight degree of this inflammation has to be considered normal for an adult person.

In an earlier communication, *Osogoe* (1951) has demonstrated that plasma cell aggregations, though highly variable in size, number and density, constantly occur in the subepithelial connective tissue of the gingiva which otherwise has to be regarded as normal. They were composed chiefly of more or less densely aggregated mature plasma cells of *Marschalko* type with a lesser number of lymphocytes; they occurred most frequently in the areas around small blood vessels where the collagenous fibers are scanty. Within the plasmocyte infiltrations occurring in such areas, a fine network of the argyrophil fibers was often well developed. On the basis of these observations, *Osogoe* regarded the plasmocyte aggregations in the gingiva as being the formations corresponding to the lymphocyte infiltrations which are very common in the subepithelial connective tissue of the intestinal and respiratory tracts.

The presence of plasma cell infiltrations in the seemingly healthy human gingiva has recently been confirmed by *Takata* (1955), who examined the tissues from 24 individuals of varying age from 3 to 42 years. Although his findings were essentially the same as described by *Osogoe*, *Takata* emphasized the abundant occurrence of lymphocytes in the subepithelial tissue of the gingiva. According to this author, there appear in the gingival tissues four types of round-cell infiltrations: (1) those consisting almost solely of lymphocytes; (2) those consisting

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predominantly of lymphocytes with a lesser number of plasma cells; (3) those consisting predominantly of plasma cells with a lesser number of lymphocytes; and finally, (4) those consisting almost solely of plasma cells. Among those four types of round cell infiltrations, the second and third types were found much more frequently than the first and fourth types, and the frequency of occurrence of individual types decreased in the following order: second type, third type, first type, fourth type.

Cattoni (1951) also reported that lymphocytes constantly occur not only in the subepithelial connective tissue but also in the epithelial layer of the healthy gingiva. In biopsy material from men and dogs, these cells were found passing through the basal membrane, entering into the intercellular spaces. The lymphocytes were most abundant in the germinative layer and fewer in the prickle cell layer. The lymphocytes never reach the superficial part of the epithelium.

Since in the earlier study (*Osogoe*, 1951) no special attention was directed to the lymphocytes present either in the epithelium or in the underlying connective tissue of the gingiva, it was felt necessary to re-examine the material on which the previous study was based. In addition, we examined two other individuals.

Table 1. Summary of findings in the seemingly healthy gingiva from 10 cases of sudden accidental death (drowning, suicide, or vehicle accident). Plasma cells tended to form dense aggregations in the subepithelial connective tissue, whereas lymphocytes were found scattered singly in both the connective tissue and epithelium of the gingiva.

Case No.	Sex	Age	Cause of death	Plasmocyte infiltration in connective tissue	Lymphocyte scattered singly in	
					connective tissue	epithelium
1	M	60	Drowning	+++	very numerous	very numerous
2	F	30	"	++	very numerous	very numerous
3	M	26	Suicide by potassium cyanide	+++	very numerous	very numerous
4	M	48	Drowning	+	scanty	scanty
5	F	25	Suicide by corrosive sublimate	+	numerous	numerous
6	M	19	Vehicle accident	++	numerous	numerous
7*	M	51	"	+++	numerous	numerous
8*	M	44	"	++	scanty	scanty
9**	M	29	"	++	numerous	numerous
10**	M	72	"	+	numerous	numerous

The designation +++ means the highest degree of plasmocyte infiltration in the subepithelial connective tissue as seen in Figs. 1, 2, 4, 5, and 6; ++ a somewhat lesser degree, as seen in Figs. 2 and 3; + a still lesser degree.

The designation "numerous" indicates a relatively large number of lymphocytes in the connective tissue and epithelium; as seen in Figs. 9 and 10; "very numerous" a greater number and "scanty" a lesser number of lymphocytes, as seen in Figs. 11 and 12, respectively.

* Fracture of the base of skull.

** Recently obtained material.

The cause of death for all these individuals could be certified as drowning, suicide, or vehicle accident, that is, as dying suddenly while in apparently good health (Table 1). Histological examination revealed that the gingival tissues from these individuals are relatively rich in plasma cells and sometimes also in lymphocytes but otherwise have to be regarded as normal. The findings in individual cases are listed in Table 1.

The characteristic features of the plasma cell aggregation occurring in the subepithelial connective tissue of the gingiva are quite the same as described previously (Osogoe, 1951). The plasma cell aggregations, variable in size, form and number, consisted predominantly of mature plasma cells of *Marschalko* type (Figs. 1-6). In the regions, notably around small blood vessels, where such plasma cell aggregations occurred, there is developed a fine network of argyrophil fibers, simulating that of the lymphatic tissue (Fig. 8). The plasma cell aggregations were found not only in the attached but also in the free gingiva.

Contrary to the observations of *Takata* (1955), lymphocytes never occurred in the form of cell aggregations in the gingival tissues we examined; these cells were found scattered singly in variable numbers in both the connective tissue and epithelium. As seen in Table 1, there was a tendency that the greater the degree of plasma cell infiltration was, the more numerous were the lymphocytes which were found in the connective tissue and epithelium. The lymphocytes were most abundant in the papillar layer of the subepithelial connective tissue and in the germinative layer of the epithelium. In the latter position some lymphocytes are passing through the basal membrane, entering into the intercellular spaces. In such instances both lymphocytes and basal epithelial cells often showed a physical distortion (Figs. 9-10). The lymphocytes never reach the superficial part of the epithelium. All the lymphocytes seen were intercellular in position. Neither mitotic figures nor signs of disintegration were observed among the lymphocytes.

The significance of the presence of the plasmocyte infiltration and the scattered lymphocytes in the gingiva is entirely unknown. It should be noticed, however, that while the scattered lymphocytes, though variable in numbers, also occur in other parts of the oral mucous membrane, the presence of an extensive infiltration of plasma cells is confined to the gingiva, and this represents one of its characteristic features. Therefore, this feature of the gingiva may be correlated with its anatomical and physiological peculiarity, especially with the fact that the gingiva is subjected to strong forces of friction and pressure in the process of mastication. That the gingiva is characterized by high connective tissue papillae may also be regarded as being an expression of structural and functional adaptation to mechanical impacts.

SUMMARY

1. The seemingly healthy gingival tissues from 10 human cases of sudden accidental death were studied in tissue sections.
2. In the subepithelial connective tissue of the gingiva which otherwise has to be considered normal, plasma cell aggregations, though highly variable in size, number and density, were found to be constantly present.
3. In addition to plasma cells, lymphocytes were also found scattered singly in variable numbers in both the connective tissue and the epithelium.
4. There was a tendency that the greater the degree of plasmocyte infiltration was, the more numerous were the lymphocytes which were found in the connective tissue and epithelium.

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EXPLANATION OF FIGURES

All of the photomicrographs were taken from preparations fixed in formol-alcohol and stained with *Mayer's* acid hemalum and eosin.

PLATE I

1. A large aggregation of plasma cells in the subepithelial connective tissue of the gingiva. Case No. 8, 44 year old man. $\times 100$.
2. A portion of the same plasma cell aggregation as shown in Fig. 1 under higher magnification. $\times 400$.
3. Small aggregations of plasma cells in the subepithelial connective tissue of the gingiva. Case No. 6, 19 year old man. $\times 100$.
4. One of the plasma cell aggregations shown in Fig. 3 under higher magnification. $\times 400$.

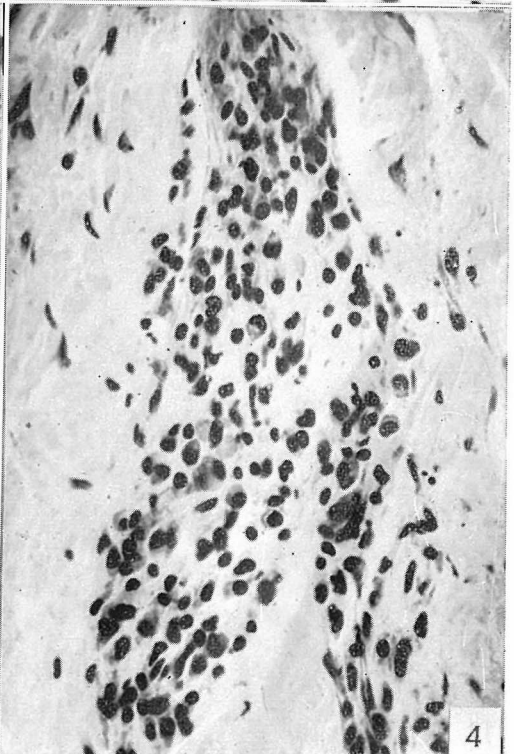
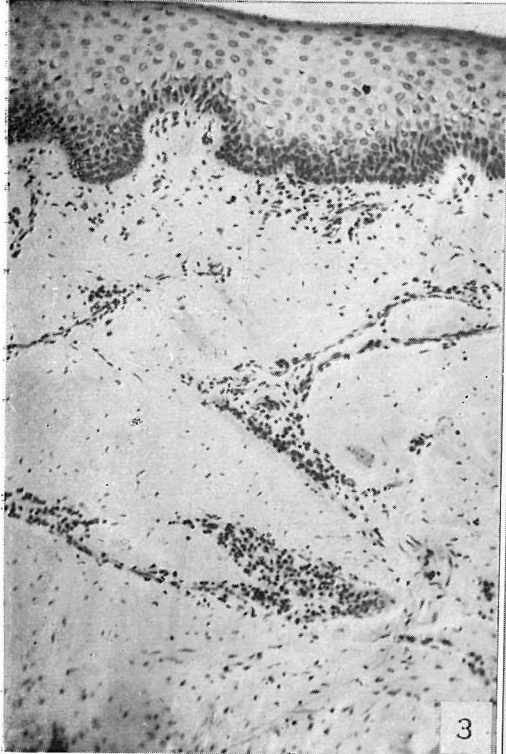
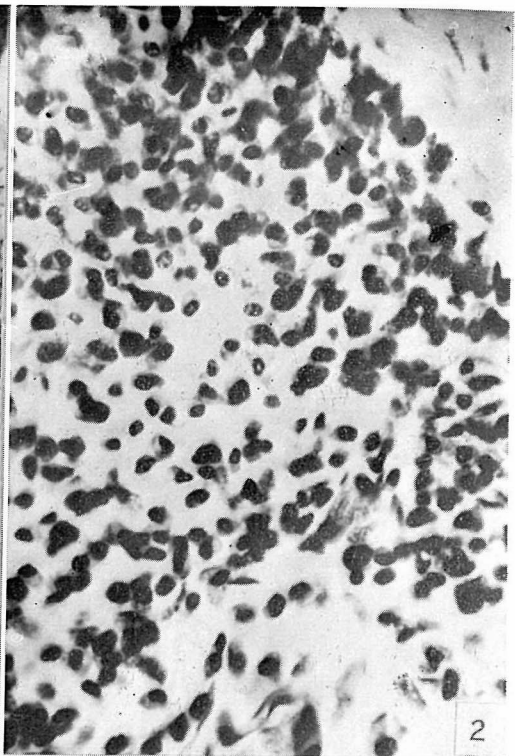
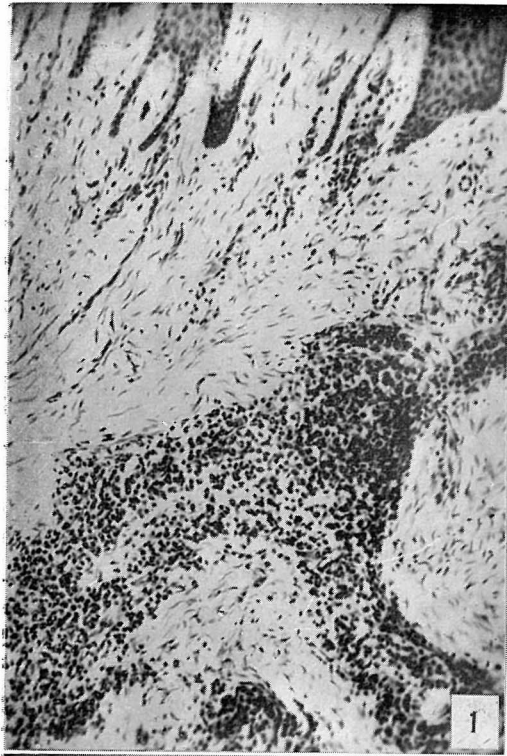


PLATE II

5. Diffuse infiltration of plasma cells around small blood vessels. Case No. 7, 51 year old man. $\times 100$.
6. High power magnification of a part of the plasma cell infiltration shown in Fig. 5. $\times 400$.
7. Low power view of the plasma cell aggregations in the subepithelial connective tissue of the gingiva. Case No. 3, 26 years old man. $\times 40$.
8. Silber impregnation of the subepithelial connective tissue from the same gingiva as illustrated in Fig. 7. A fine network of argyrophil fibers is well developed within the plasma cell infiltrations.

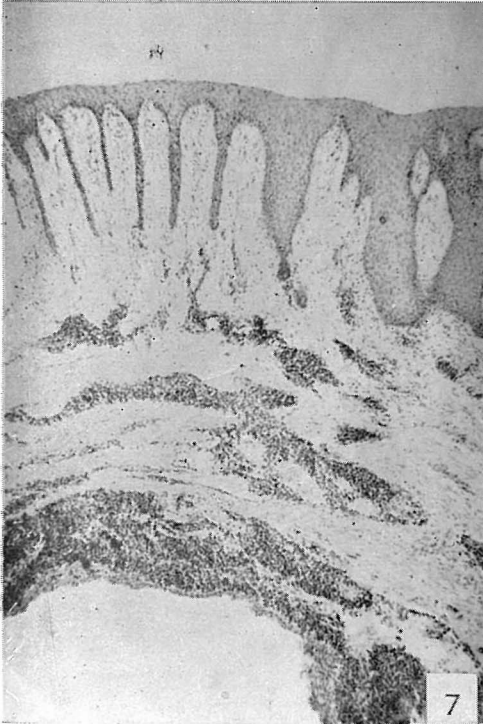
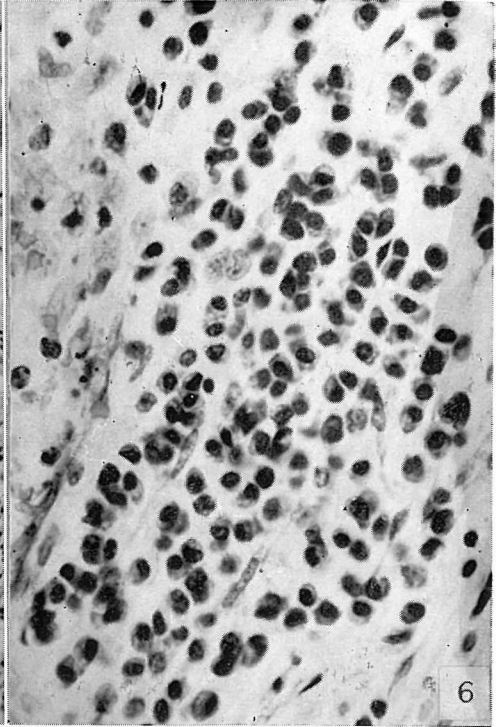
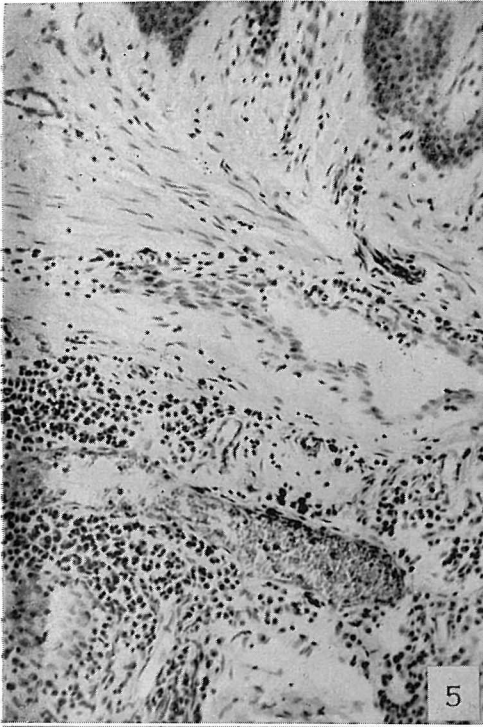


PLATE III

9. Scattered lymphocytes in the basal layer of the epithelium and in the underlying connective tissue of the gingiva. The small lymphocytes are seen as dark-staining bodies. Case No. 6, 19 year old man. $\times 400$.
10. Another part of the same section as shown in Fig. 9. $\times 400$.
11. Basal layer of the epithelium and underlying papillae of the gingiva. Numerous lymphocytes are seen in both layers. Case No. 3, 26 year old man. $\times 400$.
12. Basal layer of the epithelium and underlying papillae of the gingiva, both scanty in lymphocytes. Case No. 8, 44 year old man. $\times 400$.

