BIOCHEMICAL AND GENETIC HETEROGENEITY OF THE BASIC GLYCOPROTEINS OF PAROTID SALIVA.*

by

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The importance of salivary components in maintaining a state of oral and systemic health should not be underestimated. However, the precise relationship between any single glycoprotein component from the salivary secretions and the oral manifestations of disease is not easily determined. There are still many indications that saliva contributes glycoproteinaceous material to dental calculus, plaque, and the enamel integument. Up to now most of the studies have demonstrated that sialoproteins, in contrast to basic glycoproteins, are involved in adsorption phenomena. A concentrated effort has not been made, thus far, to study the basic glycoproteins in this context. Such experimentation, however, is anticipated with the belief that the basic glycoproteins take part in useful bodily functions.

Concluding Remarks and Summary.

Closely related groups of heterogeneous glycoproteins have been found in parotid saliva. Partial separation of these groups on the basis of their net charge has also been accomplished. Within each group there still remain minor charge differences, which are more difficult to define. Additionally, among those sub-groups with similar charge densities there appear to be assortments of molecules differing in the design of their carbohydrate architecture. Chemical, quantitative and statistical analysis of twin data has indicated that some of the individual monosaccharide and protein components are under genetic control.

Genetic heterogeneity was demonstrated by examining the within-set variances in MZ and DZ twins of the variables, Peak C protein/pre-Sephadex protein, Peak E protein/pre-Sephadex protein, and the monosaccharide/Peak protein ratios. Assuming that the Peak C and E Proteins (of the basic glycoproteins) have been isolated in a relatively pure state, the above Peak protein/pre-Sephadex ratios are the best estimates of the percentage of basic glycoproteins in parotid saliva. However, the Peak C and E proteins are not necessarily correlated with the pre-Sephadex soluble protein, and it may be a mistake to consider them in this manner. When examined as a ratio or as a separate entity, the within-set variance of the Peak C protein in twins was just barely significant at the 10% level. On the other hand, the Peak E protein within-set variance was unquestionably significant when analyzed either individually or as a ratio to the pre-Sephadex protein. The enhanced biochemical purity of the Peak E glycoprotein, as previously accounted for and discussed, may account for the more significant results of this variable.

The individual (specific) carbohydrates expressed as a ratio to the Peak C protein show significant differences in the two twin types. There are probably multiple genes affecting the structure of glycoproteins. Therefore, it seems reasonable to assume that the heterogeneity of the Peak C glycoprotein found in individuals is principally a consequence of the regulation of sugar moiety

attachment to the protein core, controlled by specific synthetic enzymes (transferases) which are genetically determined. Whether these genes affect control mechanisms or generate enzymes is only conjecture at this time. Undoubtedly, enzymes are involved, but whether synthetic or degradative processes have contributed to the findings in this study is hypothetical. Further biochemical and genetic coordinate studies on these heterogeneous molecules will be needed to resolve the many unanswered questions.

The possible association between the salivary basic glycoproteins and a factor recognized as a polycationic protein in the serum of patients with cystic fibrosis has been discussed. Also, there may be some correlation between the salivary basic glycoproteins and the glycoproteins associated with the enamel integument of teeth. Although not established, these relationships may have functional implications regarding the salivary glycoproteins.

Although family data is not yet available, it eventually will be possible to make quantitative estimates of the basic glycoproteins using less elaborate techniques in parents and their children. In this way, the genetics can be further substantiated, and patterns of inheritance related to quantitative measurements of the ranges (low, moderate, high) of glycoprotein secretion can be evaluated. Furthermore, it may then be possible to predict the secretory pattern or specificity in the progeny of known mating types.