Lectin Histochemistry of Palatine Glands in the Developing Rat

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At the light microscopical level, lectin histochemistry has been used to provide biological information for the glycosylation modification during development and under different physiological and pathological conditions. In the present study, an avidin-biotin technique was used to examine the binding pattern of lectins, soybean agglutinin (SBA), Dolichos biflorus agglutinin (DBA), Vicia villosa agglutinin (VVA), Ulex europaeus agglutinin-I (UEA-I), peanut agglutinin (PNA), wheat germ agglutinin (WGA), and succinylated WGA (sucWGA) in the developing rat palatine glands. Lectins were found to be bound to the basal membrane of acinar and duct cells in the developing palatine glands in the prenatal stage. Prenatally, results showed the importance of terminal sialic acid rather than N-acetylglucosamine (GalNAc) in this developmental differentiation. This conclusion was indicated by intense WGA binding to cell membranes and the lack of sucWGA binding. At embryonic day 18 (E18), weak labeling was observed with UEA-I and WGA at epithelial cords and the basal membrane of terminal buds, PNA showed higher affinity to epithelial buds than terminal bulbs, and there was no apparent binding for SBA, DBA, VVA, and sucWGA. At E20, after acinar lumenization, all lectins were detected at the acinar cell basal membranes. After birth, in addition to cell membranes, lectins were recognized in the cytoplasm and saliva. Palatine glands in the early postnatal stage exhibited the general overall appearance of an adult; therefore, no dramatic histological and morphological changes occurred during postnatal development. In parallel, lectin labeling at those stages was located in the cytoplasm apical region at slightly different degrees, and progressively increased with maturation and spread out basally, corresponding with progressive enlargement of the apical faint eosinophilic cytoplasm, where secretory granules exist. Postnataly at day 0, all lectins, except PNA bound to luminal border, showed generally similar lectin binding patterns. Staining tended to be diffuse or reticular in the apical cytoplasm and the apical as well as basolateral membranes of the acini. Apparent serous cells were observed around postnatal day 10 (PN10) and bound UEA-I, while PNA, SBA and sucWGA reacted from PN21. At PN21, a broad distribution of lectin bindings was noted. These additional mucous secretions might have been required as a lubricant for both chewing and swallowing of solid food, and provide a protective coating for the soft palate, and thus may be coincidental with forced weaning. Around PN28, the binding patterns became identical to those of adults. At adults, distinguishable differences were observed between the anterior and posterior parts of the soft palate, where O-linked oligosaccharides were overexpressed in the posterior side, as indicated by the observed SBA, DBA and VVA binding. The oligosaccharides were further extended with galactose and GlcNAc, as demonstrated by positive reactivity with PNA and sucWGA, respectively, in the posterior side. Two reasons might explain the heterogeneous distribution of glycoproteins between the anterior and posterior side glands of the soft palate. First, overexpression of glycoproteins in the posterior side could be a functional compensation to the relative thin epithelial and glandular layer at the posterior side of soft palate. A second, serous cells located abundantly in the posterior portion probably could have contributed to glycoprotein production, subsequently expressed by lectin binding in the main acinar cells, owing to continued glycosylation of demilunes to main mucous cells. In conclusion, the present results illustrated that the recruitment of different cells into the process of maturation of mucous cells and secretory cycle during palatine glands development could have led to biochemical changes of glycoconjugates. Moreover, the heterogeneous distribution of glycoconjugates between the posterior and anterior side glands, which could be due to different functional demands, expands our knowledge and understanding of the role of salivary glands in oral function.