Epithelial-Mesenchymal Interactions in Differentiation of Stomach Epithelium in Fetal Mice

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Summary. Epithelial-mesenchymal interactions during development of the forestomach and glandular stomach in fetal mice were investigated by recombination experiments in vitro. Stomach epithelium could not survive when cultivated alone, but its development was supported by the presence of homologous or heterologous mesenchyme.

The developmental fate of the epithelium was not affected by recombination with heterologous mesenchyme, but the expression of epithelial differentiation was influenced by the type of mesenchyme. The rate of keratinization of the forestomach epithelium was significantly greater on recombination with homologous mesenchyme than on recombination with heterologous mesenchyme. Moreover, the rate of formation of glandular structures in the glandular stomach epithelium was significantly greater on recombination with 16.5-day stomach mesenchyme than on recombination with 14.5- or 18.5-day stomach mesenchyme.

Key words: Epithelial-mesenchymal interaction – Stomach epithelium – Differentiation – Organ culture – Mouse fetus.

Introduction

Adult mouse stomach can be divided into two regions: the forestomach and the glandular stomach. The forestomach, like the esophagus, has stratified squamous epithelium, while the glandular stomach has simple columnar epithelium with gastric glands.

The normal development of the mouse stomach has been reported (Fukamachi, 1978). In 11.5-day fetuses, the stomach epithelium is pseudostratified with little difference between the presumptive forestomach and presumptive glandular stomach. Differentiation of the epithelium is first noted on day 12.5 of gestation.

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The epithelium of the forestomach begins to stratify on day 13.5, and keratinization is first noted on day 16.5. In the glandular stomach, the epithelium begins to stratify on day 12.5, and intra-epithelial vacuoles first appear on day 13.5. Primitive gastric glands are formed on day 15.5. The appearance of the two regions of the mouse stomach on day 16.5 is shown in Fig. 1.

Epithelial-mesenchymal interactions in determination of the epithelium of the gastro-intestinal tract have been investigated by many workers. In avian embryos, heterotypic differentiation of the epithelium of the digestive tract has been induced by recombination with heterologous mesenchyme (Sigot, 1963; Mizuno and Yasugi, 1973; Yasugi and Mizuno, 1974, 1978; Yasugi, 1976a, b), but homotypic differentiation of the epithelium has also been observed in the presence of heterologous mesenchyme (Le Douarin et al., 1968; Gumpel-Pinot et al., 1978; Yasugi and Mizuno, 1978). David (1972) reported a two-stage induction of epithelial morphogenesis and cytodifferentiation of rabbit stomach by the mesenchyme, but Soriano (1965) failed to detect any mesenchymal induction in mouse stomach.

In the present investigation, heterotypic and heterochronic recombinations of epithelium and mesenchyme were performed to re-examine the problem of whether morphogenesis and cytodifferentiation of the stomach epithelium of fetal mice can be altered by heterologous mesenchyme.