Proceedings of 32nd Annual Symposium on the Biology of Skin Biology of the Keratinocyte in Vitro

The skin was one of the first tissues to be successfully maintained in organ culture. Although this method had been used for more than 80 years to observe the behavior of skin in vitro, selective growth of the keratinocyte as an isolated cell had been unusually difficult to achieve. Since 1968, several laboratories have made impressive strides in solving major technical problems associated with the isolation and growth of keratinocytes. Today, keratinocytes may be used to study many areas of either normal or abnormal biology, biochemistry, and physiology with the ease that begins to approach that of the fibroblast.

The 32nd Annual Symposium on the Biology of Skin brought together major scientists studying the keratinocyte in vitro who were in large measure responsible for these advances.

The isolated keratinocyte can be grown on plastic, on cross-linked type III collagen beds, and on freeze-thaw killed dermis; air-liquid interface rafts and feeder-layer-supported culture systems are also used. Each in vitro technique has been developed to maximize a specific element of keratinocyte growth, i.e., extensive differentiation, or rapid proliferation and enhanced capacity for passage, or some balance between these two functions. The remarkable plasticity of the keratinocyte and its ability to be manipulated by various environmental conditions is now apparent and can be used to advantage.

Innovations in culture methodology have been made both as the outcome of technique-oriented research and from other research projects where it was necessary to adapt culture conditions to satisfy the major goals of the research. Boyce and Ham, for example, described the development of a modified culture medium in which many of the previously undefined components have been eliminated and the constituents of the medium optimized. The importance of the substrate in controlling membrane receptors on epithelial cells was described by Gospodarowicz. A new and unexpected role for calcium ions, mediated by postassium, in the regulation of maturation was reported by Hennings. Investigators now use keratinocyte cultures in combination with state-of-the-art techniques of cellular and molecular biology.

Although the value of the keratinocyte in vitro is certainly recognized by investigators, it is also used by them with the knowledge (and sometimes reservation) that the keratinocyte in vitro expresses a program of differentiation different from that of its in vivo counterpart. There are both qualitative and quantitative differences in biochemical constituents and differences in tissue architecture and in certain cellular organelles present in cells at specific stages of differentiation. These differences can be exaggerated or attenuated by conditions in which the cells are grown. Thus this aspect of keratinocyte biology in vitro, the modulation of differentiation and phenotypic expression, has become a major thrust of keratinocyte culture work. It is now possible to support a certain pattern of growth or select for a given status of differentiation.

The range of topics considered at this Symposium suggests that the conference was timely; a variety of topics were summarized and discussed in the context of keratinocyte structure and function in vivo and in vitro. Future directions for research using cultured keratinocytes were suggested. It was clear that keratinocyte cultures have been adapted as an important adjunct method or as a primary research method for studies in nearly every area of cutaneous research.

Cultured keratinocytes are currently being used for studies at the tissue, cellular, and molecular levels to answer questions about epidermal differentiation and its modulation by environmental and pharmacologic agents, dermal-epidermal interactions, keratinocyte-nonkeratinocyte interactions, wound repair, carcinogenesis, aging, drug toxicity, effect of allergens, cytotoxic effects of virus, and burn grafting—all questions of basic science and clinical relevance.

The success of these basic studies has permitted investigators with a wide range of interests to use keratinocytes in new and exciting ways. Ongoing work on the regulation and isolation of the keratin gene, the aging process, tumor promotion, and cell transformation were other high points of the Symposium.

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