EDITORIAL

Smooth Muscle - Aspects of Differentiation

Smooth muscle cells are the main components of the vascular wall, the gastrointestinal and urogenital tract. Since this cell type is a key participant in all vital bodily functions, its physiological behaviour deserves close attention.

Especially the development of the vascular tree has been a topic of great interest and controversy ever since the angioblast theory was established by W. His (1900) and blood vessel development during vertebrate embryogenesis has been monitored by microscopists for almost a century. In contrast to skeletal muscle arising from somites, the smooth muscle progenitors are ill defined and local induction seems to play an important role particularly in the formation of distal blood vessels and viscera from mesenchyme.

Furthermore, the versatile nature of this cell type has precluded studies of smooth muscle differentiation *in vitro*. Cultivated smooth muscle cells display an extraordinary range of phenotypes, depending on their proliferative state.

This can extend from the freshly isolated, elongated contractile smooth muscle cell, to a broad-based cell with fibroblast characteristics and increased biosynthetic activities. Lastly, the molecular regulation of smooth muscle differentiation has remained an enigma so far. While the identification of the MyoD family and their role in development has greatly helped the understanding of skeletal muscle differentiation, similar transcription factors have been sought in vain in smooth muscle cells.

In this issue, contributions cover a wide range of aspects in smooth muscle cell development and differentiation. Owing to the cardinal importance of the cardiovascular system, the emphasis has been placed on vascular development and smooth muscle cell differentiation.

The embryonic origin of blood vessels has been a central problem in vascular biology. Lineage tracing was performed in the elegant studies of Gittenberger-de Groot et al. by following the developmental fate of lacZ stained cells in the neural crest.

Whereas countless investigations have centered around the de novo formation of blood vessels, the embryogenesis of visceral smooth muscle has attracted comparatively little attention. The maturation of visceral smooth muscle, monitored by Romanska et al., shows important differences in its temporal expression pattern of smooth muscle-associated proteins.

Growth factor studies have in recent years greatly helped to elucidate regulatory mechanisms in development and differentiation. Thus, their influence on isolated vascular smooth muscle cells have been studied by several authors in this issue. While Johan Thyberg has monitored the phenotypic response of this cell type to growth factors, Somasundaram et al. have employed growth factors to investigate the regulation of smooth muscle myosin heavy chain gene expression. Cell lines of neonatal smooth muscle, derived from the aortae of H-2K^{b}-tsA58 transgenic mice have been used by Elisabeth Ehler to analyse the changes of α-smooth muscle actin expression triggered by variation of culture conditions.

Finally, a clinical outlook is provided by Gerhard Bauriedel with his investigation of smooth muscle differentiation in human atherectomy specimen of restenotic lesions.

This issue addresses a number of important question in development and differentiation of an important, yet elusive cell type. Future studies will hopefully determine a smooth muscle progenitor, explain the recruitment of mesenchymal cells and clarify the molecular basis of smooth muscle cell differentiation.

Annette Draeger
Institut of Anatomy
University of Bern, Switzerland

His, W.: Lecithoblast und Angioblast der Wirbeltiere. Abhandl. d. math.-naturwiss. Kl. d. k. sächs. Ges. d. Wiss., 1900; Bd 26