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Teaching

I teach a range of topics in molecular cell biology and development genetics at undergraduate levels 1 to 3. I also teach postgraduate students at MSc, MRes and PhD levels. The latter including both formal teaching and also extended or shorter laboratory based research projects.in skeletal muscle biology, myogenesis and related topics.

Postgraduate supervision

For a list of possible PhD projects offered by Dr Smith:

www.findaphd.com/search/customlink.asp?inst=birm-Biol&supersurname=Smith (http://www.findaphd.com/search/customlink.asp?inst=birm-Biol&supersurname=Smith)

Research

Molecular and Cell Biology

Lab website address

Smith Laboratory Web Page (http://www.stemcells.bham.ac.uk/research/JSmith.shtml)

Short research description
Organisation and behaviour of chromosomes in plant meiosis

Full research description

Skeletal muscle stem cell biology and skeletal muscle disease
Skeletal muscle stem cells (SMSc) play an important role in the genesis of embryonic skeletal muscle and in the repair and restructuring of post-natal and adult skeletal muscles. SMSc can be isolated from mammalian skeletal muscles and may be induced to differentiate into skeletal muscle fibres both in vivo and in vitro. We are using this system to address important biological questions about the function and regulation of SMSc including (1) embryonic origin of SMSc (2) Molecular regulation of SMSc survival and apoptotic cell death. (3) the differentiation programme of SMSc. These processes are of relevance to two distinct groups of human disease: age-associated skeletal muscle atrophy and the skeletal muscle dystrophies. Much of our work has focussed on growth factor regulation of stem cell function in these diseases. We are currently investigating early myogenic events and aberrant stem cell function in the dystrophic mammal using a range of technologies including transgenesis and ShRNAi. We hope this work will lead to novel stem cell therapy and growth factor based therapeutic approaches for MD and muscle atrophy conditions.

Extended description:

Skeletal Muscle Dystrophies
(1) The mechanism of cell death in dystrophic skeletal muscle stem cells. Loss of or a defect in one or more of the components of the DGP leads to a number of severe congenital disease of the skeletal musclulature known collectively as Muscular Dystrophies (MD). The commonest form in humans is Duchenne Muscular Dystrophy (DMD) caused by mutation of Dystrophin. Apoptosis (cell death) of SMSc is a major early trigger of pathogenesis in MD. We identified a survival factor (Igf-2) which prevents cell death in skeletal muscle cells and normalises dystrophic pathology. We are investigating the mechanism of this interaction between Igf-2 and SMSc death and searching for molecules which could be used for clinical treatment of MD. Recently we established an embryonic basis for two forms of skeletal muscular dystrophy (MD); Duchenne MD and caveolin-3 deficiency type Limb Girdle MD (1c). We are currently investigating the molecular mechanisms which underlie this pathology in order to understand the biological function of DGC proteins in the embryo and to identify novel therapeutic targets for MD.

(2) Stem cell and gene therapy. Skeletal muscle stem cells are a potential route for the delivery of therapeutic genes to MD muscles and may also serve as a â€˜protein factoryâ€™ by which stem cells engineered to express deficient genes (for example Factor VIII). We are investigating ways of engineering and delivering these cells for therapeutic use.
Skeletal Muscle Ageing
This study involves comparing the stem cell behaviour of normal and a short-lived animal models with respect to their rates of apoptotic cell death, differentiation capability and growth. The aim of this purpose is to identify the mechanism by which skeletal muscle atrophies with age and to devise ways of treating this debilitating condition using stem cells.
Myogenesis (embryonic muscle development)

IGF-2 is an important embryonic growth factor with pleiotrophic roles. During embryogenesis it regulates the cell cycle gene p57kip2. IGF-2 is expressed in differentiating myotubes during myogeneis (embryonic skeletal muscle formation). We are studying the role of IGF-2 in embryonic skeletal muscle development and are examining the role of the embryonic skeletal muscle stem cell (eSMSc) in culture and in vitro. In particular we are looking for gene markers of eSMSc which will enable us to identify them and track their progress.

Publications

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Additional articles written for the Times Higher Education Supplement (THES) by Janet Smith can be found on

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Skeletal muscle and stem cells

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