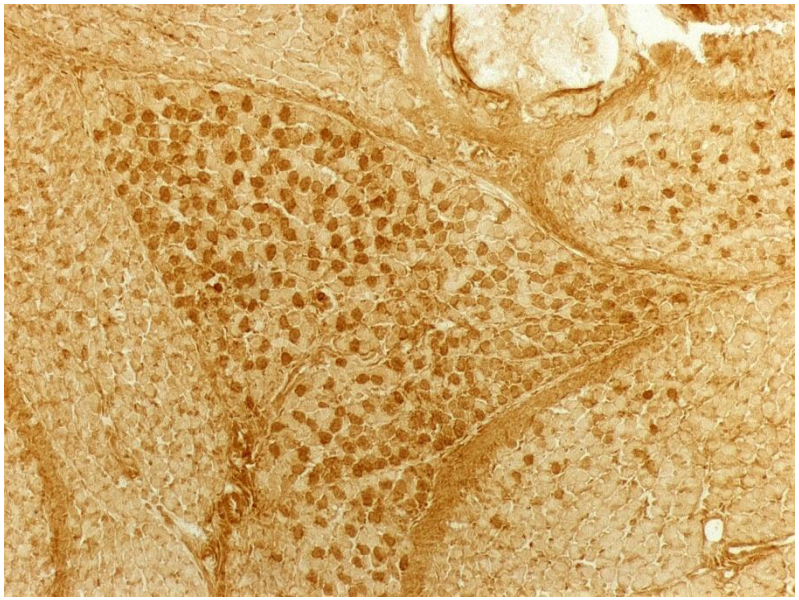
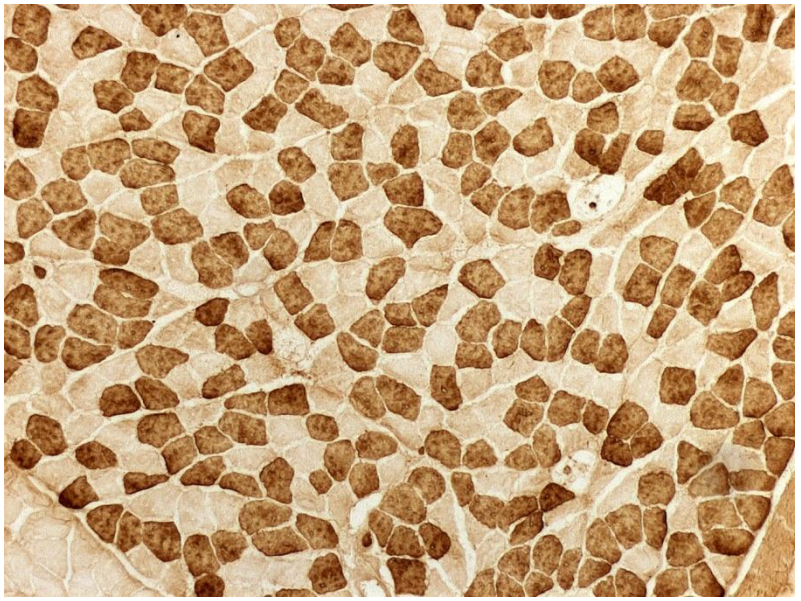
Exercise 1: Estimate the degree of MATURATION HYPERTROPHY that occurs in mouse SOLEUS muscle fibres between birth and adulthood

Images taken at same magnification – low power

BIRTH



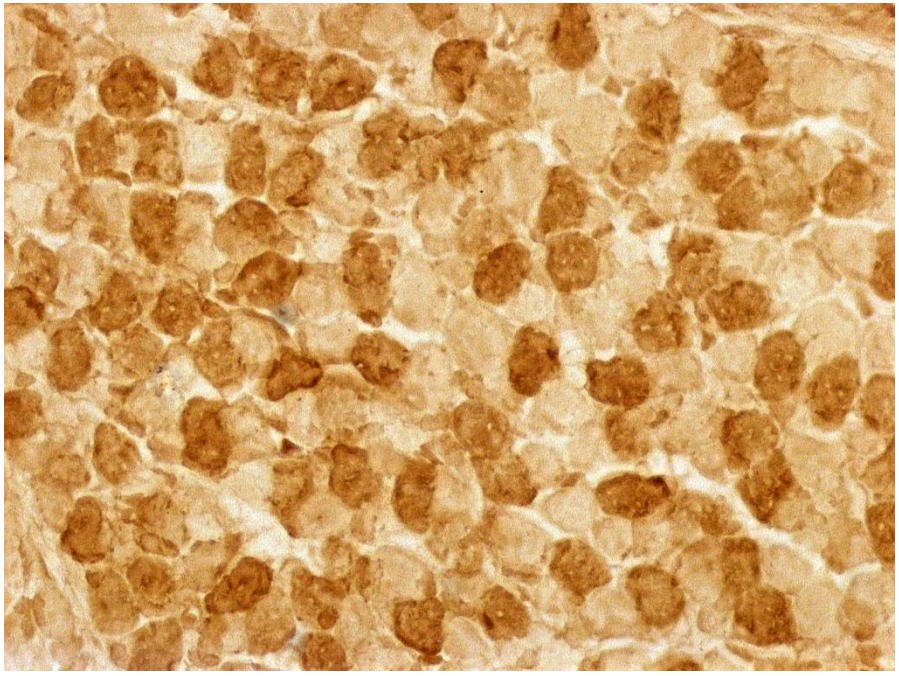
ADULT



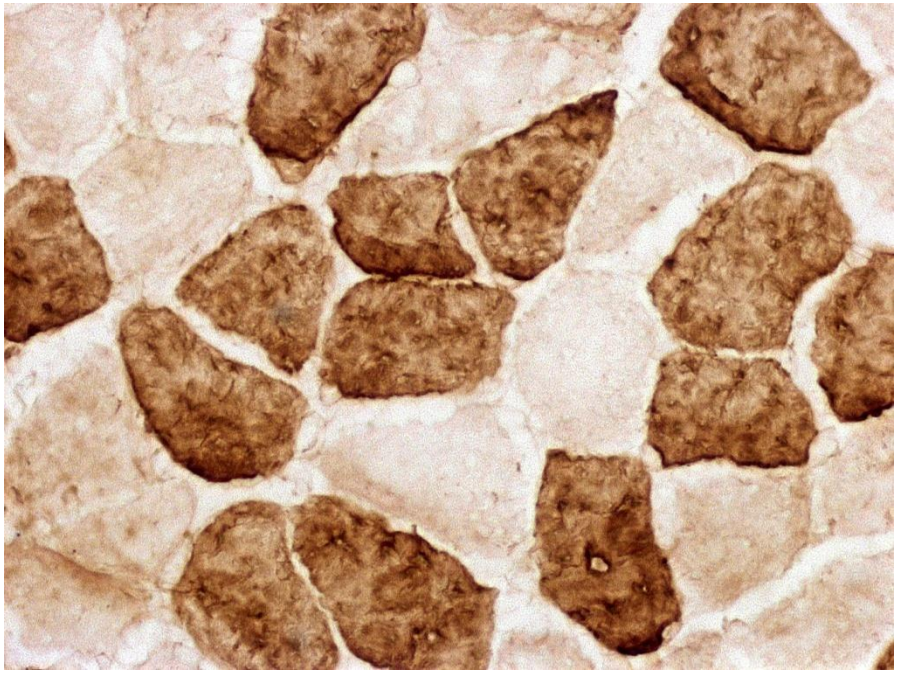
Exercise 1: Estimate the degree of MATURATION HYPERTROPHY that occurs in mouse SOLEUS muscle fibres between birth and adulthood

Images taken at same magnification – HIGH power

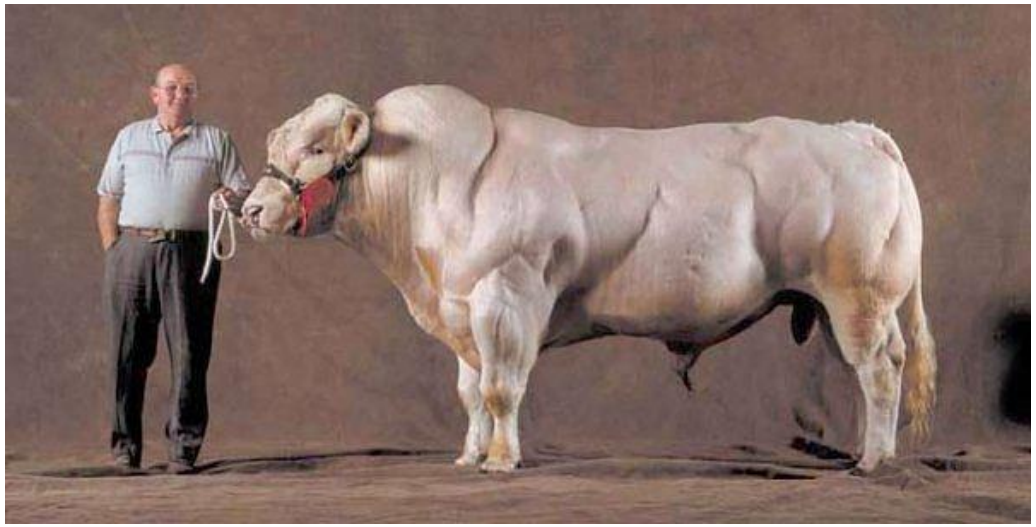
BIRTH

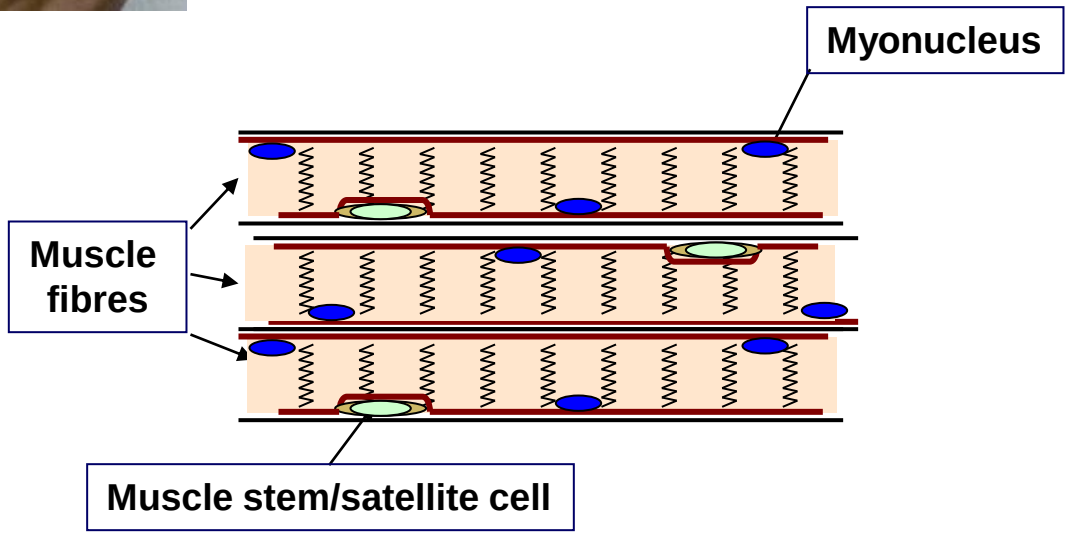


ADULT

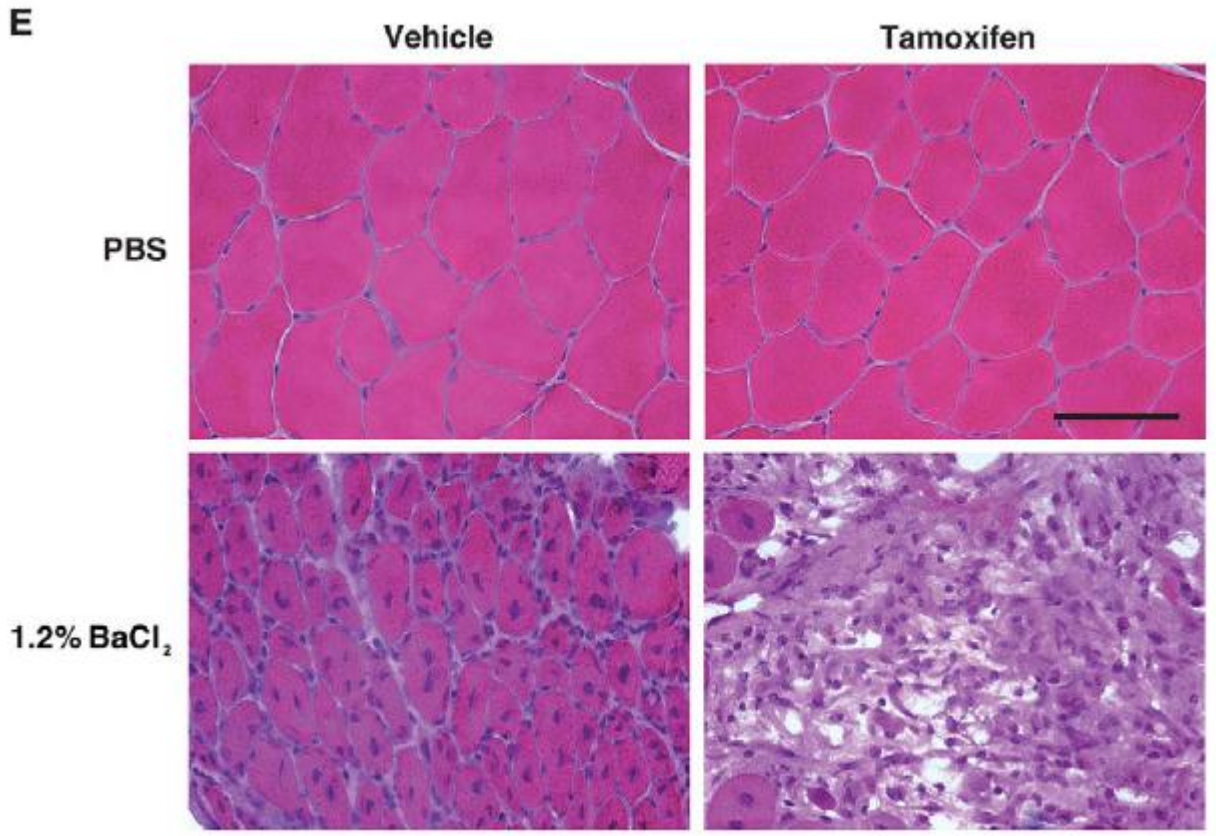


Are satellite cells necessary for muscle hypertrophy?



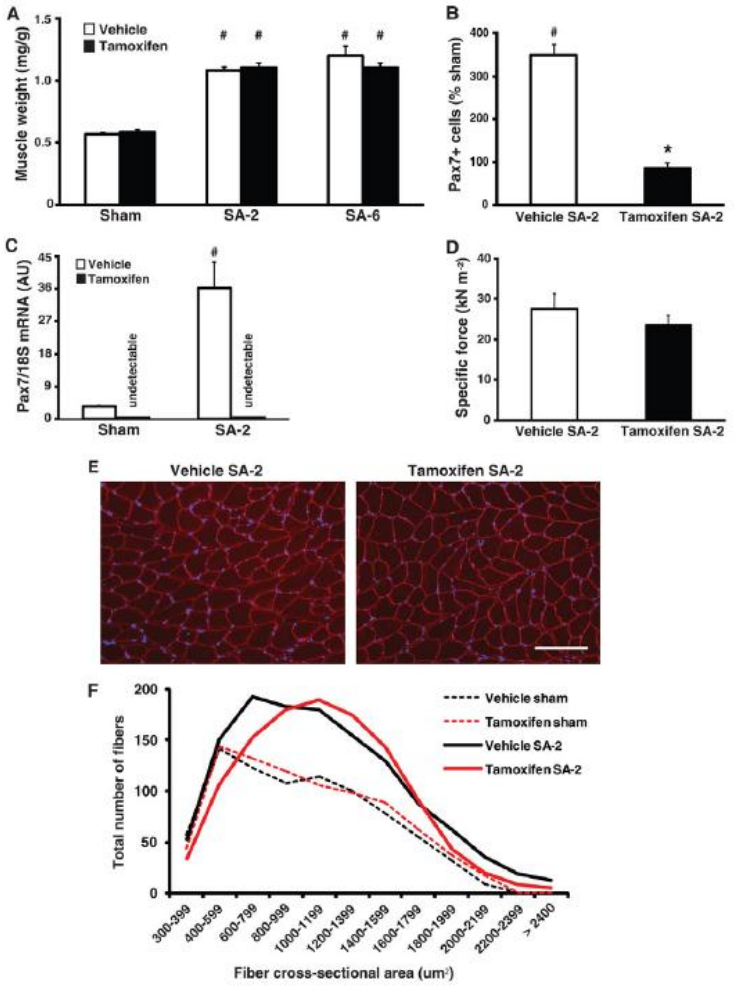


Pax7$^{CreER/CreER}$ mice crossed with Floxed DTA mice
Treated with Tamoxifen to induce the Cre expression



Barium Chloride BaCl2 causes muscle damage

Synergist ablation (SA): removing nearby muscles to induce hypertrophy experimentally in the Pax7-DTA mice

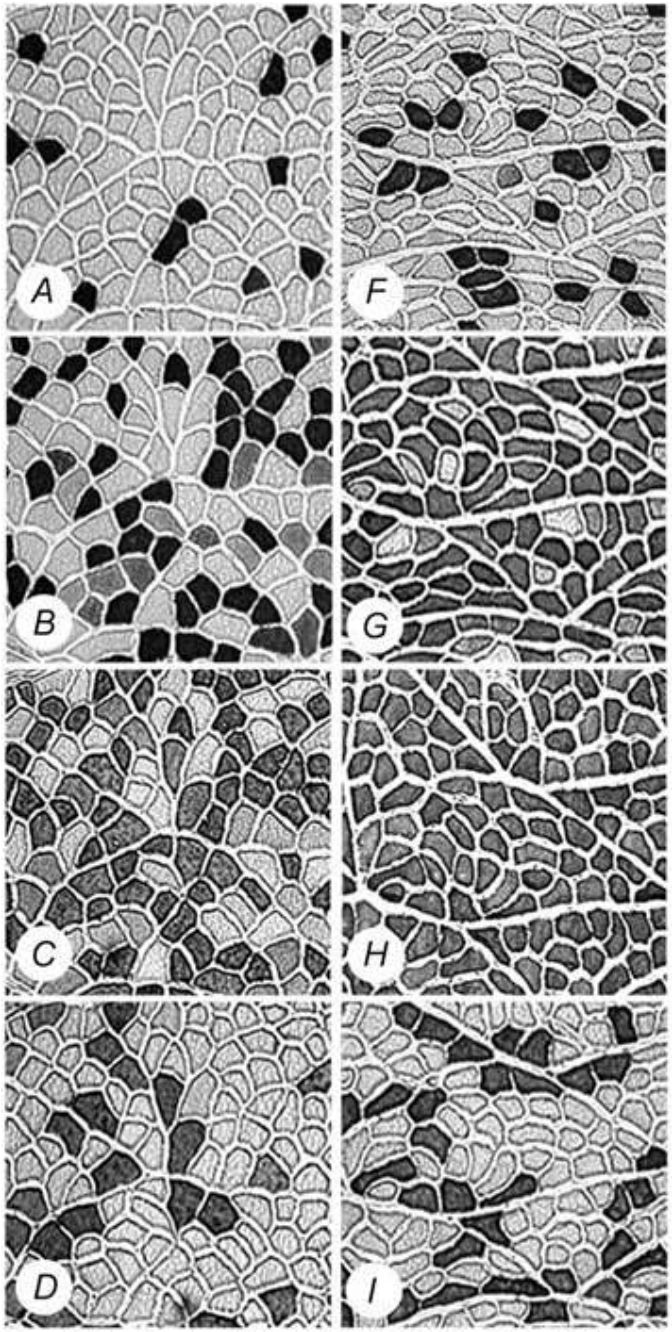


Exercise 2: read the results section of the McCarthy et al. 2011 paper

Discuss

Experimental induction of muscle fibre type change

(A) Chronic low frequency stimulation
(B) Transgene expression



Antibody

MyHC I

MyHC IIa

All MyHC but not IIx

MyHC IIb

Exercise 3: Chronic Low Frequency Stimulation Experiment – Rat left common peroneal nerve stimulated 21 days with CLFS. Transverse sections of Tibialis Anterior muscle stained with Antibodies against the different MyHC protein isoforms (dark coloured fibres)

A,B,C,D – Control no CLFS
F,G,H,I – CLFS for 21 days

Count total number of fibres in field
Count number of fibres stained by each antibody
Express proportion of each fibre population as a percentage of total.
Discuss findings

Martins K J B et al. J Physiol 2006;572:281-294

The Journal of Physiology
A publication of The Physiological Society

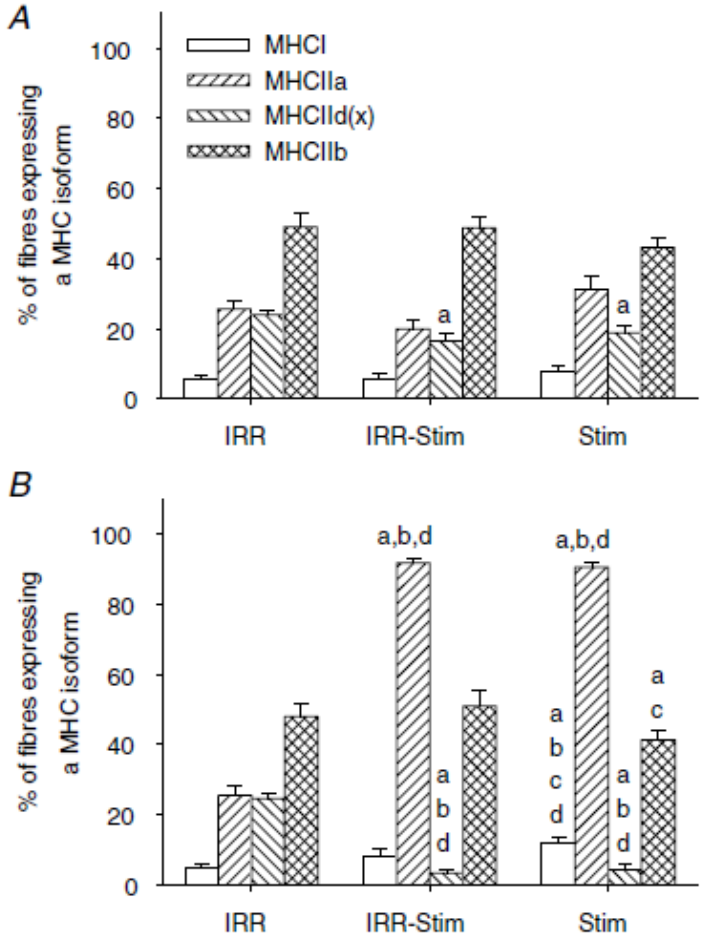


Figure 6
The percentage of fibres expressing a particular MHC isoform in contralateral control (*A*) and stimulated/sham rat tibialis anterior muscles (*B*). Statistical symbols as in Fig. 2.

Measuring fibre type conversion using immunohistochemistry on muscle sections

Measuring fibre conversion using protein gels

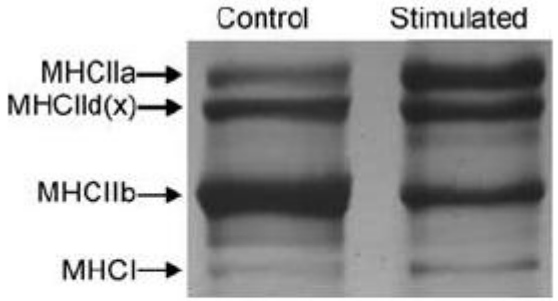


Figure 8
Example of the electrophoretic method used to quantify MHC isoform composition of rat tibialis anterior muscles. Control (IRR-control) and stimulated (Stim) are shown.

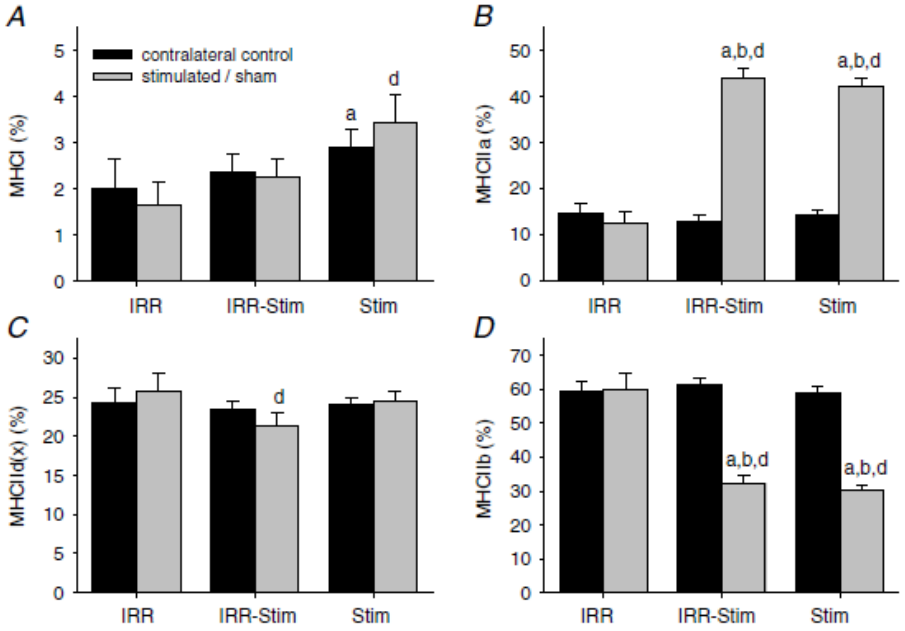
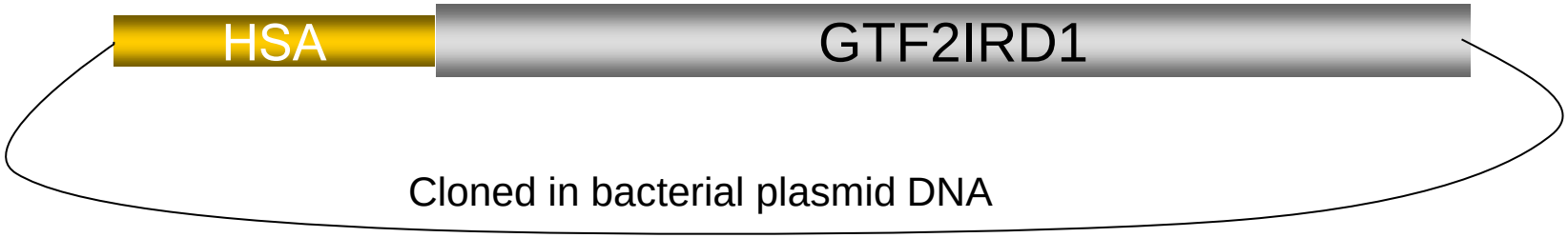


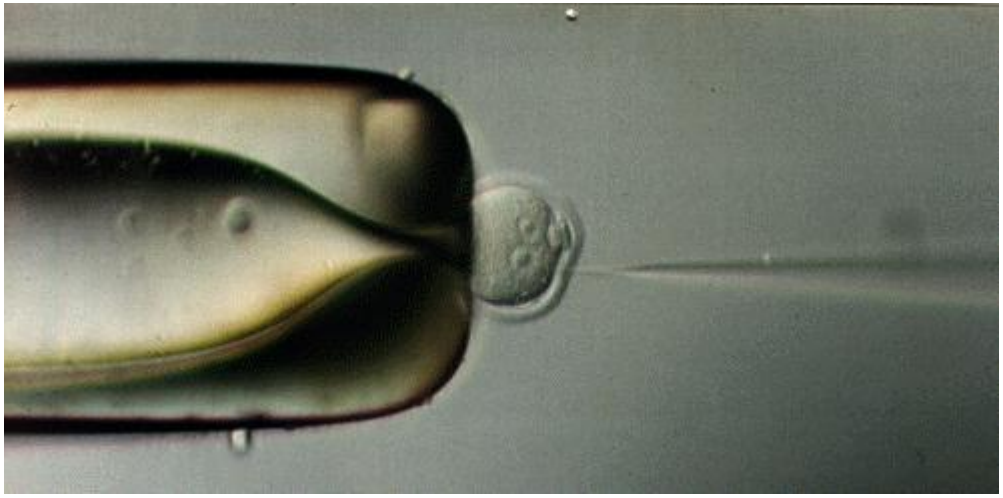
Figure 9
Percentage of MHCI (*A*), MHCIIa (*B*), MHCIId(x) (*C*) and MHCIIb (*D*) distribution as determined by densitometric evaluation of triplicate gels. Statistical symbols as in Fig. 2.

Transgene-induced fibre type change

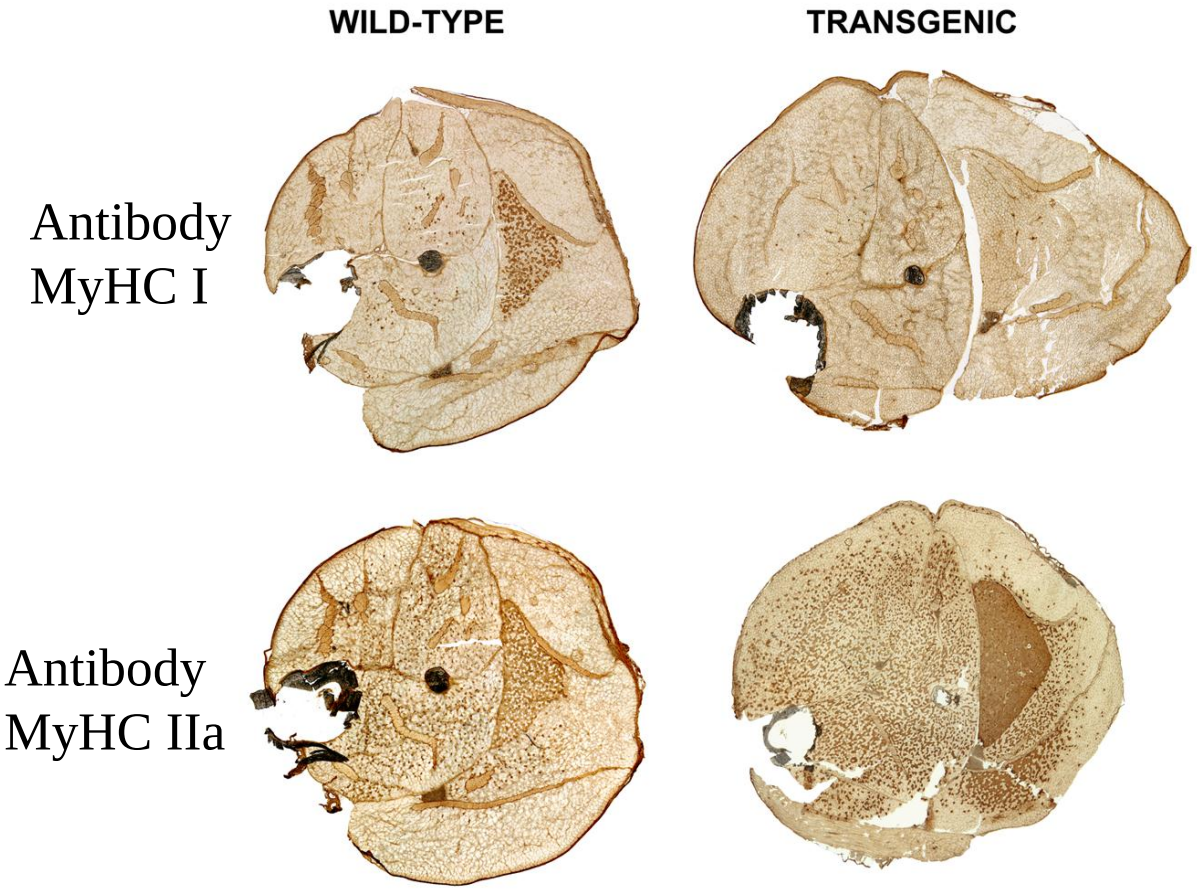
Human skeletal actin promoter and enhancer combined – EXPRESSION ONLY IN MUSCLE FIBRES

Human *GTF2IRD1* gene encodes a nuclear DNA binding protein that controls other genes





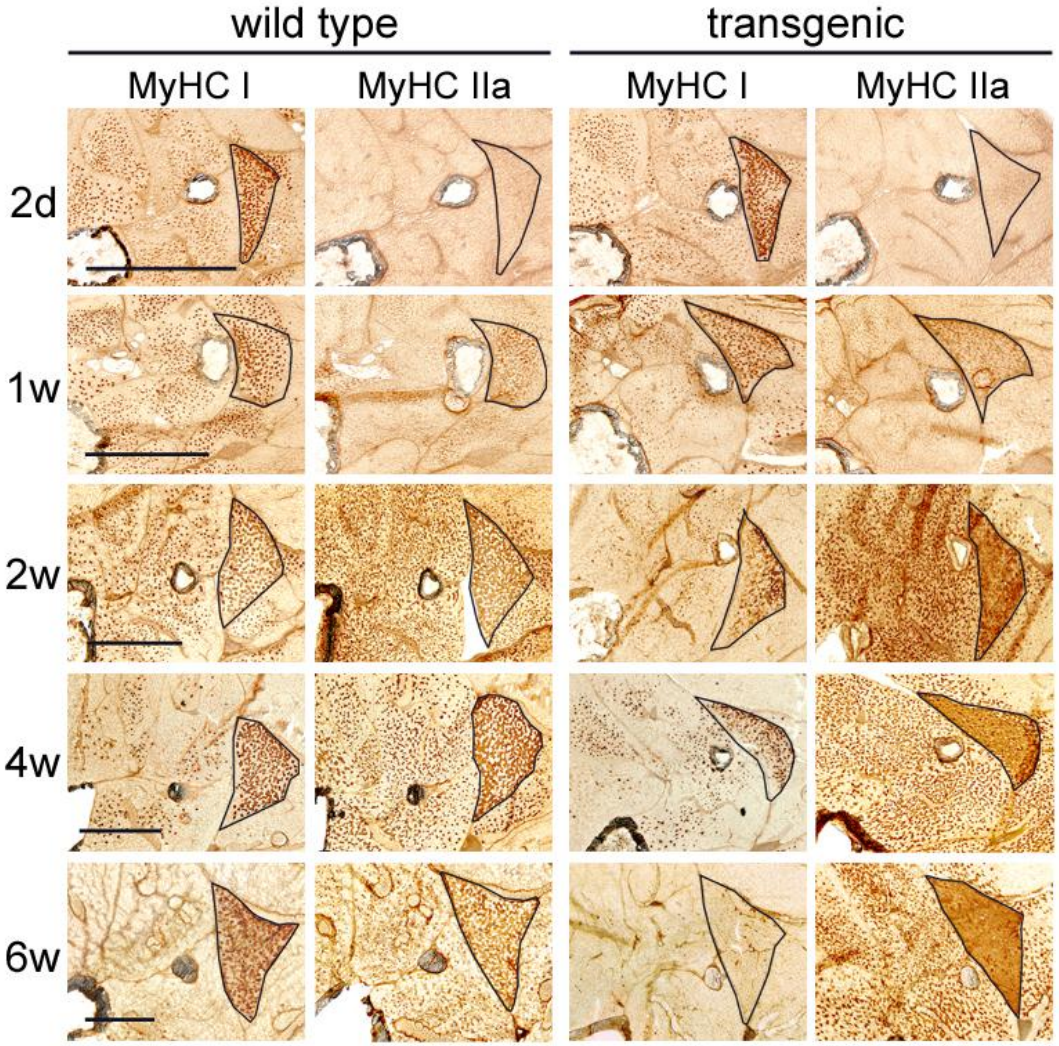
DNA microinjected into a fertilized mouse embryo to make a transgenic mouse.



Transverse sections through the lower hind-limb of adult GTF2IRD1-transgenic and wild type mice – stained for MyHC type I/slow and MyHC2A.

1. Describe what has happened to the muscle fibre types
2. Propose a theory for what might have caused the observed effect. Is there more than one possibility?

Examining the developing fibre types in Gtf2ird1-transgenic mice.



Transverse sections through the lower hind limb of transgenic and wild type mice from 2days after birth to 6weeks.

Questions

1. Has embryonic fibre type patterning been affected by the expression of the transgene?
2. What process would describe what is happening?
3. Refine the theory concerning the effect of *Gtf2ird1* on muscle development.
4. How would you prove that *Gtf2ird1* has an important role in fibre type differentiation?

Questions

1. Define muscle plasticity?

2. Are satellite cells (a) necessary for muscle hypertrophy and (b) generally involved in hypertrophy?

3. Why does chronic low frequency stimulation cause a fast to slow fibre type shift?

4. Spinal cord injury leading to no motor function in the legs – what happens to muscle mass and fibre type?