SUMMARY:

Foetal myogenesis relies on PAX7+ muscle progenitors that provide the source of cells for muscle growth during development and for the generation of the satellite cell pool. We aimed to decipher the signals that regulate the balance between myogenic differentiation and proliferation. We performed an exhaustive analysis of the cell cycle phases of myogenic cells during foetal myogenesis. I defined that PAX7+ cells in the S/G2/M phases were enriched at the contact points to the tendons. BMP and NOTCH signals increase the number of PAX7+ cells during foetal development, but affect differentiation in a positive and negative manner, respectively. I revealed that BMP and NOTCH increase the number of PAX7+ cells independently of each other. However, they act antagonistically during differentiation. Thus, the interplay between NOTCH and BMP signalling differs in proliferation and differentiation. Because muscle is a mechanical tissue, we tested the importance of muscle contraction for foetal myogenesis in chick embryos. I found that the block of muscle contraction during foetal myogenesis mimicked a NOTCH loss-of-function, i.e.decreased the number of foetal muscle progenitors and shifted the balance between proliferation and differentiation towards a differentiation fate. Mechanical forces provided by muscle contractions are sensed in myonuclei by the transcriptional co-activator YAP1 that regulates expression of the NOTCH ligand JAGGED2 in muscle fibres. This JAGGED2 signal keeps the muscle progenitors in an undifferentiated state and suppresses differentiation.