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Jak/Stat signalling regulates dpp transcription to control germline stem cell maintenance in the Drosophila ovary

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The existence of specialised regulatory microenvironments or niches that sustain stable stem cell populations is well documented in many tissues. However, the specific mechanisms by which niche support cells govern stem cell maintenance remain largely unknown. We have show that the Jak/Stat signalling pathway acts in somatic support cells of the Drosophila ovary to maintain the adjacent germline stem cells (GSCs) in an undifferentiated state. In addition, we have demonstrated that removal of this pathway in support cells leads to stem cell loss by differentiation. Further, the ectopic activation of Jak/Stat signalling in support cells augments dpp mRNA levels and increases the range of Dpp signalling, a BMP2 homologue known to act as a niche extrinsic factor required for GSC survival and division in Drosophila. As a consequence, the GSC niche is expanded and tumours of stem cells are produced. Our results provide strong evidence for a model in which Jak/Stat signalling in support cells regulates dpp transcription and thus niche size.