Cell division group

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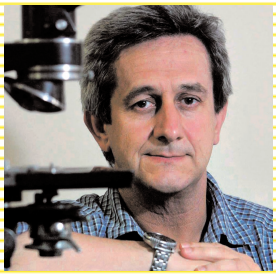

Cayetano González

Our goal is to understand the mechanisms of cell division. For this purpose, we use a multidisciplinary approach that combines genetics, molecular biology and advanced *in vivo* microscopy. We use *Drosophila* as well as cultured cells derived from vertebrates as model systems. Current on-going projects include the study of the mechanisms of spindle assembly, the characterisation of new centrosomal proteins and the modelling of cancer in *Drosophila*.

Spindle assembly *in vivo*
Direct visualisation is becoming mandatory to unravel the complex processes that occur within the living cell. Using protocols developed in our lab we are obtaining new information on the behaviour of specific proteins labelled with florescent tags (Rebollo and González 2000; Lange *et al*, 2002; Sampaio *et al*, 2001; Rebollo et al, 2004).

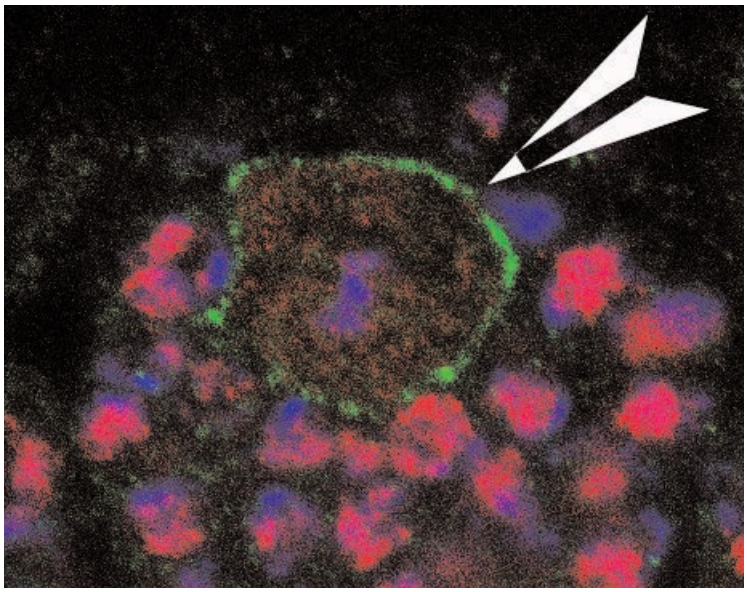

Figure 1. *Mutant neuroblast (NB) undergoing symmetric divisions. The pointed NB (nervous system stem cell) is undergoing mitosis. Miranda, a cell polarity protein is stained in green, the centrosomal protein CP190 is shown in red and DNA in blue. The smaller cells are ganglion mother cells derived from successful asymmetric division of other NBs. In the mutant NB there are no centrioles thus CP190 is not localised in two foci but is distributed throughout the cell and Miranda is inappropriately localised around the entire cortex rather than being localised basally as it should be in asymmetrically dividing NBs.*

Modelling cancer in *Drosophila*
We are starting to exploit *Drosophila* to study basic principles regarding cell proliferation and malignant growth (Caussinus and González, 2005; Wodarz and González, 2006). Loss of cell polarity and cancer are tightly correlated, but proof of a causative relationship remains elusive. In stem cells, loss of polarity and impairment of asymmetric cell division could alter cell fate and thereby render daughter cells unable to respond to the mechanisms that control proliferation. To test this hypothesis, we have developed a *Drosophila* model of tumour transplantation using larval neuroblasts (NBs) containing mutations in various genes that control asymmetric cell division.

Molecular analysis of centrosomes
We have recently cloned the gene that encodes a centriolar protein. We have mutant alleles, functional GFP fusions and antibodies that will be instrumental in the molecular dissection of this organelle (Lange *et al*, 2002; Tavosanis and González, 2003).

Protein traps
The specific localisation of proteins in different compartments is a key aspect of cell division. We have now automated a protein trap protocol (González and Bejarano, 2000; Isalan *et al*, 2005; Santori *et al*, 2006) which is being applied in several high-content screens.

Peter Askjaer's work
Peter Askjaer works as an independent Ramón y Cajal researcher within the lab. Peter's group uses the nematode *Caenorhabditis elegans* to analyse processes of cell and developmental biology with an emphasis on the nuclear envelope.

PUBLICATIONS

Caussinus E and González C (2005) Induction of tumour growth by altered stem-cell asymmetric division in *Drosophila*. Nat Genet, 37:1125-1129

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Schetter A, Askjaer P, Piano F, Mattaj IW and Kemphues K (2006) Nucleoporins NPP-1, NPP-3, NPP-4, NPP-11 and NPP-13 are required for proper spindle orientation in *C. elegans*. Dev Biol, 289:360-371

Wodarz A and González C (2006) Connecting cancer to the asymmetric division of stem cells. Cell, 124:1121-1123

RESEARCH NETWORKS AND GRANTS

Regulación de la localización subcelular y su contribución a la transformación cancerosa
Spanish MEC: 2004-2006
Principal Investigator: Cayetano González

Molecular analysis of Drosophila *cell division, MADCDC*
EU V Framework Programme
Research Network Contract: 2003-2007
Project Coordinator: M Gatti

Integrative approach to cellular signalling and control processes: bringing computational biology to the bench, COMBIO
EU VI Framework Programme, STREP: 2004-2007
Project Coordinator: Luis Serrano

Alteraciones en la localización subcelular y transformación cancerosa: Determinación de su utilidad diagnóstica
Fundación Médica Mutua Madrileña Automivilistica: 2004-2007
Principal Investigator: Cayetano González

Generation of cancer tumour models in Drosophila
Generalitat de Catalunya: 2006-2009
Principal Investigator: Cayetano González

Cancer stem cells and asymmetric division, ONCASYM
EU VI Framework Programme, STREP: 2006-2009
Project Coordinator: Marcos González Gaitan

Centrosome 3D: Hacia la comprensión estructural y funcional del centrosoma
CONSOLIDER - INGENIO 2010: 2006-2010
Project Coordinator: Luis Serrano

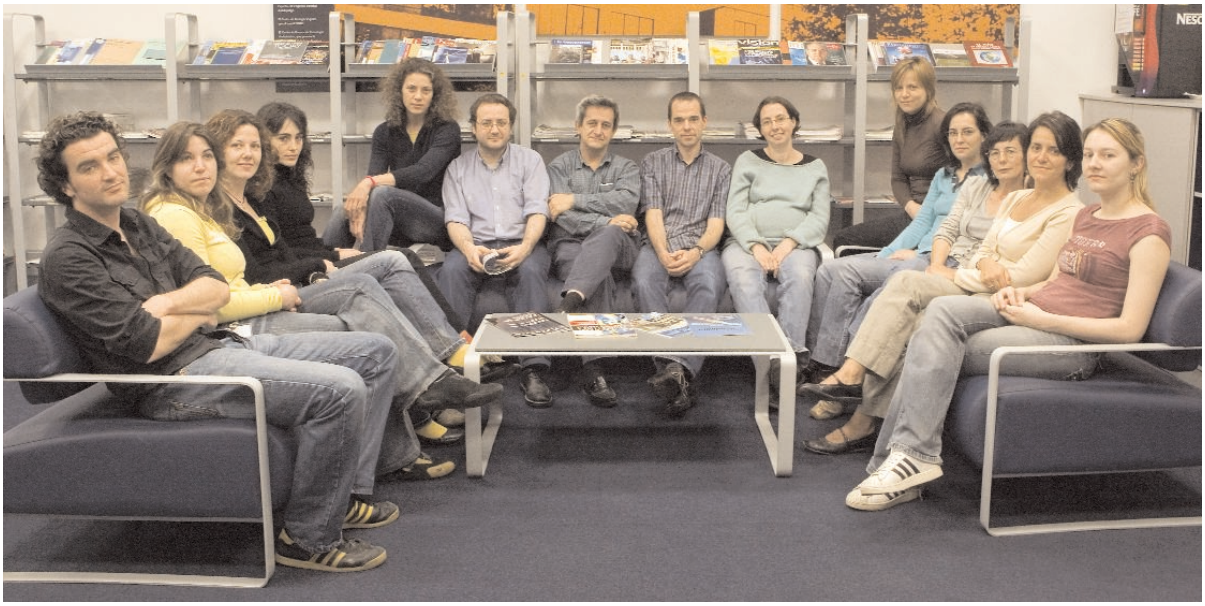
Identification of pathways that are relevant for the malignant transformation of stem cells in *Drosophila*.
Spanish MEC: 2006-2009
Principal Investigator: Cayetano González

OTHER FUNDING SOURCES

Sponsored research agreement with CIBASA: 2006-2008

AWARDS

Conference Award from the Institucio Catalana de Recerca i Estudis Avançats (ICREA) for the organisation of the international meeting: "*Drosophila* as a model for human diseases" at IRB Barcelona, October 5-7, 2006



Cayetano González's group, March 2006.