

Epigenetic mechanisms in plant development

Genetic information needs to be inherited, from cell to cell and from generation to generation. Genetic information is not only DNA encoded, but to a not yet fully appreciated extent encoded by DNA and histone modifications.

These marks establish the «epigenome» and are decisive for cell fate development. How epigenetic information is faithfully inherited is a central question we are currently addressing in our group. Key players in keeping the cellular memory are Polycomb group (PcG) proteins.

Some PcG proteins form complexes that insert histone methylation marks into chromatin causing transcriptional repression. Disturbances in the ratio of active and repressive histone methylation marks result in the development of cancer in animals and causes dedifferentiation of plant cells.

Although the histone methylation potential of PcG complexes is evolutionary conserved, the mechanisms that interpret this information are different. We are investigating how PcG proteins establish transcriptional repression and the functional requirement of PcG proteins during plant development.



A Polycomb group protein fused to the green fluorescent protein localizes to endosperm nuclei.

Research focus

- Gene silencing
- Chromatin modifications
- Polycomb group proteins
- Cell differentiation

Interdisciplinarity

- Functional genomics



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Liste 1: Promotionsarbeiten

	Betreuer(in)	Doktorand(in) und Titel	Anzahl der Betreuer
1.	Köhler, Claudia	Erilova, Alexandra; "Mechanisms of epigenetic gene regulation during plant development"	2
2.	Köhler, Claudia	Aichinger, Ernst; Identification and characterization of mutants impaired in Polycomb group mediated silencing	3
3.	Köhler, Claudia	Villar, Corina; Polycomb group mediated imprinting control in plants	3
4.	Köhler, Claudia	Hehenberger, Elisabeth; Defining the role of Polycomb group genes in seed development of Arabidopsis thaliana	2
5.	Köhler, Claudia	Rozsak Pawel; Developmental requirement and function of the FIS Polycomb group complex during seed development in Arabidopsis thaliana	1

Liste 4: Forschungsprojekte

	Projekt-ID	Projektleiter	Titel
1.	15873	Köhler, Claudia	Mechanisms and control of reproductive development in plants
2.	18594	Köhler, Claudia	Molecular dissection of endosperm development in Arabidopsis
3.	19713	Köhler, Claudia	Developmental requirement and function of the FIS Polycomb group complex during seed development in Arabidopsis thaliana

Liste 5: Wissenschaftliche Publikationen

a) Referierte Publikationen				
	Publikations-ID	Autoren	Titel	Erschienen in
1.	43155	Köhler C., Villar C.B.R.	Programming of gene expression by Polycomb group proteins.	Trends Cell Biology
2.	43154	Makarevich G., Villar C.B.R., Erilova,A., Köhler C.	Mechanism of PHERES1 imprinting in Arabidopsis.	Journal Cell Science
b) Monografien				
	Publikations-ID	Autoren	Titel	Erschienen in

c) Varia			
Publikations-ID	Autoren	Titel	Erschienen in

Liste 6: Vorträge vor wissenschaftlichem Publikum

a) Eingeladene Vorträge vor wissenschaftlichem Publikum		
	Redner	Titel
1.	Köhler, Claudia	Mechanisms of epigenetic inheritance, Regensburg, Germany, January 9th, 2008, Invited lecture
2.	Köhler, Claudia	Mechanisms of epigenetic inheritance in plants, Davos, Switzerland, June 4th, 2008, 7th D-BIOL Symposium ETH Zurich
3.	Köhler, Claudia	Epigenetic switches – toggling gene activity and cell identity, Freiburg, Germany, September 9th, 2008, invited lecture
4.	Köhler, Claudia	Imprinting establishment at the PHERES1 locus in Arabidopsis, Singapore, September 23rd, 2008, EMBO workshop on Genomic Imprinting
5.	Köhler, Claudia	Epigenetic regulation of plant development, Tübingen, Germany, October 2nd, 2008, invited lecture
6.	Köhler, Claudia	Imprinting establishment at the PHERES1 locus in Arabidopsis, Tucson, USA, October 23rd, 2008, Frontiers on plant sexual reproduction conference
7.	Köhler, Claudia	Mechanismen der epigenetischen Vererbung, Potsdam, Germany, November 24th, 2008, invited lecture
8.	Aichinger, Ernst	Role of the chromatin remodeler PICKLE in repression of Polycomb group target genes in Arabidopsis, Zurich, Switzerland, September 10-13, 2008, Trinational Arabidopsis Meeting
b) Sonstige Vorträge und Posterpräsentationen vor wissenschaftlichem Publikum		
	Redner	Titel
1.	Roszak, Pawel	Mechanisms of Polycomb group-mediated gene silencing in Arabidopsis, Davos, Switzerland, June 2-4th, 2008, 7th D-BIOL Symposium ETH Zurich
2.	Roszak, Pawel	Identifying regulators of seed development in Arabidopsis, Kloster Kappel, Switzerland, August 21-23rd, 2008, PhD Symposium
3.	Roszak, Pawel	Identifying regulators of seed development in Arabidopsis, Zurich, Switzerland, September 10-13th, 2008, 5th Tri-National Arabidopsis Meeting
4.	Roszak, Pawel	Identifying regulators of seed development in Arabidopsis, Retzbach (Wurzberg), Germany, September 17-19th, 2008, 1st International

		PhD School on Plant Development
5.	Erilova, Aleksandra	Functional requirement of the FIS Polycomb group complex during seed development, Spetses, Greece, September 3-8, 2008, Summer School: Chromatin and Transcription
6.	Erilova, Aleksandra	Functional requirement of the FIS Polycomb group complex during seed development, Davos, Switzerland, June 2-4th, 2008, 7th D-BIOL Symposium ETH Zurich
7.	Hehenberger, Elisabeth	Defining the function of Polycomb group proteins during seed development, Davos, Switzerland, June 2-4th, 2008, 7th D-BIOL Symposium ETH Zurich
8.	Hehenberger, Elisabeth	Defining the function of Polycomb group proteins during seed development, Zurich, Switzerland, September 10-13, 2008, Trinational Arabidopsis Meeting
9.	Hehenberger, Elisabeth	Defining the function of Polycomb group proteins during seed development, Heidelberg, Germany, September 21-28, 2008, EMBO YIP PhD course
10.	Aichinger, Ernst	Role of the Mi-2 homolog PICKLE in repression of Polycomb group target genes in Arabidopsis, Mosbach, Germany, March 27 - 29, 2008, 59. Mosbacher Kolloquium: Epigenetics - Molecular Principles and Mechanisms
11.	Aichinger, Ernst	Role of the Mi-2 homolog PICKLE in repression of Polycomb group target genes in Arabidopsis, Davos, Switzerland, June 2-4, 2008, 7th D-BIOL Symposium ETH Zurich June 2 - 4, 2008
12.	Villar, Corina Belle	Mechanisms of Polycomb group-mediated gene silencing in Arabidopsis thaliana, Davos, Switzerland, June 2-4, 2008, 5th D-BIOL Meeting, ETH
13.	Villar, Corina Belle	Mechanisms of Polycomb group-mediated gene silencing in Arabidopsis thaliana, Singapore, September 21-24, 2008, EMBO Genomic Imprinting workshop

Liste 7: Gutachten

	Gutachter	Art des Gutachtens	Typ der anfordernden Organisation	Sitz der anfordernden Organisation	Anzahl
1.	Köhler, Claudia	Projektanträge	öffentliche	Europa	2
2.	Köhler,	Projektanträge	öffentliche	Nordamerika	1

	Claudia				
3.	Köhler, Claudia	Publikationen			12