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newsflash

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Scientists unveil a molecular mechanism that controls plant growth and development

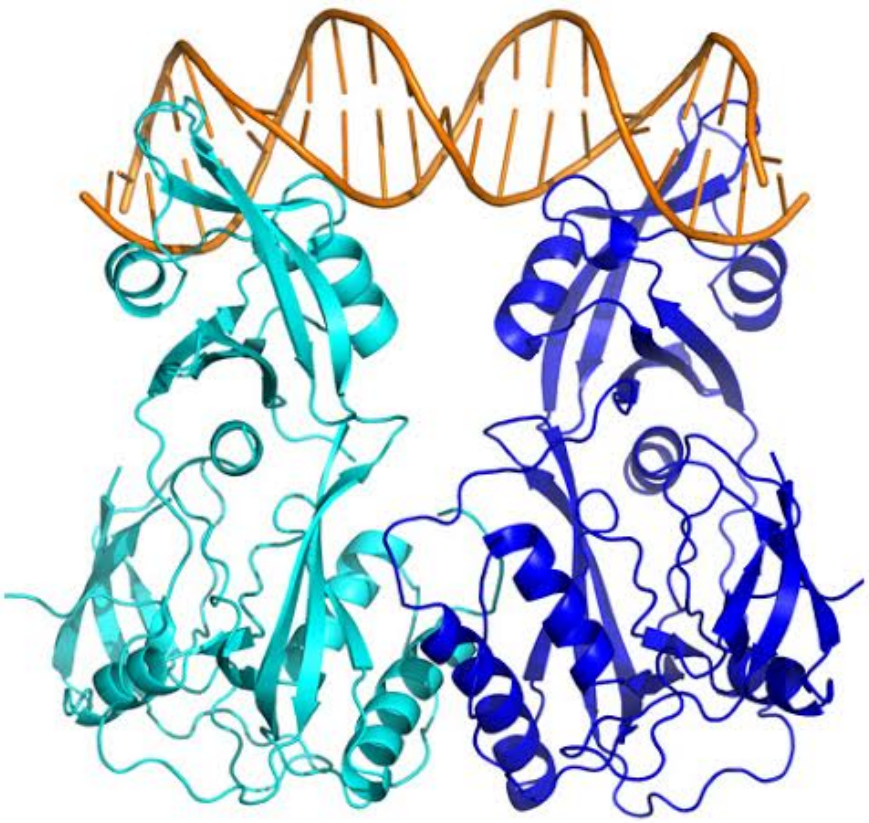
X-rays from ESRF and ALBA Synchrotron helped to discover how auxin hormone-regulated proteins activate development genes in plants. Results of this study have been published in *Cell* journal.

Auxins are plant hormones that control growth and development, that is to say, they determine the size and structure of the plant. Among their many activities, auxins favor cell growth, root initiation, flowering, fruit setting and delay ripening. Auxins have practical applications and are used in agriculture to produce seedless fruit, to prevent fruit drop, and to promote rooting, in addition to being used as herbicides. The biomedical applications of these hormones as anti-tumor agents and to facilitate somatic cell reprogramming (the cells that form tissues) to stem cells are also being investigated.

At the molecular level, the hormone serves to unblock a transcription factor, a DNA-binding protein, which in turn activates or represses a specific group of genes. Some plants have more than 20 distinct auxin-regulated transcription factors. They are called ARFs (Auxin Response Factors) and control the expression of numerous plant genes in function of the task to be undertaken, that is to say, cell growth, flowering, root initiation, leaf growth etc.

This joint study, composed by researchers from the Institute for Research in Biomedicine (IRB), the Molecular Biology Institute of Barcelona (IBMB-CSIC) and the University of Wageningen (The Netherlands), has analyzed in detail the DNA binding mode used by various ARFs. The team in Barcelona, led by Miquel Coll, used X-ray diffraction techniques at the ALBA Synchrotron and at the European Synchrotron Radiation Facility to solve five 3D structures which have revealed why a given transcription factor is capable of activating a single set of genes, while other ARFs that are very similar with only slight differences trigger a distinct set.

Reference: D. Roeland Boer, Alejandra Freire-Rios, Willy van den Berg, Terrens Saaki, Iain W. Manfield, Stefan Kepinski, Irene López-Vidrieo, Jose Manuel Franco, Sacco C. de Vries, Roberto Solano, Dolf Weijers, and Miquel Coll (2014). Structural basis for DNA binding specificity by the auxin-dependent ARF transcription factors. *Cell* **156**, 577-589.



Atomic structure of an ARF/DNA complex. Auxins control the growth and development of plants through ARF (Author: R. Boer, IRB/CSIC)

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