A RECEPTOR TO DETECT THE INVISIBLE

An international collaboration leads to the discovery of a UV-B sensor and reveals how plants use it to elaborate their molecular "sunscreen"

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Ultraviolet radiation is an intrinsic part of sunlight and protection against harmful UV-B is of the utmost importance to living organisms. Due to their sessile life-style and dependence on sunlight for photosynthesis, plants have developed cellular tools to parry this danger and adapt to UV-B radiation. However, until now, the means used to detect this invisible light remained elusive. Together with his co-workers at the University of Freiburg (Germany), Roman Ulm, professor at the University of Geneva (UNIGE, Switzerland), identifies the first UV-B receptor and its key role in mounting the plants' defence, in a study published in the April 1st 2011 edition of Science. Conservation of the UV-B receptor in plants raises the intriguing possibility that it has influenced land plant evolution.

Sunlight is essential to plants, both as an energy source to fuel photosynthesis and as a signal to coordinate and optimize different aspects of their life. Plants have indeed devised various kinds of "antennas" to perceive specific wavelengths and use them for their profit. Thus, the energy of certain photons is captured by chlorophyll to produce sugar, whereas detection of a variety of light colours is ensured by numerous photoreceptors: "Plants are able to perceive quality, intensity, duration and direction of light to regulate important processes, such as seed germination, phototropism, shade avoidance or flowering time", explains Roman Ulm, professor at the Department of Botany and Plant Biology of the University of Geneva.

UV-B affects the plant's development

In contrast to the photoreceptors acting in the visible part of the light, a UV-B specific sensor had not yet been identified. Nevertheless, physiologists have shown that UV-B is used by plants as an environmental stimulus. "Plants are well acclimated to this highly damageable type of radiation and they produce their own molecular sunscreen", notes Jean-Jacques Favory, a postdoctoral scientist at the University of Freiburg. The plants' shield consists of UV-absorbing substances such as flavonoids or enzymes that repair DNA damage, during exposition to light.

UV-B also influences the growth and yield of plants. Roman Ulm's team now reveals how this radiation is perceived: "The UV-B photoreceptor is formed of proteins called UVR8. Upon light absorption, the proteins separate and interact with a central regulator of light signaling present within the cell. This in turn triggers a biochemical cascade necessary to promote the responses for plant survival and acclimation", details Luca Rizzini, another member of the group.

Ozone and the UV-B sensor work hand in hand

UVR8 proteins are broadly present throughout the plant kingdom. This raises the intriguing possibility that, together with the development of an ozone layer in the stratosphere of

Earth, the evolution of terrestrial plants may be coincident with the acquisition of the UV-induced responses mediated by this receptor. The identification of a UV-B sensor will also allow investigating whether its activity is influenced by anticipated climate change.

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