Title: Plant Stress Responses: Impact of an Energy Sensor on Alternative Splicing.

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Abstract

Compelling evidence indicates that the proteomic diversity and gene expression regulation conferred by alternative splicing, a key posttranscriptional regulatory mechanism that generates multiple transcripts from the same gene, is crucial in the ability of plants to respond to environmental stress. On the other hand, the SNF1-related Protein Kinase 1 (SnRK1) is a key component of the plant stress response. Upon sensing stress-associated energy deprivation, SnRK1 triggers a vast reprogramming of the transcriptome that promotes stress tolerance and survival [1], but most of the mechanistic details underlying regulation of gene expression by SnRK1 remain unknown.

Collaborative work between the Plant Molecular Biology and Plant Stress Signaling groups at the Instituto Gulbenkian de Ciência (IGC) has uncovered a connection between alternative splicing and the SnRK1 kinase. Our work has shown that the arabidopsis SR45 splicing factor, a negative regulator of sugar and stress signalling [2], genetically interacts with SnRK1 modulating the stability of this protein kinase [3]. We hypothesize that SnRK1 regulates gene expression in response to stress partly by controlling SR45 function and thereby alternative splicing. To test this hypothesis, we are using a combination of molecular biology, biochemistry and large-scale computational approaches to assess whether: 1) the SR45 and SnRK1 proteins interact physically; 2) SnRK1 phosphorylates SR45; and 3) both components have overlapping global effects on alternative splicing. This project will provide the student with an opportunity to develop skills in a broad set of methodologies, including RT-qPCR, immunoprecipitation, in vitro kinase assays and RNA-seq.

References