FurC (PerR) from *Anabaena* sp. PCC7120 is a global regulator that controls several important processes in cyanobacteria such as nitrogen metabolism, photosynthesis and oxidative stress defenses. Previous studies from our research group identified a putative FurC DNA-binding consensus sequence. In the present work, this putative FurC DNA-binding box was searched in the promoter regions of the whole *Anabaena* sp. PCC 7120 genome in order to expand the regulon of FurC. All the newly predicted FurC targets were evaluated by electrophoretic mobility shift assays (EMSA), allowing the identification of novel FurC targets. Some of these newly identified targets display relevant roles in nitrogen fixation (*hetR* and *hgdC*) and carbon assimilation processes (*cmpR, glpP1* and *opca*) suggesting a key regulatory role of FurC in the control of C and N metabolisms. Besides, 2-oxoglutarate (2-OG) a molecule that acts as a signal of C/N balance was found to be able to bind to FurC and to have an effect on its DNA binding activity. Taken together, these data suggest that apart from redox signals and metal homeostasis, FurC could also respond to C/N ratio. Thus, FurC would be an additional player for the harmonization of carbon and nitrogen metabolisms.

1. **Prediction of novel FurC-binding sites in *Anabaena* sp. PCC 7120 genome**

Bioinformatics tools were used to build a FurC DNA binding-box weight matrix and look for putative FurC-binding sites in *Anabaena* sp. PCC 7120 genome.

2. **Identification of novel FurC direct targets**

Electrophoretic Mobility Shift Assays (EMSA) were used to determine whether FurC was able to bind to the predicted binding sites and allowed the identification of 19 novel FurC direct targets. Gene expression analysis was used to compare the expression levels of these novel FurC direct targets in a *furC*-overexpressing strain (EB2770FurC) versus the wild type strain *Anabaena* sp. PCC7120. All the tested genes showed altered expression in the *furC*-overexpressing strain thus confirming their direct regulation by FurC.

3. **Differential gene expression analysis of newly identified FurC Targets**

Transcriptional analysis were used to compare the expression levels of some novel FurC direct targets in a *furC*-overexpressing strain (EB2770FurC) versus the wild type strain *Anabaena* sp. PCC7120. All the tested genes showed altered expression in the *furC*-overexpressing strain thus confirming their direct regulation by FurC.

4. **FurC binds to 2-OG**

EMSA assays showed that FurC was able to bind to 2-OG, a molecule that acts as a signal of carbon/nitrogen balance, in the presence of Mn²⁺ and reducing conditions. Besides, this interaction was proven to be specific, since FurC was not able to bind glutamate, a molecule which a similar structure to 2-OG.

5. **FurC is involved in the control of processes dependent on C/N ratio**

FurC seems to control important processes essential for the maintenance of C and N homeostasis: genes involved in heterocyst formation such as the *hgdC* transporter and the master regulator of heterocyst development *HetR*; genes involved in carbon metabolism such as *CmpR*, a transcriptional regulator that controls the carbon fixation, *GlpP1* glycogen phosphorylase and *Opca*, which activates G6PDH.

**CONCLUSIONS**

- This work allowed the identification of several novel FurC targets displaying key roles in carbon and nitrogen metabolism (*hgdC, hetR, glpP1, cmpR, opca*) but also genes involved in photosynthesis (*psbZ, fos1*), zinc homeostasis (*supT*) or aminoacid metabolism (*phea*)
- FurC could regulate these processes by integrating 2-OG levels, a metabolite that informs about the cellular C/N balance