INTERINTERVIEW DR.VICTOR YASHUNSKY

POSITION: Post-doctorate
INSTITUTION: UMR168 – LABORATOIRE PHYSICO CHIMIE CURIE
RESEARCH SUBJECT: Physico-biology

After contacting Dr Bar Dolev and discussed about our project, she advised us to contact one of her ancient PhD student, Dr Yashunsky, because of his expertise on physico-biology. We thought indeed that Dr Yashunsky could help us in our quest for a great proof of concept ! We want to thank him for his time !

WHAT ARE YOUR ADVICE ABOUT OUR PROOF OF CONCEPT AT THE COLD LEVEL?

→Firstly you need to know the volume of protein/compound you want to make. Look at the compound's effective concentration, its action and competition with other molecules like water and other particles, how they bind ice. The compounds effects are visible through the use of microfluidics, with only the compound in solution.

WHAT MATERIAL DO YOU THINK WE WOULD USE?

→The experiments are performed with difficult and specific materials.You could use microscopes with big white cells like onion cells. You could also test your compounds on hydrogels because they are close to living tissues properties. You can also use environmental chambers. Chillers circulator (water circulator), freeze a volume of water (to cool pipes), can be set to the temperature of choice. It is good because of the control board that controls temperature directly.

WHAT COULD BE THE SAMPLE SIZE FOR SUCH PROOF OF CONCEPT?

→Ice nucleation is very unpredictable and can vary from one sample to another so you will need a great number of samples to have reproducible results. The size of the sample is important also because of the ice melting that can happen and degrade the samples.

HOW DO YOU THINK WE SHOULD PROCEED?

→To measure frost damages, you can use electrolytes and measure conductivity. You take the leaf and put it in the measured medium, than you dose the ions in the medium. Damaged leaves will release more ions that will be observable by the device. This works as well for the damages caused by heat. You could use thermocouples to analyse the temperature of ice formation.

ANY OTHER REMARKS?

→Firstly stay close to 0°C with your temperatures. You can take also -20°C and dry ice (-70°C). You can first look at your Antifreeze proteins activity by putting capillaries with protein in solution in ice. The capillaries will start to freeze, and you can evaluate the degree of freezing and deduce the protein efficiency with a space gradient (distance at which the freezing stops).
You can put the protein in water or in plant fluids. I recommend using salts and glycerol before your proteins as positive controls. You could even do an array of tubes with various glycerol/salt concentration to have a reference.
You will need a great volume of ice and be careful because low volume capillaries can freeze very hardly. You can add a temporal gradient to your space gradient by measuring the time needed for cooling.

ANY ADDITIONAL REMARKS?

→You can contact Sylvain Deville and Hervé This, they are specialists in freezing processes and manipulation, they might have equipments ! Try also to look at the product called Snowmax and be careful with the AFPs. They are very hydrophilic and can induce the probability of ice forming on the leaves.

A big thank to Mr Yashunsky for his contribution and his good advices !