A MODEL BACTERIUM

Pascale Cossart – There is a real come back of infectious diseases… We no longer have the weapons that we had 30 years ago to fight them. We need to create new ones and thus it is important to understand how microbes generate diseases, in order to identify the weak points in their strategies and consequently targets for new therapeutics. We do it in the Pasteur Institute by studying a bacterium used as a model, which has revealed that bacteria are amazing: they deploy an unexpected arsenal of weapons and mechanisms to escape human defenses and sometimes kill their human host.

Unfortunately antibiotic resistance has dramatically increased and there is a risk that we come back to a pre-antibiotic era. The present challenges are thus a constant survey of microbes and infections, rapid and efficient diagnostics and the search for new vaccines and new therapeutics, not only against present diseases but also against emerging diseases. It was in this context that in the late 80's I started to study the biology of bacterial infections, and chose the bacterium Listeria monocytogenes as a model system. This bacterium lives in the environment and can contaminate food, such as dairy products. This bacterium, contrary to other, first resists the stomach acidity and once in the intestine can cross the intestinal barrier, reach the blood and disseminate in the organism, sometimes succeeding to reach the brain and in pregnant women the placenta. With elegance and efficiency!

A fascinating property of Listeria is that it is able to move from one cell to the next… For that it recruits actin from the cell –actin is a compound used for cell mobility and also cell plasticity–. So Listeria recruit actin, polymerize it and become able to move inside cells and from cell to cell, protected from defenses of the immune system like circulating antibodies, complement etc. Listeria is also different from other bacteria: it can grow at low temperatures, this is why it is called the "fridge bacterium". In general when you put food in the fridge you think that growth of microbes stops. Listeria still grows as if it were kept warm…

Up to recently, one thought that bacteria were very simple. This is no longer true they are very complex! Moreover, they often live in communities and can act in groups! One talks now of the social life of bacteria. I like this term because they can communicate. They talk to each other, they have a language, a chemical language. They send signals to each other… Bacteria do recognize each other! They can say: you are my sister or you are my cousin… You are more distant … Sometimes bacteria act with their sisters so that together they produce a toxin and proceed to the attack… They can detect the presence of other bacteria by the fact that each one sends in the medium a compound. The concentration of the compound increases and once a threshold is reached, all bacteria start to produce toxin or poison…

Be very careful, bacteria are terrible! However, don't forget, many are very useful but this is another story!

3min 50sec