A GARDEN OF CELLS

Dr. Jamie Piret is interested in ways of optimizing conditions for the growth and maintenance of mammalian cells. The ability to maintain these types of culture is becoming increasingly important for research in areas such as biopharmaceuticals, stem cell technologies, cell transplantation, tissue engineering and gene therapy.

When you're thinking about growing cells (in say,.. a flask), you have to realize that there are many many different conditions with which you can play around with.

FOR EXAMPLE, how much should I feed the cells? How much oxygen should I give them? What temperature is best? Should I swirl gently or vigorously, or not at all?

As you can see, there are many variables involved, and Dr. Piret's research is all about figuring out the best ones.



Dr. Piret's lab helped to develop an acoustic particle separation device which acts as sonic filter allowing fluids (but not cells) to pass through.

* Using perfusion reactor systems, Dr. Piret is primarily interested in understanding how to efficiently optimize protein production and stem cell culture processes.

* Many cells can be made to produce useful pharmaceuticals in the form of some sort of biological molecule. Usually, this molecule is a recombinant protein. (An example of a commonly produced recombinant protein is insulin). * In essence, this work is important because the optimization of cell culture conditions would lead to the optimization of biopharmaceutical production. Furthermore, these cells which have the ability to produce specific proteins can be used in a form of gene therapy, whereby missing proteins can be replenished via the delivery of cells.

* There is also a huge interest in the culturing of stem cells. These are special cells which have the potential to become anything.

In other words, these cells have not been committed to any one particular type of tissue. Immune stem cells or hematopoietic stem cells have the



potential to become any type of immune cell.

This includes things like red blood cells, your white blood cells, and cells responsible for blood clotting. When a person receives a bone marrow transplant or a placental cord transplant, it is really these stem cells that the doctor is after.

These cells are difficult to work with because they are (i) very rare and (ii) very hard to maintain once outside an organism. Therefore, the ability to grow and keep them in culture is invaluable in many medical technologies.

 $q_P = \beta \mu + \alpha$ $\frac{dS_i}{dt} = -q_s X$ $\frac{dP}{dt} = q_P X$

Dr. Piret conducts research by performing experiments and by using mathematical models of the various conditions observed. 5 a a a d



Dr. Jamie Piret

KEY WORDS tissue culture: the process of maintaining and growing mammalian

cells.

recombinant protein: this is a protein produced by an organism or cell,after a scientist has inserted the specific DNA code for that protein.

perfusion reactor: this is basically a container which can hold a high number of cells whilst allowing fluids (providing nutrients) to pass through. In addition, fluid coming out (which may contain materials produced by the cells) can be collected.