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Beyond Cell Counting to Study Leukemia

Claudia Bruedigam at the Gordon and Jessie Gilmour Leukemia Research Laboratory, QIMR Berghofer Medical Research Institute Australia, shares her experience with the Corning® Cell Counter.

Why are you interested in leukemic research?

I developed an interest in leukemia during my Ph.D. and joined Associate Professor Steven Lane's laboratory in 2011. Acute Myeloid Leukemia (AML) is of particular interest since it is a very aggressive and lethal disease. The field is currently at an inflection point, with several drugs entering clinical trials as a result from discoveries made during the "genomic era". I think there is a lot of opportunity here at this time to transform research and to deliver outcome, and it is this urgency that fascinates me. On the other hand, leukemia is also a disease that can be very well studied because we do have a lot of models available and many patients are willing to donate their samples to our research efforts and commit themselves to clinical trials as well.

What are your research goals in studying AML?

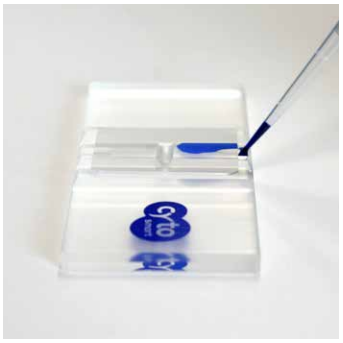
I am interested in developing and testing new drugs for the disease having focused on the development of the first in class telomerase inhibitor Imetelstat for the past 5 years. I am consolidating a comprehensive and representative AML patient-derived xenograft resource in conjunction with biomarker discovery, preclinical testing, and optimization of novel therapeutic agents.

Can you talk about the different cell types used in your leukemia models?

We use a large panel of suspension-based AML cell lines that are very well established such as NB4, MV411, and OCIAML3. We also have bone marrow aspirates or leukapheresis samples from AML patients at the Royal Brisbane and Women's Hospital which is located on the same campus. These aspirates are banked and are frequently used to establish our xenograft models. The laboratory head A/Prof. Steven Lane is also the AML trial lead for the Brisbane Diamantina Health Partners (BDHP) clinical trials group which is a collaboration between ten world-class hospital and health services, research institutes, and universities in Queensland, Australia. Therefore, we do have access to many AML patients.

Why is cell counting important in your laboratory workflow?

Cell counting is important because often it is really the first step of the experimental workflow, so it's paramount to have a very precise cell count. Furthermore, with our large patient sample size it is also important to be able to do this in a relatively fast manner. We perform between 50 to 100 cell counts on a weekly basis.



As we use the Corning® Cell Counter to count cells after Ficoll separation, the heterogeneity of the bone marrow aspirate is already largely reduced having enriched for the blast-like cells.

In addition, the Cell Counter is used for our large-scale *in vitro* drug testing and characterization studies and for the preparation of xenograft transplantation experiments.

Are there any differences counting the established cell lines versus the primary cells?

Yes. There is a discernable difference in size. We find that AML cell lines are approximately 9 to 10 µm in size and generally larger compared to patient samples which are approximately 7 to 8 µm. Otherwise we find that the Cell Counter data for viable cell count is reliable when we compare to our manual cell counting technique.

Why are you excited about the Corning Cell Counter?

We had been looking for an automated cell counter like this for a long time. It is important for us to be able to use our own hemocytometer so that we can always double-check the cell count manually if it is a very important sample. I don't think there is another automated cell counter on the market at the moment that has this flexible feature. With the Corning Cell Counter, the counting algorithm seems to be very robust so we do get very reliable data, and it is also very fast. Another absolute advantage is that the cell counter can provide data pertaining to treatment-specific changes in cell size as well. We get a very good readout of the morphological changes that are induced by our drugs in the AML cell culture dishes since very often the cells change size after treatment. It is helpful to get this functional data in such an easy manner.

How do you feel about the cloud-based features of the instrument?

I think a key advantage is that it allows us documentation of data unlike other cell counters. Cloud-based documentation ensures the precise recording of the workflow including exact time and raw data. This is particularly important for data reproducibility, and also experimental trouble-shooting if required.

What can be difficult at times is the IT set-up at the institute and challenges using the ethernet with the cloud-based application. We generally run the software via Wi-Fi which can sometimes be slow, so we take this into consideration and allow more time for counting if necessary. I think it is great that so much work and development has been done so that the software is constantly improving.

Are there other differences about the Corning Cell Counter that may matter to researchers?

The handy feature of getting cell size is also quite informative when we wish to flow sort cells that haven't previously been flow sorted so we know which size of nozzle to use. The cell counter can be connected to a large monitor making it easy to clearly see the cells on the screen. Other automated cell counters have a small embedded screen on the machine itself, so sometimes it can be tricky to visualize the cells. Finally, we don't need to buy the counting chamber consumables which is a big plus financially as well.

What are your future aspirations in the laboratory?

My future plan is to continue to develop our comprehensive patient-derived xenograft resource that is really a unique resource in Australia and also one of the largest worldwide. We are also helping to build an Australian pre-clinical cancer consortium combining our expertise with other cancer type specialists. The goal here is to improve and significantly drive forward pre-clinical drug development in Australia using suitable preclinical models in conjunction with biomarker testing and optimization of novel drugs.

Further information

- https://www.qimrberghofer.edu.au/lab/gordon-and-jessie-gilmour-leukaemia-research/
- https://www.leukaemia.org.au/
- https://brisbanediamantina.com/about/the-partners/

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