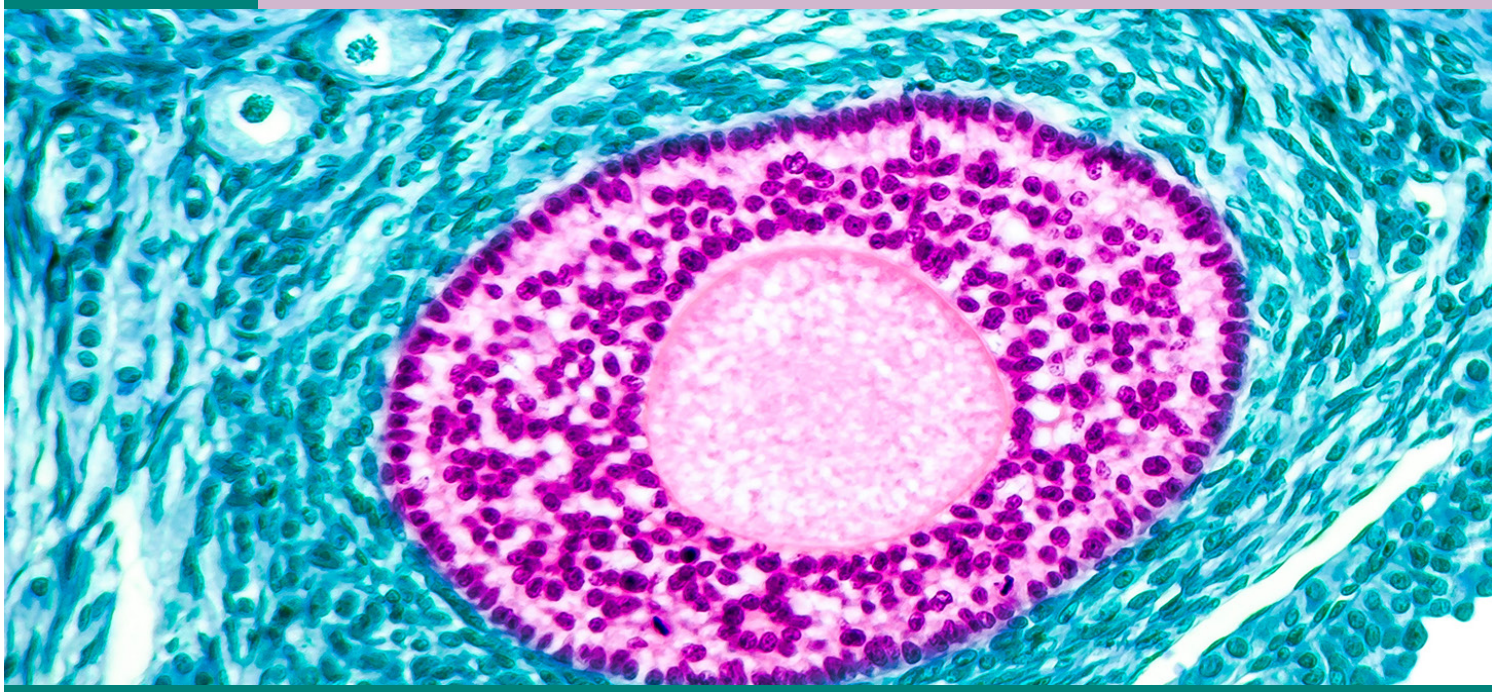
CASE STUDY

Research Pathology



Single Cell ICP-MS Presents Hope for More Effective Ovarian Cancer Treatments

Background On Ovarian Cancer

For the more than 22,000 American women diagnosed with ovarian cancer every year, a new treatment could soon increase their chances of survival beyond the current estimate of 50% after five years[1].

The current high mortality rate is the result of several factors. Foremost among them is that the most lethal form of the disease – epithelial ovarian cancer – happens to be its most common form, affecting up to 90% of women diagnosed with the disease. Then there is the insidious side of the deadly disease. In its early stages, ovarian cancer has few if any noticeable symptoms that escape even the most skilled diagnosticians. By the time the disease is finally discovered, the cancer is usually at an advanced stage[2].

Finally, there is the long-term efficacy of treatment options. Most ovarian cancer patients initially undergo major surgery for the removal of cancerous ovaries, fallopian tubes, uterus, and nearby lymph nodes. Chemotherapy and sometimes radiotherapy treatments normally follow. Cisplatin, a platinum-based compound, is one of the most effective chemotherapy drugs used against ovarian cancer. A standard treatment since the 1970s, cisplatin and the related platinum derivatives, carboplatin and oxaliplatin, initially work well against cancer cells. Unfortunately, patients usually relapse and their cancer develops a strong resistance to cisplatin treatment[3].

Emerging New Strategies

Researchers at the National Institutes of Health and PerkinElmer are working to change that. "The problem with studying cisplatin uptake in cells is the methodology," Lauren Amable, Ph.D., and Staff Scientist at the NIH's National Institute on Minority Health and Health Disparities, says. "Traditionally, we treat cells with cisplatin, then measure the total amount of platinum in the cell population using atomic spectroscopy or inductively coupled mass spectrometry." That, however, raises more questions than answers, since the traditional approach focuses on the total cell population and not the individual cells themselves. "In reality, cellular uptake of cisplatin most likely varies in response," Amable says, "but until now, there have not been effective methods to evaluate its uptake."

Single Cell ICP-MS

The method Dr. Amable is referring to is a revolutionary new technology developed by PerkinElmer. It features the company's new NexION® ICP-MS Single Cell Analyzer (SP-ICP-MS) that allows for the analysis and quantification of metal content per individual cells.

"For the first time, the NexION SC-ICP-MS allows for the quantification of metal at the level of a single ovarian cancer cell," Chady Stephan, Senior Leader of Applications at PerkinElmer and a co-researcher on the ovarian cancer cell study, says.

"The technique is based on the ability to measure discrete signals generated from a cell when it enters the plasma, and allows for the quantification of cisplatin within individual cells," Dr. Amable explains. "The new technology shows that cisplatin uptake more closely reflects what actually occurs within tumor cells," she notes. "That, in turn will lead to the development of new strategies to increase cisplatin uptake in cancer cells, translating to better clinical responses."

"Future studies using Single Cell ICP-MS will allow researchers to better understand cisplatin uptake in cancer cells that will likely lead to new therapies not only for the treatment of ovarian cancer, but for a number of other cancers treated with cisplatin or other metal based drugs," Stephan says. In the big picture, instead of a one-size-fits-all approach to cancer, this new technology will help advance research into personalized treatments tailored to the needs of each patient.

References

1. Cleveland Clinic, "Ovarian Epithelial Cancer," Cleveland Clinic Health Library, http://my.clevelandclinic.org/health/articles/ovarian-epithelial-cancer, accessed February 13, 2017.
2. American Cancer Society, "What Is Ovarian Cancer?," About Ovarian Cancer website, February 4, 2016, https://www.cancer.org/cancer/ovarian-cancer/about/what-is-ovarian-cancer.html, accessed February 13, 2014.
3. Britta Stordal, Mary Davey, "Understanding Cisplatin Resistance Using Cellular Models," International Union of Biochemistry and Molecular Biology Life Journal, 2007, Vol. 59, Issue 11, pp.696–699, http://onlinelibrary.wiley.com/doi/10.1080/15216540701636287/abstract;jsessionid=1918B0446B320EFB2AAD18CA4B236802.f03t03, Accessed February 13, 2017.

PerkinElmer, Inc.
940 Winter Street
Waltham, MA 02451 USA
P: (800) 762-4000 or
(+1) 203-925-4602
www.perkinelmer.com

PerkinElmer®

013495_01 PKI