Novel immunotherapy for ovarian cancer

Building on their discovery of IFNε, Hudson researchers have found a novel treatment targeting ovarian cancer.

Discovered in Professor Paul Hertzog's laboratory in 2004, it was only in 2013 that technology allowed our researchers to start determining how IFNε works. Our team have now found that IFNε has distinct properties that position it as a potential ovarian cancer therapeutic. In the provisional patent, our team describes the use of IFNε in the treatment of ovarian and other cancers, as either an alternative or adjunct to current treatments.

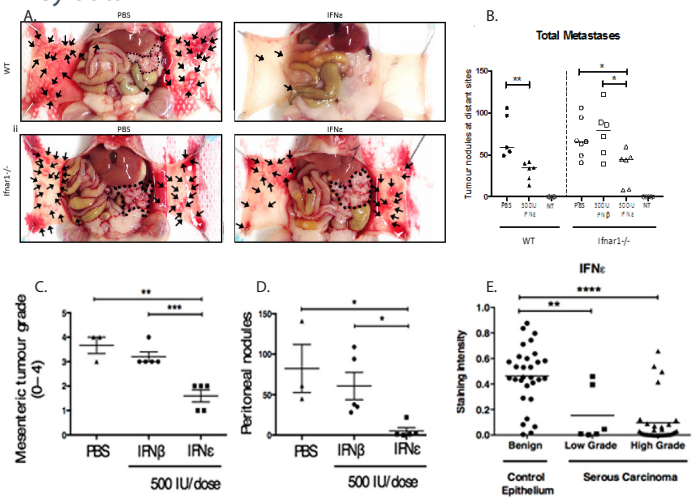
Background

Interferons (IFNs) are a group of signalling proteins released by host cells in response to pathogens and tumour cells. IFNε is unique among the type 1 interferons, as it is expressed constitutively and most abundantly in the epithelial cells of the female reproductive tract, where it is regulated by estrogen and progesterone hormones.

Ovarian cancer is one of the most common cancers of the female reproductive tract. It is the eighth most common cancer overall among women, and is the most common cause of death from a gynaecological cancer.

The Hudson team has discovered that IFNε inhibits both the development and metastasis of ovarian cancer in preclinical models. The likely protective role of IFNε in ovarian cancer was confirmed by its low expression levels in patient carcinoma samples, and treatment of human ovarian cancer cell lines with IFNε demonstrated that it induces anti-tumour effects. An *in vivo* disease model further supports their findings that treatment with IFNε suppresses tumour burden and spread.

Key data



IFNε treatment suppresses tumour burden and spread in the disseminated ID8 ovarian cancer murine model (A-D). Immunohistochemical staining showed IFNε expression was decreased in human low- and high-grade serous ovarian carcinoma patient samples compared to control epithelium (E).

IFNε Summary	
Species	Human and Murine
Delivery	Intraperitoneal (500IU)
Application	Stand alone
Size	~20kDa
Animal model PoC	-/- IFNε syngeneic ID8 ovarian cancer mouse model

Applications

Current standard treatment options for women with ovarian cancer include surgery with chemotherapy. Because there is no early detection or screening test for ovarian cancer, most cases are diagnosed at an advanced stage of disease, when the 5-year survival rate is only 43%. In many cases disease is no longer confined to the ovaries and has spread to other organs in the peritoneal cavity. Approximately 75% of patients will relapse, often with chemotherapy-resistant disease which limits treatment options further. There is an urgent and unmet need for novel therapeutic options.

Interferon therapy is currently used in combination with chemotherapy and radiotherapy as a treatment for some cancers. However, the clinical use of IFN to date has focused on the conventional type I IFNs and the type II IFN, IFNγ. IFNε has not yet been developed for clinical use, and presents a novel treatment strategy for ovarian cancer.

Market

In 2015, the ovarian cancer market was valued at USD1.233 billion across the seven major markets—USA, France, Germany, Italy, Spain, the UK, and Japan. This is estimated to rise by 15.5% to >USD5.2 billion by 2025.

Recent sales forecasts for new classes of ovarian cancer medications indicate a lucrative market for novel treatments. The introduction of molecular-targeted therapies such as PARP inhibitors are transforming the ovarian cancer treatment space. However, only three new PARP inhibitors have attained FDA approval to date. The first two PARP inhibitors, Lynparza (olaparib, Astra Zeneca, 2014) and Rubraca (rucaparib, Clovis Oncology Inc,

2016), are approved for patients with advanced ovarian cancer who have been treated with ≥2 prior lines of chemotherapy, and are limited in utility to the approximately 15% of patients with a BRCA mutation; Lynparza is also FDA approved as a maintenance treatment for patients regardless of BRCA status. Tesaro's Zejula (niraparib) is approved for use as a maintenance treatment by the FDA in patients regardless of BRCA status (2017), after demonstrating reduction of risk of disease progression by 74% in patients with BRCA mutation and by 55% in patients without BRCA mutations. Peak sales estimates for Lynparza and Zejula have been estimated at USD875 million and USD1.1 billion, respectively. Despite these advances, further innovative treatments that provide an adjunct or alternative to chemotherapy and surgery are still urgently needed.

Development pathway

To date we have demonstrated efficacy in *in vitro* models and an *in vivo* murine model, and are currently developing a PDX model. Our team are currently seeking opportunities for co-investment, licensing or collaboration to further develop the IFNε ovarian cancer treatment program.

IP position

PCT/AU2018/050054, with priority date of 30 January 2017.

The patent application has been prepared and refined by Dr John Hughes, patent attorney and partner at Davies Collison Cave, in conjunction with the Inventors. Hudson Institute is the sole assignee of the Provisional Patent Application.

Inventors

The team is led by Professor Paul Hertzog, Director of the Centre for Innate Immunity and Infectious Diseases at the Hudson Institute of Medical Research; NHMRC SPRF; Research Professor - Monash University; and Adjunct Professor - Chinese Academy of Sciences. Prof Hertzog has an established record of research on immune responses to cancer and infectious diseases, using a multidisciplinary approach involving analyses of the cell, molecular biology of cytokine signalling and gene regulatory networks, preclinical genetically modified mouse models of disease, and clinical studies.

Publication status

Manuscript in preparation.

Contact us

e: commercialisation@hudson.org.au
t: +61 3 8572 2528
w: http://hudson.org.au/commercialisation/

Hudson Institute of Medical Research

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- Cancer
- Endocrinology and metabolism
- Fetal, infant and child health
- Immunology and infectious diseases
- Reproductive health and biology
- Women's health

Opportunities for collaboration and partnership

Partnership opportunities include:

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- Reproductive, women's and children's health
- Regenerative medicine
- Infectious disease, inflammation and immunology
- Diagnostics and biomarkers

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Key Indicators

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