**Minireview Article**

**A REVIEW ON THE EMERGING TECHNOLOGIES IN OVARIAN CANCER.**

**ABSTRACT:**

In the western world, ovarian cancer is the most fatal and second most prevalent gynecologic cancer. Ovarian cancer is usually diagnosed in an advanced stage. Ovarian cancer is a dangerous tumor that affects women’s reproductive systems and poses a significant threat to their health. Researching ovarian cancer is tough due to its genetic heterogeneity, complex pathophysiology, restricted availability of human tissue, unique metastatic mechanisms, and unknown genesis. To gain anatomical knowledge of the pathophysiology of ovarian cancer, novel experimental models must be created. Six main types of ovarian cancers are identified by the WHO classified into serious, mucinous, endometrioid, clear cell, transitional cell, and squamous carcinoma. **Even though successful treatments difficult for most women with ovarian cancer**. Although the exact ethological pathways are still undetermined, mostly believed that the ovarian surface epithelium is main site of most ovarian carcinoma.

A diverse category of neoplasm’s ovarian cancer is typically categorized according to their kind and level of differentiation. It is becoming clear that every major histological form of ovarian carcinoma has distinctive genetic abnormalities that deregulate particular signaling pathways in the tumor cells, even if the present clinical therapy of this heterogeneity is mostly ignored. Furthermore, the molecular etiology of low grade and high-grade cancers seems to differ significantly within the most prevalent histological categories.

Ovarian carcinoma is a worldwide issue that lacks an efficient screening method and is usually discovered at advanced stage. For newly diagnosed cancer, platinum-based chemotherapy and cytoreductive surgery are the standard treatments.

**KEY WORDS:** Ovarian carcinoma, tumor, pathophysiology.

**INTRODUCTION:**

Ovarian cancer is the seventh most prevalent carcinogenic tumor and a fifth major cause of mortality in female reproductive illnesses. As life expectancy increases, the number of cases detected continues to rise. However, prevention measures and effective therapies still need to catch up. The condition is often not recognized until it has evolved, leading to significant hospitalization and fatality rates **[1].** In a single year, within 220,000 new cases of ovarian cancer are identified, approximately 140,000 women suffering with this cancer globally. **Ovarian malignancies it has complex disease** with multiple subtypes that differ in molecular biology and clinical behavior. Despite limited treatment options over the last decade, overall survival remains minimal. Targeted therapies had been developed as a result of **increased** **in** understanding of the disease molecular biology **[2].** **The most prominent carcinoma in women which results in ovarian cancer mortality [3].**

 Implementing cell lines with the same characteristics is crucial for the early phase of research. Cell lines are chosen based on the individual history, histopathological type at evaluation, gene sequence and signal pathways. Cell lines are naturally derived by using carcinomas at various stages of pathways. Cell lines were originally generated by using carcinomas at various stages of the disease’s progression based on histology studies. These cell lines are primarily researched invitro, beneath the standard cell cultural practices **[4].** Cell lines employed in studies frequently lack in identifying the genetic components typically associated with malignancies. The study explores the potential of such cell lines for preliminary research **[5].** The developed cell lines have been identified by morphological cell culture, surface maker expression, chromosomal evaluation, and cell survival **[6].**

Ovarian carcinoma **are** epithelial **(**malignancies**)** and **the thought to develop from the ovarian surface epithelium nor surface epithelial inclusion cysts**. **The molecular origin of ovarian cancer is so new therapeutic targets and biomarkers that aid advance diagnosis can be created usually classified ovarian epithelial tumors based entirely on cell structure**. The four **main significant** forms of epithelial carcinoma **into** serous, endometrioid, clear cell as well as mucinous show strong presence to the normal cell membrane lining various organs in the female reproductive tract **[7].**

**EPIDEMOLOGY AND RISK FACTORS:**

The epidemiological studies of ovarian cancer (ESOC) emerged in 1998to centralize and evaluate individual participant data from all ovarian cancer studies, examining the risks related with hormonal and various other causes **[8].** Having ancestry of ovarian malignancy is a major threat. First degree descendants of individuals have a 3 to 7 times greater chance of developing it, especially if many families are affected and the first sign occurs at an early age **[9].** In 2020, there was within 21,400 new instances of ovarian malignancy, corresponding to 1.2% cancer instances. **Most commonly related with 13,700 deaths**. Females have a 47.3% five-year survival rate **[10].** Epithelial ovarian cancer has been regarded as a single disease in epidemiological and research studies, including those that corroborate established risk factors like infertility and lack of oral contraception. Histologic kinds have not been distinguished. Risch first reported variances in warning signs for epithelial ovarian cancer based on histology **[11].**

 Despite an increased understanding of ovarian cancer’s indications, the accuracy of their identification remains extremely poor. Ovarian cancer is sometimes referred to as a “silent killer” due to the fact that most patients receive the diagnosis at the advanced stages, with no noticeable signs in initial stages. In the last few years, **much research** **has** focused on detecting ovarian cancer based on symptoms. Patients with ovarian cancer may experience signs for months prior to being diagnosed **[12].**

 Women with pathogenic variants in BRCA1 or BRCA2 are at a higher danger of developing ovarian cancer over the lifetime. Carriers of BRCA1 mutations have a 40% lifetime potential for developing ovarian cancer, whereas those with BRCA2 mutations have a 20% risk **[13].** Whereas genetic variants in breast cancer BRAC1 and BRCA2 have been linked to 20% of ovarian cancer cases, most of them remain isolated **[14].**

 Earlier investigation has found an important positive association between menopausal hormone therapy (MHT) and endometrioid malignancies, but not always. Studies on non-reproductive exposures have found no persistent variations in histological subtypes based on BMI, physical activity, consumption of alcohol or tobacco use **[15].**

There is a weak established link between BMI or obesity and ovarian cancer. Obesity may have no relationship with ovarian cancer, which is subtype specific. Elevated BMI of 30 or above among post-menopausal females has been linked to a high risk of developing Ovarian malignancy relating to limited cohort studies **[16].**

**TECHNOLOGIES USED IN OVARIAN CANCER CELL LINES**

**XENOGRAFTS:**

Xenografts mimic the primary tumor's variability while retaining its properties. **We created** transplantable ovarian tumor tissues with the same genetic and biologic characteristics as the original patients. The research suggests that using this can lead to new therapeutic options for ovarian cancer **[17].**

 The tumor dissociation kit was used to eliminate mouse cells from patient derived xenograft tumor [PDX] and extract only human tumor cells. PDX tumor tissues were extracted and processed under septic circumstances, eliminating fat, fibrous and dead tissue while keeping usable tumor material. To dissociate tumor tissue into single cells, 1g of healthy tissues was employed and **fragmented PDXs** were incubated with digesting enzymes for 60mins at 37°C. After incubating with digestive enzymes, **and** these samples were centrifuged, restored in a new medium, and tallied **[18].**

The combination of antibodies suppresses the growth of human ovarian cancer cells in culture in dormant xenografts **[19].**

**FLOW CYTOMETRY:**

The flow cytometric approach can detect tumor cells in samples with low quantities **[20].**

**A confirmed intracellular staining procedure was used**. **PBMC’s** were **preserved night** in 0.4% paraformaldehyde at 4°C and then stained. Antibody molecules for single color cytometry contained rabbit. During tests, a single-color flow technique was employed to optimize excitation settings. Later, a dual stain procedure was optimized with antibodies from several species.

**Designed and implemented a multiparameter flow cytometry technique to determine µH2AX and MRE11[21].**

**2D AND 3D CELL CULTURE SYSTEMS:**

Sustain ovarian tissue is a successful approach for sustain female fertility and maintain endocrine function. Several studies have used ovarian tissue culture to improve transplant life span and reduce neoplastic cell reimplantation. **This study compared** a standard (2D) culture to an alginate matrix (3D) guideline for ovarian tissue culture **[22].** Experiments utilized both 3D OvCa models and 2D analyses. Also, information from sequencing arises and RNA sequencing **is** **available** **[23].**

Research has demonstrated that 2D and 3D cell culture models are effective for studying ovarian cancer invitro, capturing many characteristics of the illness across numerous levels of complexity. Having multiple possibilities is beneficial since no single model, no matter how complicated, can fully stimulate ovarian cancer. Combining results from several methodologies can provide an increased awareness of the process under consideration **[24].**

**LENTIVIRAL VECTORS:**

Lentiviral vectors are frequently employed in investigations into biology, operational genomics, and therapy with genes. Lentiviral vectors (LVs) work efficiently for transferring genes in both proliferating and non-dividing cells **[25].**

 **Lentiviral vectors were created** using triple transfection of 293 T-cells and successfully transduced the human ovarian cancer cell line IGROV-1 in vitro. Initial titrations testers with several vectors on 293 A-Cells revealed titers. After incubating samples of vector containing the residues at 37°C for different durations and testing their transmission on IGROV-1 cells.

The results showed that the viral particles half-life in vitro was similar to that in vivo **[26].**

**CRISPR/CAS 9 GENE EDITING:**

**CRISPR/CAS 9 method in SKov3 ovarian cancer cell line cultures** and examine its impact on self-factors associated in cancer development and death **[27].**

Ovarian cancer SKov3 cells with lentivirus encoded eGFP and eGFP-stable cells (SKOV-3eGFP+) were isolated using green fluorescence sorting. Fluorescence microscopy and flow cytometry studies revealed **that F-LP transfection inhibitor eGFP expression** in approximately 70% of SKOV-3eGFP+ cells. The genome modification efficiency was comparable to previous cationic lipid.

The CRISPR plasmid was modified to recognize DNMTI 1, and F-LP was employed to deliver the gDNMT1 plasmid and decrease DNMT1 expression in cancerous ovarian cells **[28]**

**CONCLUSION:**

Ovarian cancer is a serious condition often detected lately, but early diagnosis significantly improves the result. Advances in treatment and awareness, along with genetic testing for high-risk individuals are essential for better prevention and outcomes. **It is a leading cause of cancer incidence and deaths all over the world in female population**. Many technologies are used in the treatment of ovarian cancer some of them are xenografts, flow cytometry, 2D and 3D cell culture systems, lentiviral vectors, CRISPR/CAS9 gene **editing.The specific technologies which detect the cancer cells.**

**REFERENCES:**

**[1]** E. Pujade-Lauraine, Mechanisms and advance in anti-ovarian cancer with natural plant component’s DOI:10.1093/annonc/mdx442.

**[2]** Bernd C. Schmid, Martin K. Oehler,New perspective in ovarian cancer treatment DOI:77(2014)128,136.

**[3]** Cyril Touboul, Raphael Lis, Mesenchymal stem cells enhance ovarian cancer enhances ovarian cancer cell infiltration through IL6 secretion in an amino chronic membrane-based 3D mode. Journal of Translational Medicine 2013,11:28.

**[4]** Gynecol Oncol, Characterization of ovarian cancer cell lines as in vivo models for preclinical studies.

DOI: 10.1016/j.ygyno.2016.05.028

**[5]** Gynecol Oncol Beyond genomics: critical evaluation of cell line utility for ovarian cancer research.

DOI: 10.1016/j.ygyno.2015.08.017

**[6]** Collaborative group on Epidemiological studies of ovarian cancer,Menopausal hormone use and ovarian cancer risk: Individual participant meta-analysis of 52 epidemiological studies vol:385 May 9,2015.

**[7]** Brett M. Reid, Jennifer B. Permuth. Epidemiology of ovarian cancer: a review, Cancer Biol Med 2017.

 DOI: 10.20892/j.issn.2095-3941.2016.0084

**[8]** Kathleen R. Cho, le-Ming Shih, OVARIAN CANCER, Annu Rev Pathol.2009;4:287-313.

 DOI: 10.1146/annurev.pathol.4.110807.092246**.**

**[9]** Hal W. Hrite, M.D, Jutta S. Kaiser R.T, Establishment and Characterization of Four Human Epithelial Ovarian Carcinoma Cell Lines.

DOI: 10.1002/1097-0142

**[10]** Udit M. Zamwar, Ashish P. Anjankar, Aethiology, Epidemiology, Histopathology, Classification, Detailed Evaluation and Treatment of Ovarian Cancer. DOI: 10.7759/cureus.30561

**[11]** Allison W**.**K urian, Raymond R. Balise, Histologic types of epithelial ovarian cancer.

DOI: 10.1016/j.ygyno.2004.10.037.

**[12]** Ketan Gajjar, Gemma Ogden, khali Razvi Symptoms and risk factors of ovarian cancer.

 DOI: 10.5402/2012/754197.

**[13]** J.R. McLaughlinReproductive risk factors for ovarian cancer in carriers of BRCA1 or BRCA2 mutation.

 DOI: 10.1016/S1470.

**[14]** Eilbhe Whelan, I1kka Kalliala, Risk Factors for Ovarian Cancer: An Umbrella Review of the Literature. Cancers 2022,14,2708.

DOI: <https://doi.org/10.3390/cancers14112708>

**[15]** Int J. Cancer Ovarian cancer risk factors by histologic subtypes in the NH-AARP diet and health study. DOI:10.1002/ijc.26469.

**[16]** Wasana Sumanasekera, Taralein Beckmann, Epidemiology of Ovarian Cancer: Risk Factors and Prevention. ISSN: 2574-1241

DOI:10.26717/BJSTR.2018.11.002076

**[17]** Francesca Ricci, Marta Cesca and Carmen Ghilardi, Patient derived ovarian tumor xenografts recapitulate human clinicopathology and genetic alterations.

DOI:10.1158/0008-5472.

**[18]** Luyo Wang, Lin Wang and Ruiz-Echevarria, Patient derived Xenografts of high-grade serous ovarian cancer subtype as a powerful tool in pre-clinical research.

DOI: org/10.3390/cancers/13246288.

**[19]** Wei Qun Mao BS, Peters Phd, the role of vascular growth factor, Interleukin 8, and insulin like growth factor in sustaining autophagic DIRAS3-Induced Dormant ovarian cancer xenografts.

**[20]** Marti D. Forster, Michael G. Ormerod, flow cytometric method for determining folate receptor expression on ovarian cancer.

DOI:10.1002/cyto.a.20456.

**[21]** Lee et al. J Transl Med, development of a multiparameter flow cytometric assay as a potential biomarker for homologous recombination deficiency in woman with high-grade serous ovarian cancer.

DOI:10.1186/s12967-015-0604z.

**[23]** Ana Sofia Pais, Sandra Reis, the challenge of ovarian tissue culture: 2D versus 3D culture.

DOI: org/10.1186/s13048-021-00892-z.

**[24]** Marilisa Cortesi, Kristina Warton, beyond 2D cell culture: how 3D models are changing the in vitro study of ovarian cancer and how to make the most of them.

DOI: 10.7717/peerj.17603.

**[25]** Janaka Matrai, Marinee KL Chuah, recent advances in lentiviral vector development and applications.

DOI: 10.1038/mt.2009.319.

**[26]** Stefano Indraccolo, Walter Habeler, gene transfer in ovarian cancer cells: a comparison between retroviral and lentiviral vectors.

Publications: November 2,2015 American association.

**[27]** Behshad Montazeri Najafabadi, Abbas Dosti, evaluation of the effects of UCA1gene knockout with a new CRISPR/Cas9 gene editing technique in ovarian cancer cell line.

DOI:10.52547/JMJ.19.1.3.

**[28]** Diana E. Lamendola, Zhenfeng Duan, molecular description of evolving paclitaxel resistance in the SKOV-3 human ovarian carcinoma cell line.

DOI: <http://aacrjornals.org/cancerres/>.