

**Details of the Project sanctioned under the Human Resource Development scheme of  
Department of Health Research**

**1. Project Title:** Chemopreventive effect of Maslinic acid, a pentacyclin triterpenoid present in olives, on Triple-negative breast cancer

**2. Category of fellowship:** Young scientist in newer areas

**3. PI (Name & Address):** Ritu Jain  
c/o Dr. Abhinav Grover  
School of Biotechnology  
Jawaharlal Nehru University

**4. Qualifications:** Msc. Biotechnology

**5. Mentor (Name & Address):** Dr. Abhinav Grover  
School of Biotechnology  
Jawaharlal Nehru University

**6. Duration of the project:** 3 Years

**7. Broad area of Research:** Biotechnology

**7.1 Sub Area:** Drug discovery / new treatment in the area of Cancer

**8. Summary of the Project:** (Give in about 300 words)

Clinically, breast cancer can be divided into distinct subtypes that have prognostic and therapeutic implications. Breast cancer patients routinely have the expression of estrogen receptor (ER), progesterone receptor (PR), and amplification of HER-2/Neu evaluated. Tumors which do not express these three molecular markers are referred to as triple-negative breast cancer (TNBC). It is one of the most aggressive forms of breast cancer and is typically characterized as a morphologically high grade tumor. TNBCs behave more aggressively, with patients affected having a worse overall and disease-free survival when compared to other breast cancer subtypes. This has been partially attributed to the insensitivity of TNBCs towards available targeted treatment strategies such as endocrine and anti-Her2 therapies. Drugs that have been evaluated in chemoprevention trials on high risk TNBC individuals did not receive widespread application due to their serious side effects. Therefore, there is a definitive and urgent need for identification and development of improved and safe therapies against TNBCs. Several studies have shown that phytochemicals in vegetables and fruits have potential to reduce risk of a variety of cancers. Of all environmental factors known to influence cancer, diet appears to be one of the most significant. Table olives and olive oil constitute regular dietary components of the traditional Mediterranean diet, which has been associated with a low incidence and prevalence of certain types of cancers and has been extensively used in ayurvedic system of medicine. This healthy property is mainly

ascribed to oleic acid, phenolic compounds and squalene. Nonetheless, other minor components have showed relevant interesting activities. Among them, Maslinic acid is the main pentacyclic triterpenes located in the skin of olive fruits. It is found to have anti-tumor properties. However, the mechanism of action is not clear. Therefore, this study aims at to elucidate the anti-tumor effect of maslinic acid and its molecular mechanism on TNBC and to modify it for improved drug delivery. Changes at the proteome level will also be explored in order to gain deeper insights in to the mechanism of action.

## **9. Objectives of the Proposal:**

The objectives of the proposed project are as follows:

- a. To isolate and characterize the pentacyclic triterpenoid Maslinic acid from olives.
- b. To explore the anticancer activity of Maslinic acid and to elucidate the molecular mechanism of cell death using breast cancer models.
- c. To modify maslinic acid for efficient drug delivery.
- d. To study the effects of maslinic acid at proteome level.

## **10. Innovations in the project: (Give in about 100 words)**

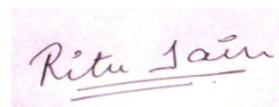
Drugs that have been evaluated in chemoprevention trials on high risk individuals and approved by the U.S. FDA did not receive widespread application due to their serious side effects. However, many studies have shown that phytochemicals in vegetables and fruits have potential to reduce risk of a variety of chronic and inflammatory conditions including cancer. Maslinic acid found in olive skin, is one such phytochemical to be explored. Among other biological activities, including anti-inflammatory and cardioprotective, it was reported to possess antioxidant and antitumor properties. The anti-tumour effect of maslinic acid had been confirmed later by studies investigating its role in colon cancer cells. This clearly illustrates the significant anti-neoplastic effects of maslinic acid. And, this project aims to exploit the anti-tumor properties of maslinic acid on TNBC.

## **11. Significance of the outcome of the project: (Give in about 150 words)**

Cancer is a global threat to public health, causing great morbidity and high mortality rates. Based on a global cancer statistics, approximately 14.1 million people were diagnosed with cancer in 2012 and the number is increasing fast. It is predicted that there will be 23.6 million new cancer cases worldwide each year by 2030. Out of all, Breast cancer is the leading cause of mortality in women in developing countries. According to 2012 worldwide survey, over 1.6 million cases of invasive breast cancer are diagnosed annually. While all breast tumor types may be treated with chemotherapy, therapeutic options in both early and late stage breast cancer are affected significantly by the expression of three validated markers but TNBC have a poor outcome in patients as compared to the other because of the lack of validated molecular targets. Therefore, there is a clear need for a greater understanding of TNBC at all levels and for the development of better therapies.

## **12. Relevance in Public Health:**

Cancer related mortality has not improved for the past several decades despite immense efforts in anti-tumour drugs research. The discovery and testing of novel compounds that are more effective and safer as cancer chemopreventive agents are intensively required. Using a phytochemical will eliminate the risk of side effects and will lead to the production of a safer drug for human consumption. Olive is one such vegetable material that is stable in nature, easily available and is highly safe for the human body.

A handwritten signature in cursive script that reads "Ritu Jain". The signature is written in black ink on a light pink background. The name "Ritu" is written above "Jain", and there are two horizontal lines underlining the name "Jain".

**Signature of the Fellow /Faculty**