

Prof. Vandana Patravale's research group wins Best Poster Award at ICMR International Conference

Ms. Rashmi Prabhu from Prof. Vandana Patravale's research group has won the Best Poster Award for their work entitled "Paclitaxel Nanostructured Lipid Carriers for Treatment of Triple Negative Breast Cancer" at International Conference on Women's Reproductive Health: A step towards improving quality of life organized by Indian Council of Medical Research (ICMR)-National Institute for Research in Reproductive Health (NIRRH) on February 20-23, 2020, Mumbai. This conference was a part of ICMR-NIRRH Golden Jubilee Celebrations and was inaugurated by Honourable Union Minister for Health and Family Welfare Dr. Harsh Vardhan. The work was carried out in collaboration with Dr. Vikas Dighe, Toxicology Division, ICMR-NIRRH, Mumbai. The present work explores the application of lipid-based paclitaxel nanocarriers for the potential treatment of triple negative breast cancer (TNBC). Anticancer activity of paclitaxel nanocarriers was evaluated in human TNBC cell lines in vitro. In vivo antitumor efficacy study was performed in murine TNBC 4T1 induced Balb/c mice in comparison to Intaxel[®] by intravenous delivery and treatment-associated toxicity was also assessed. The award was presented by Dr. S.K. Sikdar, Deputy Commissioner of Family Planning, Ministry of Health and Family Welfare.



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ICMR-NIRRH Golden Jubilee Celebrations

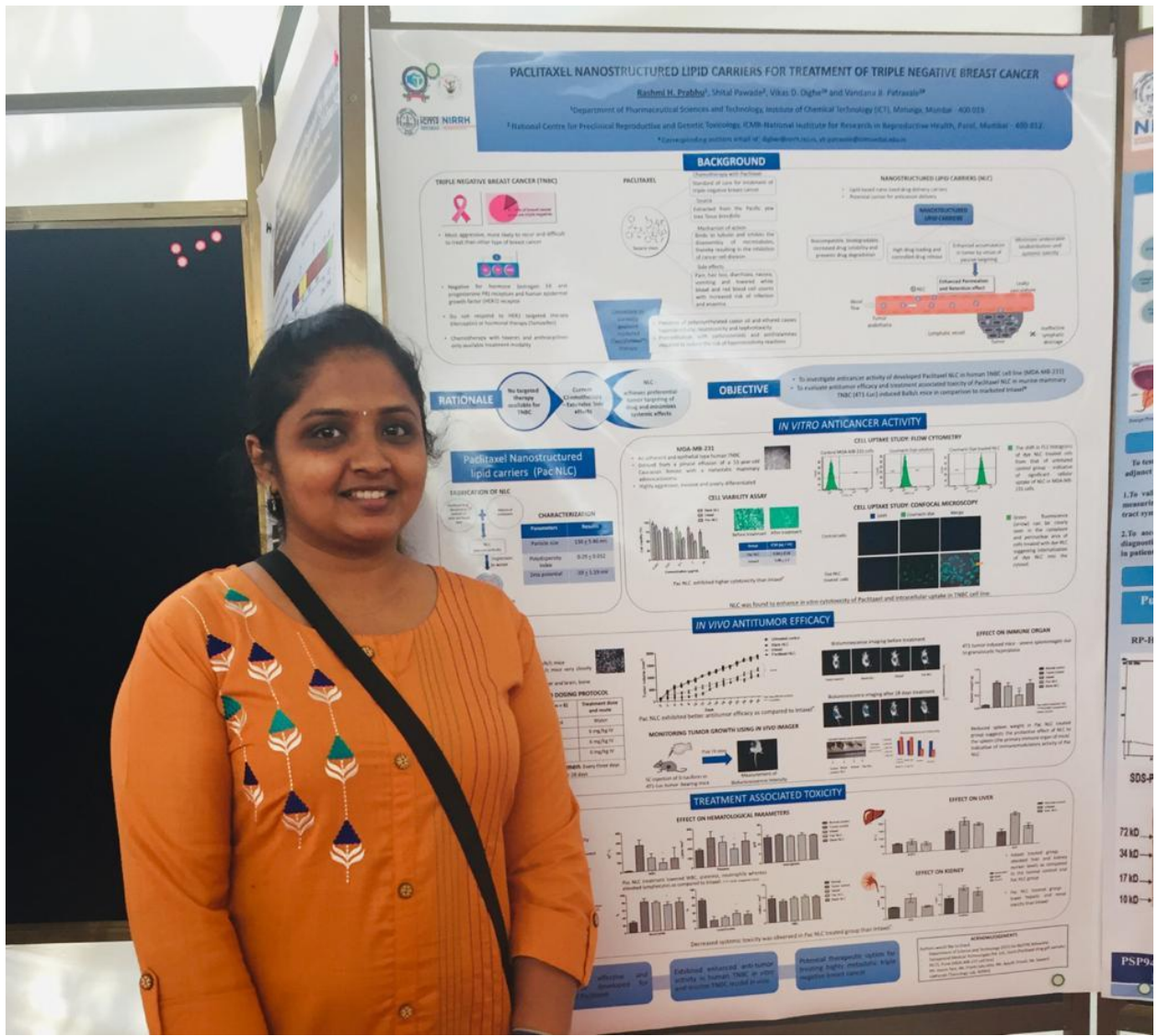
International Conference
on

Women's Reproductive Health:
A step towards
improving quality of life

20-23 February 2020, Mumbai, India

50 Years of NIRRH (1970-2020)
Commemorating five decades of advancements
in reproductive and sexual health





PACITAXEL NANOSTRUCTURED LIPID CARRIERS FOR TREATMENT OF TRIPLE NEGATIVE BREAST CANCER

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BACKGROUND

TRIPLE NEGATIVE BREAST CANCER (TNBC)

- Most aggressive, more likely to recur and difficult to treat than other types of breast cancer
- Negative for hormone receptors ER and progesterone PR receptors and human epidermal growth factor (HER2) receptor
- Has high mortality in TNBC because of its metastatic potential (metastasis)
- Characterized with limited and unpredictable anti-cancer treatment options

PACITAXEL

Standard of care for treatment of breast negative breast cancer

Formulated from the Pacific yew tree *Taxus brevifolia*

Mechanism of action: Binds to tubulin and stabilizes the assembly of microtubules, leading to the inhibition of G₂M phase

Side effects: Hair loss, diarrhea, nausea, vomiting, and lowered white blood and red blood cell counts with increased risk of infection and anemia

Presence of suboptimal cancer cell adhesion causes poor drug delivery and bioavailability

Formulation of suboptimal cancer cell adhesion causes poor drug delivery and bioavailability

NANOSTRUCTURED LIPID CARRIERS (NLC)

- Lipid-based carriers used for drug delivery
- Proven carrier for anticancer drugs

NANOSTRUCTURED LIPID CARRIERS

Biocompatible, biodegradable, increased drug solubility and prevent drug degradation

High drug loading and controlled drug release

Enhanced permeability to cancer cells due to passive targeting

Reduced side effects: Nausea, vomiting, and diarrhea

Targeted delivery: Liposomes, micelles, and solid lipid nanoparticles

RATIONALE

No targeted therapy available for TNBC

Current Chemotherapy: Tax-Paclitaxel

NLC: Enhance pharmacokinetic, tumor targeting and reduce side effects

OBJECTIVE

- To investigate anticancer activity of developed Paclitaxel NLC in human TNBC cell line (MDA-MB-231)
- To evaluate anticancer efficacy and treatment associated toxicity of Paclitaxel NLC in murine mammary TNBC (BT20) induced Balb/c mice in comparison to marketed drug*

IN VITRO ANTICANCER ACTIVITY

CELL VIABILITY ASSAY

MDA-MB-231: An immortal and metastatic human breast TNBC derived from a 53 year old Caucasian female with no metastatic disease at diagnosis

Highly aggressive, invasive and poorly differentiated

IC₅₀ values: Paclitaxel (0.015 ± 0.002), Taxol (0.015 ± 0.002), Paclitaxel NLC (0.005 ± 0.001)

The NLC exhibited higher cytotoxicity than Paclitaxel

CELL UPTAKE STUDY - FLOW CYTOMETRY

The cell is 4.5 fold higher of Paclitaxel NLC uptake than Paclitaxel

Paclitaxel NLC showed 4.5 fold higher uptake than Paclitaxel

CELL UPTAKE STUDY - CONFOCAL MICROSCOPY

Paclitaxel NLC showed 4.5 fold higher uptake than Paclitaxel

Paclitaxel NLC showed 4.5 fold higher uptake than Paclitaxel

IN VIVO ANTITUMOR EFFICACY

EFFECT ON ANIMAL ORGAN

BT20 tumor induced mice showed significant increase in organ weight

Paclitaxel NLC treated mice showed significant decrease in organ weight

MONITORING TUMOR GROWTH USING IN VIVO IMAGER

Paclitaxel NLC showed better antitumor efficacy as compared to Paclitaxel

Paclitaxel NLC showed better antitumor efficacy as compared to Paclitaxel

TREATMENT ASSOCIATED TOXICITY

EFFECT ON HEMATOLOGICAL PARAMETERS

Paclitaxel NLC showed no significant change in hematology parameters

Paclitaxel NLC showed no significant change in hematology parameters

EFFECT ON LIVER

Paclitaxel NLC showed no significant change in liver parameters

Paclitaxel NLC showed no significant change in liver parameters

EFFECT ON KIDNEY

Paclitaxel NLC showed no significant change in kidney parameters

Paclitaxel NLC showed no significant change in kidney parameters

Abbreviations: ER, Estrogen Receptor; PR, Progesterone Receptor; HER2, Human Epidermal Growth Factor Receptor 2; TNBC, Triple Negative Breast Cancer; NLC, Nanostructured Lipid Carrier; Paclitaxel NLC, Nanostructured Lipid Carrier containing Paclitaxel; Taxol, Paclitaxel; MDA-MB-231, Metastatic Breast Cancer Cell Line; BT20, Breast Tumor Cell Line; IC₅₀, Half Maximal Inhibitory Concentration; In vivo, In living organism; In vitro, In glass or test tube; Cell viability assay, Assay to measure the ability of cells to survive and proliferate in a specific culture medium; Confocal microscopy, A type of optical microscopy that uses a series of optical sections (optical slices) to create a three-dimensional image of a fluorescently labeled specimen. It is a type of light microscopy that uses a series of optical sections (optical slices) to create a three-dimensional image of a fluorescently labeled specimen.