CURRICULUM – VITAE

GAURAV

CORROSPONDING ADDRESS
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EDUCATION

- **Ph.D.** thesis to be submitted soon, **Postgraduate Institute of Medical Education and Research (PGIMER)**, Chandigarh in the field of ***Molecular Oncology and Cellular Redox Homeostasis*** (See Annexure-1).
- Completed short course in Research methodology and Biostatistics (2004) conducted by **Postgraduate Institute of Medical Education and Research (PGIMER)**, Chandigarh.
- **M.Sc. (Biotechnology)** from **Institute of Advanced Studies**, C. C. S. University Campus, Meerut, 2000.
- **B.Sc. (Biology),** C. C. S. University, Meerut, 1998.

RESEARCH AND PROFESSIONAL EXPERIENCE

- July 2nd, 2001 to till date, Research Fellow, Biophysics Department, Postgraduate Institute of Medical Education & Research (PGIMER), under Prof. K. L. Khanduja (Head of the Department) to work on:

  1) **Cigarette smoke condensate induced changes in molecular pathways involved in maintaining the cellular redox homeostasis in lung epithelial type-II cells: Modulatory effects of curcumin.**

  2) **Protective role of resveratrol in NDEA and azoxymethane induced lung and colon carcinogenesis.**

- Completed project report entitled "**To study the certain Biochemical changes in rats exposed to hypoxia and effect of pomegranate as a food supplement**." for the partial fulfillment of M.Sc. (Biotechnology), under the guidance of Dr. Som Nath Singh (Sc `D`) and. Dr. P.C. Sharma (Internal Guide), **Defense Institute of**

Physiology and Allied Sciences, (Defense Research and Development Organization), New Delhi.

- One month training (Nov, 2002 to Dec 2002) in the field of cell culture and hybridoma technology in Immunology laboratory under the supervision of Dr. Javad N Agrewala in **Institute of Microbial Technology (IMT)**, Chandigarh.

- Worked as Undergraduate Research Assistant for six months in the Department of Botany, M. M. P. G. College, Modinagar.

RESEARCH PUBLICATIONS/ COMMUNICATIONS

Papers published / accepted

1. Kaur T, Khanduja KL, Kaushik T, **Kaushik G,** Gupta R, Gupta NM and Vaiphei K **(2006).** P53, COX-2, iNOS protein expression changes and their relationship with anti-oxidant enzymes in surgically and multi-modality treated esophageal carcinoma patients. ***Journal of Chemotherapy*** 18 (1), 71-82: 2006.

2. Khanduja K. L, **Kaushik G**, Laldinpuii J and Behera D **(2006)**. Corticosteroids affect nitric oxide generation and nitric oxide synthase activity in monocytes of asthmatic patients. ***Respiratory Research*** (**Submitted**).

3. Avati P, Kumar S, **Kaushik G**, Kaushik T, Farooq A, Pathak C.M., and Khanduja KL. Effects of low doses of radiations in modulating the antioxidant defense system in lung and liver of rats (**Accepted**). ***International Journal of Radiation Biology*** (**2006, in press**).

4. Khanduja KL, Sohi KK, Pathak CM, **Kaushik G**. Nimesulide inhibits lipopolysaccharide-induced production of superoxide anions and nitric oxide and iNOS expression in alveolar macrophages. ***Life Sciences*** (**2005**) Oct 19

5. Khanduja KL, Bhardwaj A, **Kaushik G**. Resveratrol inhibits N-nitrosodiethylamine-induced ornithine decarboxylase and cyclooxygenase in mice. ***J Nutr Sci Vitominol*** (**2004**) Feb; 50 (1):61-65.

6. **Kaushik G** and. Khanduja K.L. Oxidants, the major determinant of cell signaling and gene expression. ***SFRR-India Bulletin*** Vol. 3, No. 1, pp. 5-10 (**2004**)

7. **Kaushik G**, Vats P, Shyam R, Suri S, Kumaria MML, Sridharan K, Sharma PC and Singh S N (**2001**). Effects of Pomegrante (*Punica granetum)* juice on changes in tissue glutathione levels of rats exposed to high altitude hypoxia. ***Ancient Science of Life***, (21) 75-86

Manuscript from PH.D. work

1. **Kaushik G**, Kaushik T, Pathak CM and Khanduja KL. Cellular redox homeostasis play an important role in maintaining molecular pathway involved in cell proliferation and cell apoptosis in oxidative stress condition induced by cigarette smoke condensate **(under process)**.

2. **Kaushik G**, Kaushik T, Pathak CM and Khanduja KL. Biphasic effects of curcumin in modulating the cigarette smoke condensate induced oxidative stress in A549 cells **(under process).**

Manuscript under communication/communicated

1. Singh KA, **Kaushik G**, Kaushik T, Behra D, and K. L. Khanduja*. Expression pattern of Intercellular Adhesion Molecule-1 (ICAM-1) in alveolar macrophages from malignant and non-malignant lobe of malignant and non-malignant diseases patients. ***Lung Cancer*** **(Communicated)**.

2. Kaushik T, **Kaushik G**, Khanduja K.L and Vaiphei K. Protection of azoxymethane-induced colonic aberrent crypt foci formation by resveratrol in male Balb/C mice **(under process).**

Abstracts presented or published in conferences

1. **Gaurav Kaushik,** Toshi Kaushik and K. L. Khanduja (**2006**). Cigarette smoke condensate induce changes in molecular pathways involved in maintaining the cellular redox homeostasis in lung epithelial cells. **Cancer Susceptibility and Cancer Susceptibility Syndromes (AACR), 1-5th March, Muai, Hawaii (USA).**

2. K.L.Khanduja, **Gaurav Kaushik** and Toshi Kaushik (2006). Oxidative stress by cigarette smoke condensate induces changes in molecular pathways involved in maintaining the cellular redox homeostasis in lung epithelial cells. **Emerging Trends in Free Radical Biology** (**SFRR-India) IL-44, Calcutta**.

3. Anjana Bhardawaj, **Gaurav Kaushik** and KL Khanduja. Evaluation of anti-oxidative and anti-radical properties of resveratrol, and its effect on some key mechanism underlying carcinogeneesis (2002, 31th jan –2 nd feb). **XXIth Annual Convention of Indian Association for Cancer Research** (**Indian Institute of Science, Banglore**, India).

4. **Gaurav**[a], Toshi Kaushik[a], Radhay Shyam[b]., Praveen Vats[b]., Sobha Suri b, P.C. Sharmaa., MML Kumaria[b]., Som Nath Singh[b] (2001**). Biochemical changes in rats exposed to hypoxia and pomegranate as food supplement**. (**Biotechnology Society of India**, New Delhi).

5. Kashyap MK, Kumar A, **Kaushik G**, Sharma PC, Khullar M (2003). **Role of Bio-informatics in Molecular Medicine**. For conference on."Scuola Superiore G Reiss Romoli (SSGRR) Rome (Italy). http://www.ssgrr.it/en/ssgrr2003w/papers/193.pdf.

6. Anjana Bhardawaj, **Gaurav Kaushik** and KL Khanduja (2002, 21-23 Jan). Modulation of some key pathways involved in the process of carcinogenesis by resveratrol. **Discussion meeting on Structural Biology and Symposium on Biophysics. (Deptt of Crystallography and Biophysics, University of Madras, India).**

7. Toshi Kaushik[a], **Gaurav**[a], Radhey Shyam[b], Praveen Vats[b], Shoba Suri[b], MML Kumria[b], PC Sharma[a], Som Nath Singh[b]. Glutathione metabolism in rats exposed to high fluoride containing water and effect of spirulina treatment. **Conference on Natural Antioxidants and Free Radicals in Human Health and Radiation Biology (BARC-2001).**

BOOK:

- Book entitled "**Introduction to Bioinformatics" (in press)** by BS Bhadana, Manoj Kumar Kashyap and **Gaurav Kaushik**, Jaypee publication (In Press)

TECHNICAL EXPERTISE:

Cell and tissue culture / animal work:

Maintaining various tumor cell lines especially **A549**, **NCI/H520, NCI/H460, E A** (Ehrlich Ascites epithelial tumor cell line) and **Hep G2**. Isolation of cells like lymphocytes, macrophages and monocytes. Tumor induction in mice and rats by chemical carcinogen or by tumor cell lines.

Molecular biology techniques:

Working experience and expertise in

1) Polymerase Chain Reaction and Reverse Transcriptase Polymerase Chain Reaction (RT-PCR).
2) Agarose gel electrophoresis, PAGE and SDS-PAGE
3) Extraction of genomic DNA, fragmented DNA and total RNA from cultured cells
4) Western Blotting for **MAP Kinases activity (p38, ERK and SAPK)**,
5) Elementary knowledge of primer designing and familiar with other routine molecular biology laboratory techniques.

Expertise in Flow cytometry (FACS) and Microscopy:

Immuno-fluorescence staining of cell surface molecules and intracellular cytokine staining, DNA analysis (cell-cycle analysis), intracellular ROS estimation, assay of mitochondrial membrane potential and detection of apoptosis by Flow-cytometer. Fluorescence, light and phase contrast microscopy for morphological and apoptotic changes.

Biochemistry:

Enzyme Superoxide Dismutase, Catalase, Glutathione-S-Transferase, Glutathione Reductase, Glutathione Peroxidase, gamma-Glutamyl cystein synthatase assay. Estimation of Nitric Oxide Synthase (NOS) activity, reduced glutathione (GSH), oxidized glutathione (GSSG), total glutathione (GSH+GSSG), Lipid peroxidation and MPO enzyme activity. Purification and characterization of bioactive compounds (especially prostaglandin's) by Thin layer chromatography (TLC), cell viability/proliferation assays by using MTT and [^{3}H] thymidine incorporation assay.

Bioinformatic tools and computer softwares:

Exposed to important bioinformatics tools and proficient in using Windows, SPSS, Origin 5, My Front page, Gene Runner, Clustal-X, Basic Local Alignment Search Tool (BLAST) etc

SCHOLARSHIPS/FELLOWSHIP

- Merit research fellowship of Postgraduate Institute Of Medical Education and Research (PGIMER) Chandigarh from 2 July 2001till now.

- **Scored second position** in All India level entrance examination for Postgraduate Institute Of Medical Education And Research (**PGIMER) fellowship programme** in 2001 July.

MEMBERSHIP OF NATIONAL AND INTERNATIONAL SOCIETIES

1. **Life membership** of Biotechnology Society Of India (**BSI**).
2. **Life Membership** of Association of basic medical scientists (**ABMS**), PGIMER, Chandigarh (India)
3. American Society of Microbiology **(ASM)** (online)
4. **Executive member** of Association of basic medical scientists (ABMS)
5. Student member of **Indian Science Congress** (ISC)
6. Online member of **American Association for Cancer Research (AACR)**

EXTRA CURRICULAR ACTIVITIES

- Participated in Inter Departmental Basketball Tournament in the University.
- Interstate Representation in Karate & Judo Tournament

DEMOGRAPHIC PROFILE

- Date of Birth : 11th May, 1976
- Marital Status : Married
- Nationality : Indian
- Languages proficiency : English & Hindi (Native fluency)

REFEREES:

1. **Prof. K. L. Khanduja,**
   Head, Department of Biophysics,
   Research Block-B,
   Postgraduate Institute of Medical
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2. **Prof. C. M. Pathak,**
   Department of Biophysics,
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3. **Prof. P.C. Sharma**
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Abstract (Ph.D. Thesis)

Cigarette Smoke Condensate Induce Changes in Molecular Pathways Involved in Maintaining the Cellular Redox Homeostasis in Lung Epithelial Cells

Cigarette smoke, a potent chemical carcinogen, is known to be one of the causative factors in various lung diseases especially cancer. A single puff of cigarette smoke (comprising over 7,000 identified chemical compounds) contains 10^{18} oxidant molecules out of which 10^{14} are ROS/RNS. The effects of ROS/RNS may not be solely mediated through gross damage of the cellular constituents (lipids, proteins, DNA etc) but may also be by their more discriminating role as a redox regulator of cell signaling. The present study was initiated to evaluate the effects of cigarette smoke condensate (CSC) on normal cellular function and physiology of lung epithelial type-II cells (A549). CSC at various concentrations (0, 0.1, 10 and 50 μg/ml) significantly decreased the cell viability, increased the polyploidy and apoptosis of A549 cells in a dose and time dependent manner. CSC exposure also increased ROS/RNS production (estimated by DCFH-DA and DHE fluorescent dyes), lipid peroxidation. Reduced glutathione (GSH; a key redox regulator) and oxidized glutathione (GSSG) significantly increased in a dose and time dependent manner, where as GSH/GSSG ratio significantly decreased at 50 μg/ml CSC concentration at 24 hr. Lower dose of CSC (0.1 μg/ml) showed no significant change in activities of superoxide dismutase (SOD), glutathione reductase (GR) and catalase. However, 50 μg/ml of CSC increased SOD activity and decreased GPx and catalase activities. Similarly, CSC at 0.1 μg/ml concentration significantly increased the cell proliferation by shifting the cells population from G0/G1 phase to S phase of cell cycle, where as 50 μg/ml CSC concentration showed cell cycle inhibitory effect by shifting S Phase cell population in G0/G1 phase. This was accompanied by significant increase in MAPK kinase cascade member's activity (i.e. SAPK and p38 Kinases) and gamma-GCS m-RNA levels in a dose dependent manner. Effect of CSC on surface and soluble ICAM-1 was also studied. CSC at 0.1 μg/ml of concentration significantly induced the surface, soluble and total ICAM1-1 at 24 hrs of treatment. However, 50 μg/ml of CSC concentration significantly induced the surface, cellular and total ICAM1-1 at 24 and 48 hrs (except soluble ICAM-1 at 24 hrs). It was interesting to observe that CSC at lower doses induced the cell proliferation and at higher doses caused cell cycle arrest and induced polyploidy. This study shows that, changes induced by CSC make epithelial type-II lung cells more susceptible to transformation and this all occur due to disturbance in GSH and GSSG cellular redox homeostasis. This cellular redox homeostasis may play an important role in several basic processes such as signal transduction, gene expression, inflammation, cell proliferation, apoptosis and finally carcinogenesis.

My view in few words

Cancer treatment is still far from its destination. Various approaches are being used in the control and cure of cancer. Beside all other facts and factors, proteins malfunctioning play a key role in initiation, progression and metastasis of cancer. This malfunctioning of proteins may be due to chemical, physical and genetic factors. As the proteins are working horse of mammalian cells, thus protein profile of normal cell, transformed cell and metastasized cell may be helpful in decoding the basic pathways involved in protein malfunctioning during energy generation, cell signaling, cellular metabolism and cellular death during the process of cancer initiation, progression and metastasis. Here energy generation and energy crisis may be the important phenomenon for running all these process ranging from malfunctioning of protein to synthesis and functioning of protein in cancer development. These few lines force us to think the following question: -

1. What are the sources of energy for cells to survive in extreme nutrient deprived condition in the tumors? And what are the factors involved in this process?
2. Does energy crises make cells more susceptible to transformation or metastasis?
3. Does cells revert back to the pathway of dedifferentiation?
4. Does proteins play a key role in this process of dedifferentiation?
5. What is the role of protein-protein and protein-gene interaction in process of dedifferentiation and various stages of carcinogenesis?

If we will be able to explore these basic objectives then it may be possible to design chemotherapeutic drug based on the pathways involved in these basic survival process of normal cell, transformed cell and metastasized cell during the process of carcinogenesis. For the execution of this work we may use Laser Capture Microdissection techniques, Mass spectroscopy, SALDI, micro array etc. Cell culture techniques, microscopy (especially fluorescence and confocal), transgenic mice and other advanced bioinformatics techniques may also be used in this project. This work may explore the basic pathways involved in evoking the process of carcinogenesis and will delineate the role of energy crisis and signaling in carcinogenesis. We will be able to predict the proteins' involvement in these processes. In the end, I will like to say that I will concentrate on the source of energy in cancer cell and how normal lung cell follow the path of transformation.