

# RISHI KUMAR, Ph. D.

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## Profile Summary

Excellence driven and result-oriented professional with more than 16+ years of comprehensive research experience in interdisciplinary areas of Chemistry, Bio/Medicinal chemistry, and Lifesciences. Displays considerable strength across a wide range of scientific-technical and people skills.

- **Group Lead and Project Management skills.**
- Expertise in R&D, literature search, patent support, data management, data analysis and documentations.
- Adept in writing new project proposals and collaborations leading to successful completion of projects.
- Proficiency in **synthetic organic chemistry, process chemistry, route scouting** with expertise in **Carbohydrates, Peptides, Lipids, heterocycles** and **biomacromolecules** both in micro to macro scales.
- Demonstrated excellence in **Vaccine development, Bio-conjugations, API/ Drugs**, and intermediate synthesis as well as **stable isotope chemistries**.
- Exhaustive knowledge and proficiency in **Analytical** and **chromatographic technologies**.
- **24 research publications** in international journals

## Technical Skills

### Organic Syntheses:

- Synthesis, purifications, and analysis/ characterizations of molecules.
- Multi-step total synthesis of complex natural products.
- Modulations and bio-conjugations of macromolecules.
- Polyconjugate vaccine synthesis.
- Stable isotope labelled molecule synthesis.
- Library synthesis.
- Antigens synthesis: Sialyl- L<sub>x</sub>, Sialyl -L<sub>y</sub>, S-Tn, TF, T-antigens and core-mucins.
- Oxidations, Reductions, Functional group transformation, Organometallic and air sensitive reactions.

### Analytical:

- Normal and Reversed phase, Size exclusion and ion exchange chromatography, both manual and automated: HPLC, Biotage®, Teledyne®. Membrane filtration (Tangential flow) and centrifugal filtration of macromolecules.
- Hyphenated chromatography: LC-MS, GC-MS, and SEC-MALS.
- NMR (1D and 2D): data acquisition and analytical interpretations.
- Mass spectroscopy, UV and IR spectroscopy.
- Small molecule x-ray crystallography.

## Work Experience

**SENIOR SCIENTIST AND TEAM LEAD | VIBRANT SCIENCES LLC., CA, USA | OCT '20- NOV' 22**  
**SENIOR SCIENTIST | SUSSEX RESEARCH LABS, OTTAWA, ON, CANADA | MAY'16- JULY '20**  
**RESEARCH SCIENTIST | ALBERTA RESEACH CHEMICALS INC., CANADA | OCT '12- APRIL '16**

- Identify and expand new products in alignment to companies focus area.
- Regulating the purpose, goal, and scope of the work (complete project plan); collaborate and communicate with the stakeholders.
- Head the team and oversee the progress of the projects. Pivotal in coordinating with Chemists and Engineers to identify / diagnose chemistry issues and provide support and solutions.
- Arranging and setting up scalable and sustainable process which can be manufactured in cost effective larger scales.
- Literature searches and provide alternative synthetic routes for the process development.
- Regular project updates and presentations in research review meetings, departmental meetings, weekly meetings with the clients and stakeholders.
- Took cost saving measures and reduce overall costs through yield improvements, cheaper RM substitutes, alternate synthesis routes, recycle/ recoveries.
- Executed DOEs experiments for polyconjugate vaccine synthesis and transfer of technology to the client.

## Education

**RESEARCH ASSOCIATE | AUG'08- SEP'12 | NATIONAL RESEARCH COUNCIL OF CANADA**

- Design and Development of Sialyltransferase Inhibitors.
- New approaches to stereoselective chemical glycosylation: an insight to the mechanisms of glycosylation.
- Chemical synthesis of nonulosonic acids or sialic acids (NeuAc, PSe, Leg) –serine linkers for NMR-conformational studies.

**PH.D. | 2008 | CDRI LUCKNOW AND JNU UNIVERSITY NEW DELHI, INDIA.**

- Thesis: “**Structural Studies of Synthetic Molecules of Biological Importance.**”
- Supervisors: **Dr. Prakas Ranjan Maulik** and **Dr. Anup Kumar Misra.**

**MSC (ORGANIC CHEMISTRY) | 2003 | UNIVERSITY OF ALLAHABAD, ALLAHABAD, INDIA.**

- Passed with **First Division** (75%) of marks and conferred **Second position** in university merit

**BSC (CHEMISTRY) | 2000 | UNIVERSITY OF ALLAHABAD, ALLAHABAD, INDIA.**

- Passed with **First Division** (72%) of marks

## Awards and Achievements

- Senior Research Fellowship (3 years) from Council for Scientific and Industrial Research (CSIR), Ministry of Human resources and Development, India.
- Research Fellowship (2 years) from Council for Scientific and Industrial Research (CSIR), Ministry of Human resources and Development, India.

## Publications

- 1) **R. Kumar**, R. Nasi, M. Bhasin, N. H. Khieu, M. Gilbert, H. Jarrell, W. Zou, H. J. Jennings: Sialyltransferase Inhibitors: Consideration of molecular shape and charge/hydrophobic interactions. **Carbohydrate Research** (2013), 378, 45-55.
- 2) **R. Kumar** and D. M. Whitfield: Could diastereoselectivity in the presence of O-2 chiral non-participating groups be an indicator of glycopyranosyl oxacarbenium ions in glycosylation reactions? **Journal of Organic Chemistry** (2012) 77, 3724-3739.
- 3) **R. Kumar**, P. R. Maulik, A. K. Misra: Significant rate accelerated synthesis of glycosyl azides and glycosyl 1,2,3-triazole conjugates: **Glycoconjugate Journal** (2008) 25, 595-602.
- 4) **R. Kumar**, P. R. Maulik, A. K. Misra: Concise chemical synthesis of a tetrasaccharide repeating unit of the O-antigen of *Hafnia alvei* 10457. **Glycoconjugate Journal** (2008) 25, 511-519.
- 5) P. V. Reddy, L. V. R. Reddy, B. Kumar, **R. Kumar**, P. R. Maulik and A. K. Shaw: A general and efficient stereoselective synthesis of  $\gamma$ -azido-tetrahydrofuran carboxylic acids from glycals. **Tetrahedron** (2008) 64, 2153-2159.
- 6) **R. Kumar**, P. R. Maulik and A. K. Misra: Efficient synthesis of glycosyl enaminoesters directly from glycosyl azides. **Journal of Carbohydrate Chemistry** (2007) 26, 83-90.
- 7) K. Avasthi, S. M. Farooq, C. Bal, **R. Kumar**, A. K. Tewari and P. R. Maulik: Design and synthesis of pyrazolo[3,4-d]pyrimidine and triazolo[4,5-d]pyrimidine based dissymmetrical 'Leonard linker' compounds:  $^1\text{H}$  NMR and crystallographic evidence for folded conformation due to arene interactions. **Journal of Molecular Structure** (2007) 842, 100-108.
- 8) M. Saquib, M. K. Gupta, R. Sagar, Y. S. Prabhakar, A.K. Shaw, **R. Kumar**, P. R. Maulik, A. N. Gaikwad, S. Sinha, A. K. Srivastava, V. Chaturvedi, R. Srivastava and B. S. Srivastava: C-3 Alkyl/Arylalkyl-2,3-dideoxy hex-2-enopyranosides as antitubercular agents: Synthesis, biological evaluation and QSAR study. **Journal of Medicinal Chemistry** (2007) 50, 2942-2950.
- 9) R. Pratap, **R. Kumar**, P. R. Maulik and V. J. Ram: Versatility of 2-oxobenzo[h]chromene for the synthesis of oxabenzo[c]chrysenes. **Tetrahedron Letters** (2007) 48, 3311-3314.
- 10) **R. Kumar**, P. Tiwari, P.R. Maulik and A. K. Misra:  $\text{HClO}_4$ - $\text{SiO}_2$  catalyzed chemo-selective synthesis of acylals from aldehydes under solvent-free conditions. **Journal of Molecular Catalysis A: Chemical** (2006) 247, 27-30.
- 11) **R. Kumar**, P. Tiwari, P.R. Maulik and A. K. Misra: A generalized procedure for the one-pot preparation of glycosyl azides and thioglycosides directly from unprotected reducing sugars under phase-transfer reaction conditions. **European Journal of Organic Chemistry** (2006) 2006, 74-79.
- 12) S. Porwal, **R. Kumar**, P. R. Maulik and P.M.S. Chauhan: A multicomponent reaction efficiently producing arylmethylene 2-thiohydantoins. **Tetrahedron Letters** (2006) 47, 5863-5866.
- 13) D. Sil, R. Pratap, **R. Kumar**, P. R. Maulik and V. J. Ram: Unusual sulfanylation through ring transformation of arene-tethered 2H-pyran-2-ones by in situ-built Michael adduct. **Tetrahedron Letters** (2006) 47, 3759-3762.
- 14) D. Sawant, **R. Kumar**, P. R. Maulik and B. Kundu: Unprecedented  $\text{SnCl}_2$ -mediated cyclization of nitro arenes via N-N bond formation. **Organic Letters** (2006) 8, 1525-1528.
- 15) R. Pratap, **R. Kumar**, P. R. Maulik and V. J. Ram: A non-catalytic regioselective approach to the synthesis of (E)-stilbenes from suitably functionalized 2H-pyran-2-ones. **Tetrahedron Letters** (2006) 47, 2949-2952.

- 16) B. Saha, **R. Kumar**, P. R. Maulik and B. Kundu: Synthesis of fused polycyclic nitrogen-containing heterocycles via cascade cyclization. **Tetrahedron Letters** (2006) 47, 2765-2769.
- 17) F. V. Singh, **R. Kumar**, A. Sharon, C. K. Broder, J. A.K. Howard, A. Goel and P. R. Maulik: Synthesis and X-ray structural studies of pyrimidin-2,4-dione and 2-thioxo-1H-pyrimidin-4-one bearing chloroethyl moiety. **Journal of Molecular Structure** (2006) 782, 55-59.
- 18) S. Ponnala, **R. Kumar**, P. R. Maulik and D. P. Sahu: One pot synthesis of novel dispiro[oxindole-thiazolidinedione /thioxo-thiazolidinone /dihydro pyrazolone]-pyrrolidines via 1,3-Dipolar cycloaddition reaction of azomethine ylides. **Journal of Heterocyclic Chemistry** (2006) 43, 1635-1640.
- 19) P. Tiwari, **R. Kumar**, P. R. Maulik and A. K. Misra: Efficient acetylation of carbohydrates promoted by imidazole. **European Journal of Organic Chemistry** (2005) 4265-4270.
- 20) **R. Kumar**, R. Sagar, A. K. Shaw and P. R. Maulik: Neridienone A, a pregnane from the roots of Nerium oleander. **Acta Crystallographica Section E** (2005) 61, o3905-o3907.
- 21) **R. Kumar**, P. Tiwari, P. R. Maulik and A. K. Misra: Comparative structural analysis of 5,6,7,9-tetra-O-acetyl-4,8-anhydro-1,3-dideoxy-D-glycero-l-gluco-nonulose and its 1-O-acetylated analog, 1,2,3,4,6-penta-O-acetyl- $\beta$ -D-galactopyranose using X-ray crystallography. **Carbohydrate Research** (2005) 340, 2335-2339.
- 22) K. Avasthi, S. Aswal, **R. Kumar**, U. Yadav, D. S. Rawat and P. R. Maulik: Fine tuning of folded conformation by change of substituents: <sup>1</sup>H NMR and crystallographic evidence for folded conformation due to arene interactions in pyrazolo[3,4-d]pyrimidine core based 'propylene linker' compounds. **Journal of Molecular Structure** (2005) 750, 179-185.
- 23) D. Sil, **R. Kumar**, A. Sharon, P. R. Maulik and V.J. Ram: Stereoselective alkenylation of a 1,3-disubstituted pyrazol-5-one through ring transformation of 2H-pyran-2-ones. **Tetrahedron Letters** (2005) 46, 3807-3809.
- 24) R. Sagar, P. Singh, **R. Kumar**, P. R. Maulik and A. K. Shaw: Diastereoselective annulation of 4-hydroxypyran-2H-ones with enantiopure 2,3-dideoxy- $\alpha,\beta$ -unsaturated sugar aldehydes derived from respective glycols. **Carbohydrate Research** (2005) 340, 1287-1300.

## Certifications

- Canadian Workplace Hazardous Material Information System (**WHMIS**).
- Standard First Aid and Cardiopulmonary resuscitation (**CPR**) Level-A Training.
- Automated External Defibrillation BLS-AED.
- Fire Extinguisher Training.
- Hazardous waste management for SQ generators certification for California department of public health, USA.