RUSTEM SHAYKHUTDINOV

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Motivated, personable research scientist with a proven track record of using NMR spectroscopy in identification, structural and dynamic characterization and quantification of small and biomolecules in complex mixtures. Hands on experience in NMR and GC-MS based metabolomics for targeted and non-targeted analysis of biomarkers in cancer research, inflammatory and animal disease studies, nutritional studies and metabolic pathway discovery. Credited with expertise in research facility maintenance and management.

EDUCATION

1998: Ph.D. Physics, Kazan State University, Kazan, Russia
Thesis: "Stereodynamic Properties of Middle Size Heterocycles in Solutions by One and Two Dimensional NMR".

1987: M.S. in Physics., Kazan State University, Kazan, Russia

PROFESSIONAL EXPERIENCE

2015 – present: Self employed

- Business consulting and tutoring

2014: Research Scientist, University of Kentucky, Lexington, Kentucky, USA

- Characterized and quantified 13C isotope metabolites derived from Stable Isotope Resolved Metabolomics (SIRM) to discover molecular targets and metabolic pathways in cancer models
- Created an NMR spectral database of standard and 13C-labelled metabolites for identification and quantification of metabolites using Mnova software

2010 – 2014: Research Associate/NMR Lab Manager, Metabolomics Research Centre, Department of Biological Sciences, University of Calgary, Calgary, Canada.

- Carried out NMR metabolomics studies of animal models and human clinical samples in different area of cancer research, inflammatory diseases and dietary deficiencies, resulting in 10 publications, 2 International Conference presentations and 1 patent application

- Improved accuracy and quality of the metabolic samples preparation procedure by incorporating automatic sample handler
- Successfully maintained laboratory NMR facility including four Bruker NMR spectrometers (400, 500, 600 and 700 MHz)
- Trained and consulted users of NMR facility

2006 – 2010: Postdoctoral Research Associate, Metabolomics Research Centre, Department of Biological Sciences, University of Calgary, Calgary, Canada.

- Carried out metabolomics analysis of human and animal biofluids and plant extracts by NMR spectroscopy and multivariable statistical analysis methods, resulting in 5 publications and 2 International Conference presentations
- Assigned the ^{13}C and ^{1}H NMR spectral chemical shifts in 1D proton and 2D NMR spectra of standard metabolite compounds for the Human Metabolom Data Base project (www.hmdb.ca)
- Coached postdoctoral fellows and graduate students with NMR aspects of metabolomics research

2003 - 2006: Postdoctoral Visiting Fellow, Biotechnology Research Institute, National Research Council of Canada, Montreal, Canada.

- Studied protein/peptide structures and interactions using multidimensional NMR and structure calculation methods, resulting in 2 publications

2000 - 2003: Senior research fellow, NMR Laboratory, Department of Chemistry, Kazan State University, Russia.

- Conducted the structure and dynamics investigations of organic heterocyclic compounds in solution and solid state by NMR Spectroscopy, resulting in 5 publications
- Supervised the NMR facility of the laboratory

1999 - 2000: Postdoctoral Visiting Fellow, University of Turku, Turku, Finland.

- Carried out conformational studies of fused heterocyclic systems and characterization of chemical reaction products by NMR spectroscopy and quantum chemistry calculations, resulting in 3 publications

1987 – 1999: NMR manager in the NMR Laboratory, Department of Chemistry, Kazan State University, Russia.

- Supervised and maintained the NMR facility
- Collaborated in research with other members of the laboratory and research groups at the department, resulting in 5 publications
- Taught the practical courses of NMR Spectroscopy for graduate students

CERTIFICATIONS

- Workplace Hazardous Materials Information System (WHMIS)
- Biosafety, Level II

AWARDS AND FELLOWSHIPS

- Visiting fellowship in Canadian government laboratories, NSERC, Canada, 2003-2006
- Postdoctoral fellowship, McGill University, BRI NRC, Canada, 2003
- Principal investigator of research grant, Russian Foundation for Basic Research, Russia, 1999-2001
- CIMO scholarship grant, Centre for International Mobility, Finland, 1999-2000

RESEARCH INTERESTS

- Metabolomics study by NMR spectroscopy for animal models and clinical samples in different area of cancer research, inflammatory diseases and dietary deficiencies
- Study of protein and/or peptide structures and interactions by NMR spectroscopy
- Conformational and dynamics study of small organic molecules by solution and solid-state NMR spectroscopy

SKILLS

- Extensive knowledge of whole NMR metabolomics workflow: preparation of NMR samples of different biofluids, running NMR experiments, assigning and profiling of NMR spectra, statistical analysis using multivariate and univariate methods
- Hands-on experience in structural elucidation by multinuclear and multidimensional NMR techniques
- NMR based protein/peptide 3D structure determination
- Operating and maintenance of high field NMR equipment from different manufacturers (Agilent/Varian, Bruker, Jeol). Comprehensive knowledge of Agilent/Varian and Bruker NMR equipment for solution and solid-state NMR spectroscopy. Proficiency in troubleshooting of NMR spectrometer malfunctions
- Pulse sequence programming and implementation of new NMR experiments.
- Extensive use of computers working on multiple platforms (UNIX, Linux, Windows, MacOS)
- Excellent organizational skills, good interpersonal and communication skills
- Ability to work well under pressure in an independent manner to a dynamic production schedule

- Demonstrating personal leadership attributes incorporating an ongoing commitment to professional development and continuous learning

LIST OF PUBLICATIONS

Falegan O.S., Ball M.W., **Shaykhutdinov R.A.**, Pieroraio P.M., Farshidfar F., Vogel H.J., Allaf M.E., Hyndman M.E. Urine and serum metabolomics analyses may distinguish between stages of renal cell carcinoma. *Metabolites* **2017**, *7*, e6.

Rawn S.M., Huang C., Hughes M., **Shaykhutdinov R**., Vogel H.J., Cross J.C. Pregnancy hyperglycemia in prolactin receptor mutant, but not prolactin mutant, mice and feeding-responsive regulation of placental lactogen genes implies placental control of maternal glucose homeostasis. *Biol Reprod* **2015**, *93*, 75.

Falegan O., Ball M.W., **Shaykhutdinov R**., Gorin M., Pierorazio P., Netto G.J., Allaf M.E., Vogel H.J., Hyndman E. MP47-19 urine and serum metabolomics analyses may distinguish benign and malignant renal neoplasms. *J Urology* **2015**, *193*, e558.

De Buck J., **Shaykhutdinov R**., Barkema H.W., Vogel H.J. Metabolomic profiling in cattle experimentally infected with *Mycobacterium avium* subsp. *paratuberculosis*. *PLoS One* **2014**, *9*, e111872.

Reimer R.A., Maurer A.D., Eller L.K, Hallam M.C, **Shaykhutdinov R**., Vogel H.J., Weljie A. Satiety hormone and metabolomic response to an intermittent high energy diet differs in
rats consuming longterm diets high in protein or prebiotic fibre. *J Proteome Res*. **2012**, *11*, 4065.

Schicho R., **Shaykhutdinov R.**, Ngo J., Nazyrova A., Schneider C., Panaccione R., Kaplan G.G., Vogel H.J., Storr M. Quantitative metabolomic profiling of serum, plasma and urine by (1)H NMR spectroscopy discriminates between patients with inflammatory bowel disease and healthy individuals. *J Proteome Res*. **2012**, *11*, 3344.

Bassaganya-Riera J., Viladomiu M., Pedragosa M., De Simone C., Carbo A., **Shaykhutdinov R**., Jobin C., Arthur J.C., Corl B.A., Vogel H.J., Storr M., Hontecillas R. Probiotic bacteria produce conjugated linoleic acid locally in the gut that targets macrophage PPAR γ to suppress colitis. *PLoS One*. **2012**, *7,* e31238.

Pushie M.J., **Shaykhutdinov R.**, Nazyrova A., Graham C., Vogel H.J. An NMR metabolomics study of elk inoculated with chronic wasting disease. *J Toxicol Environ Health A*. **2011**, *74*, 1476.

Booth S.C., Workentine M.L., Wen J., **Shaykhutdinov R**., Vogel H.J., Ceri H., Turner R.J., Weljie A.M. Differences in metabolism between the biofilm and planktonic response to metal stress. *J Proteome Res*. **2011**, *10*, 3190.

Bathe O.F., **Shaykhutdinov R**., Kopciuk K., Weljie A.M., McKay A., Sutherland F.R., Dixon E., Dunse N., Sotiropoulos D., Vogel H.J. Feasibility of identifying pancreatic cancer based on serum metabolomics. *Cancer Epidemiol Biomarkers Prev*. **2011**, *20*, 140.

Schicho R., Nazyrova A., **Shaykhutdinov R.**, Duggan G., Vogel H.J., Storr M. Quantitative metabolomic profiling of serum and urine in DSS-induced ulcerative colitis of mice by 1H NMR spectroscopy. *J Proteome Res*. **2010**, *9*, 6265.

White A.P., Weljie A.M., Apel D., Zhang P., **Shaykhutdinov R.**, Vogel H.J., Surette M.G. A global metabolic shift is linked to Salmonella multicellular development. *PLoS One*. **2010,** *27*, e11814.

Shaykhutdinov R.A., MacInnis G.D., Dowlatabadi R., Weljie A.M., Vogel H.J. Quantitative analysis of metabolite concentrations in human urine samples using $^{13}C\{^{1}H\}$ NMR spectroscopy. *Metabolomics*. **2009**, *5*, 307.

Lee E.J., **Shaykhutdinov R.**, Weljie A.M., Vogel H.J., Facchini P.J., Park S.U., Kim Y.K. Yang T.J. Quality Assessment of Ginseng by (1)H NMR Metabolite Fingerprinting and Profiling Analysis. *J Agric Food Chem*. **2009**, *57*, 7513.

Wishart D.S., Knox C., Guo A.C., Eisner R., Young N., Gautam B., Hau D.D., Psychogios N., Dong E., Bouatra S., Mandal R., Sinelnikov I., Xia J., Jia L., Cruz J.A., Lim E., Sobsey C.A., Shrivastava S., Huang P., Liu P., Fang L., Peng J., Fradette R., Cheng D., Tzur D., Clements M., Lewis A., De Souza A., Zuniga A., Dawe M., Xiong Y., Clive D., Greiner R., Nazyrova A., **Shaykhutdinov R.**, Li L., Vogel H.J., Forsythe I. HMDB: a knowledgebase for the human metabolome. *Nucleic Acids Res*. **2009,** *37*(Database issue), D603.

Tolkatchev D., **Shaykhutdinov R.**, Xu P., Plamondon J., Watson D., Young M., Ni F. Three-Dimensional Structure and Molecular Interactions of the Low Molecular Weight Protein Tyrosine Phosphatase from *Campylobacter jejuni*. *Protein Sci*. **2006**, *15,* 2381.

Bhattacharjya S., Xu P., Gingras R., **Shaykhutdinov R.**, Wu C., Whiteway M., Ni F. Solution Structure of the Dimeric SAM Domain of MAPKKK Ste11 and its Interactions with the Adaptor Protein Ste50 from the Budding Yeast: Implications for Ste11 Activation and Signal Transmission Through the Ste50–Ste11 Complex. *J. Mol. Biol*. **2004**, *344*, 1071.

Gadiev T.A., Khairutdinov B.I., **Shaikhutdinov R.A.**, Karatayeva F.Kh., Aganov A.V., Klochkov V.V. Spatial Structure of Dimeric Capsules of Tetraurea Calix[4]arenes in Solutions According to 2-D NMR (NOESY) Spectroscopy. ***Appl. Magn. Reson.* 2003, *25*, 347.**

Klochkov V.V., Khairutdinov B.I., Klochkov A.V., Shtyrlin V.G., **Shaykhutdinov R.A.** Spatial Structure of Triglycine Determined by the Residual Dipolar Couplings Analysis. ***Appl. Magn. Reson*. 2003, *25*, 113.**

Klochkov V.V., **Shaikhutdinov R.A.**, Khairutdinov B.I., Klimovitskii E.N., Findeinsen M., Berger S. Separation of Cross-Relaxation and Exchange in Two-Site Spin Systems with Weak Spin-Spin Couplings. *Appl. Magn. Reson*. **2003**, *24*, 97.

Zelenin K.N., Lagoda I.V., Alekseyev V.V., Sinkkonen J., **Shaikhutdinov R.A.,** Pihlaja K. Recyclizations of 2-Aminobenzylimines and Thioaroylhydrazones of N-Substituted N-Hydroxy-3-oxobutanaminedes. *J. Heterocyclic Chem*. **2002**, *39*, 805.

Klochkov V.V., Karatayeva F.Kh., **Shaikhutdinov R.A.**, Khairutdinov B.I., Molins M.A., Pons M. Separation of Cross-Relaxation and Exchange in Two-Site Spin Systems without Resolved Couplings. *Appl. Magn. Reson*. **2002**, *22*, 431.

Ovcharenko V.V., **Shaikhutdinov R.A.,** Pihlaja K. Mass-Spectrometric Differentiation of Diexo- and Diendo-Fused Isomers of Norbornane/ene- Condensed 2-Thiouracil and 1,3-Thiazino[3,2-a]-pyrimidine Derivatives: Stereoselectivity of Retro-Diels-Alder Fragmentations Under EI and CI Conditions. *J. Am. Soc. Mass Spectrom*. **2001**, *12*, 1011.

Shaikhutdinov R. A., Klika K.D., Fülöp F., Pihlaja K. ^{1}H and ^{13}C NMR Conformational Study of N-substituted Hexahydrocyclopent[e]-[1,3]-oxazin-4-ones and Hexahydro-2H-1,3-benzoxazin-4-ones. *Magn. Reson. Chem*. **2001**, *39*, 141.

Klochkov V.V., Khairutdinov B.I., **Shaikhutdinov R.A.**, Findaisen M., Berger S. Geometric Structure of 2-Phenyl-1,3-dithia-5,6-benzocycloheptene 1-Oxide. *Zh. Obsh. Khim*. **2001**, *71*, 1266.

Klimovitskii E.N., **Shaikhutdinov R.A.**, Kikilo P.A., Klochkov V.V. Thermodynamics of the Conformational Equilibrium of 1,3-Dithiane Monoxide, a ^{13}C NMR Study. *Zh. Obsh. Khim*. **1999**, *69*, 5.

Klimovitskii E.N., **Shaikhutdinov R.A.**, Kikilo P.A., Shtyrlin Yu.G., Klochkov V.V., Aminova R.M. Stereochemistry of Seven-membered Heterocycles: XXXVII. Dynamic ^{13}C and ^{1}H NMR Study of the Conformational Composition of 1,3-Dithia-5,6-benzocycloheptene S-Oxide. *Zh. Obsh. Khim*. **1998**, *68*, 1785.

Klimovitskii E.N., **Shaikhutdinov R.A.**, Klochkov V.V., Vafina R.M. Dynamic ^{1}H NMR Study of 5-(Benzene)chromium Tricarbonyl-1,3-dioxane. Conformational Effect of the Benchrothrenyl Substituent. *Zh. Org. Khim*. **1995**, *31*, 1039.

Klimovitskii E.N., Vafina R.M., **Shaikhutdinov R.A.,** Klochkov V.V. Stereochemistry of Seven-membered Heterocycles. XXXV. Dynamic ^{1}H NMR Study of the Thricarbonyl-7,12-dioxaspiro[5,6]benz[9,10]dodec-9-enylchromium. *Zh. Org. Khim*. **1994**, *30*, 524.

Anonimova I.V., Yarkova E.G., **Shaikhutdinov R.A.**, Klochkov V.V., Arbuzov B.A. Stereochemistry of Eight-membered Heterocycles. V. Synthesis and Spatial Structure of 12-R-12-hydroxidibenzo[d,g][1,3]dioxicines. *Zh. Obsh. Khim.* **1993**, *63*, 2405.