BIOGRAPHICAL SKETCH

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NAME: Roger W. Giese

eRA COMMONS USER NAME (credential, e.g., agency login): R.GIESE

POSITION TITLE: Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Hamline University, St. Paul, MN	B.S.	1965	Chemistry
Massachusetts Institute of Technology, Cambridge, MA	Ph.D.	1969	Organic Chemistry
Harvard Medical School, Boston, MA	Postdoc	1973	Biochemistry

A. Personal Statement

I am well-suited to be an advisor on this Phase I SBIR project concerning measurement of DNA adductomics by mass tag mass spectrometry mainly for the purpose of primary cancer prevention. My general research interest is mass tag mass spectrometry, and a major area of application of this technology in my laboratory is DNA adductomics. Organic chemistry is involved in this project, which was the area of my PhD thesis. Separation techniques are involved, and I was an editor of the Journal of Chromatography A for 17 years. Urine and other biosamples are to be tested; I am a board certified clinical chemist, and taught a graduate course as well as co-authored a book on clinical chemistry. Affinity techniques are to be used; I have taught a lab-lecture graduate course on immunoassays. Several of my publications concern advances in affinity techniques. Mass spectrometry is centrally involved; I along with my co-authors have contributed many articles on mass spectrometry, and also I have taught a graduate course on this subject. When the Memorial Sloan Kettering Cancer Center wanted to study DNA adductomics to guide selection of chemotherapy for multiple myeloma, they came to us even though they have an advanced mass spectrometry laboratory there, since we have a focus in this area. This collaboration with MSKCC is ongoing, and publication c below in the section on DNA adductomics, reporting a new mass spectrometry technique for DNA adductomics (Jettison Mass Spectrometry) is co-authored with them. More details on my work in the area of DNA adductomics are provided in the section of this grant proposal concerned with preliminary results.

Some recent and ongoing research projects I'd like to highlight include:

Environmental Cancer Research Program (Director: R. Giese) 1/1/20-12/31/2027
The goal is to advance mass tag mass spectrometry in the areas of clinical diagnostics

Partnership for Clean Competition (PI: R.Giese) 1/1/19-12/30/2022
The goal was to improve testing of athletes for performance-enhancing drugs via mass tag mass spectrometry.

Memorial Kettering Cancer Research Center (PI: R. Giese) 1/1/22-12/30/2027
The goal is to monitor chemotherapy by DNA adductomics

FY19 Tier 1 University Grant Program (Co-PI: R. Giese) 7/1/2018 – 8/30/2019
Adductomics of Healthy Aging: How is Exercise Good for You
The goal was to learn more about aging by analyzing the mitochondrial DNA adductome by mass spectrometry.
Role: Co-PI

5P42E5017198 (Alshawabkeh, Akram, PI) 4/01/2014 – 03/31/2019
NIEHS
Puerto Rico Testsite for Exploring Contamination Threats (PRoTECT)
The goal of my component RO1 Grant "Discovery of Xenobiotics Associated with Preterm Birth", was to advance and employ nontargeted chemical analysis by mass tag mass spectrometry for metabolomics and DNA adductomics.

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

1999- present	Director, Environmental Cancer Research Program
1981- present	Professor of Chemistry and Biomedical Science, Northeastern University
1977-1981	Associate Professor, Northeastern University
1974- present	Faculty Fellow, Barnett Institute of Chemic Analysis
1973-1977	Assistant Professor, Northeastern University

Other Experience and Professional Membership

2017	Adductomics Study Section
2012	STTR/SBIR Study Section, NIH Second Tier
2012	Metabolomics Study Section, NIH Second Tier
2006-2007	Enabling Bioanal. Biophys. Technol. NIH Study
2003-2005	NIH Instrumental and Systems Development Study
1990-2017	Editor, Journal of Chromatography
1987-1990	Section Leader of Medicinal Chemistry
1987-2001	NIH Special Study Section, SBIR
1989	Editorial Board, Trends in Analytical Chemistry
1979-1986	Editorial Review Board, Therapeutic Drug Monitoring
1977- present	Diplomat of the American Board of Clinical Chemistry
1973-1987	Director of M.S. Program in Clinical Chemistry
1969-1972	Associate on Staff and Training Program in Human Biochem, Brigham and Women's Hospital
1969-1971	American Cancer Society Postdoctoral Research Fellowship
1966-1969	NIH Predoctoral Research Fellowship
1965- present	American Chemical Society

Honors

2010	Innovative Teaching Award, Northeastern University
1999	Klein Lecturer, Northeastern University
1965-1966	Woodrow Wilson Fellowship
1961-1965	George McPherson Scholarship
1964	Bluhm Scholarship and Service Award

C. Contributions to Science

(207 total publications)

1. **Improved detection of DNA Adducts via electrophoric derivatization.** Historical background. The ability to study DNA adducts as biomarkers of carcinogen exposure and as initiators of cancer was held back in the early years in this field by their very low level in biosamples, making them difficult or impossible to detect in a definitive way, namely by mass spectrometry. Central finding.

Electrophoric derivatization prior to gas chromatography – electron capture – mass spectrometry emerged as a way to partly overcome this problem. Influence of the finding. Many investigators have used this methodology, leading to many publications and further characterization of some DNA adducts. Specific role. My laboratory opened up this field of study, and we contributed to its growth

a. Chiu, C.S., Saha, M., Abushamaa, A. and Giese, R.W. (1993) Chemical Transformation/ Derivatization of O^6-Methyl- and O^6-(Hydroxyethyl)guanine for Detection by GC-EC-MS, Anal. Chem., 65, 3071-3075. PMID: **8256870**

b. Giese, R.W., Saha, M., Abdel-Baky, S., Allam, K. (1996) Measuring DNA Adducts by GC-EC-MS: An Example of Trace Organic Analysis, Methods in Enzymol., 271, 504-522.

c. Giese, R.W. (1997) Detection of DNA Adducts by Electron Capture Mass Spectrometry, Chem. Res. in Toxicology, 10, 255-270. PMID: **9084905**

d. Kao, C-Y., Giese, R.W. (2005) Measurement of N7-(2′-Hydroxyethyl)guanine in Human DNA by Gas Chromatography Electron Capture Mass Spectrometry, Chem. Res. Toxicol. 18, 70-75. PMID: **15651851**

2. **Avidin-Biotin Technology**. Historic Background. Once the properties of avidin-biotin system emerged, many scientists realized its potential as a general tool in biochemistry, and it has flourished in this way. Central Finding. The avidin-biotin system, including development and use of analogs of these reagents, is useful in a great diversity of biochemical assays and procedures. Influence of the finding. The avidin-biotin system is a great commercial success and has facilitated many advances in biomedical research and clinical diagnostics. Specific role. My laboratory helped the field to develop in the early days by being the first to synthesize and demonstrate the advantages of caproylamidobiotin-NHS (patent was awarded and several companies licensed the invention). My laboratory also invented a type of structural amplification by the avidin-biotin system that has been practiced in some solid phase immunoassays.

   a. Costello, S. M., Felix, RT. T., Giese, R. W. (1979) Enhancement of Immune cellular Agglutination using an Avidin-Biotin System, Clin. Chem., 25, 1572-1580. PMID: **572747**

   b. Giese, R. W. (1984) Biochemical Avidin-Biotin Multiple Layer System, U.S. Patent 4,282,287, EW 31,712. PMCID: PMC5667776

   c. Garlick, R. K., Giese, R. W. (1987) Avidin Binding of Radiolabeled Biotin Derivatives, J. Biol. Chem. 263, 210-215. PMID: **3275639**

   d. Garlick, R. K., Giese, R. W. (1990) Dissociative Binding of α- and β-Sulfoxides of Biotinylamido-ethyl-3(3[125I]iodo-4-hydroxy-phenyl)-propionamide to Avidin, Biochem. J., 268, 611-613.

3. **DNA Adductomics.** Historic Background. Many assays have been introduced and employed for targeted detection of DNA adducts, but the impact of these studies has been held back since other, unmeasured adducts in the biosample could always be playing a role. This has led to a growing interest in nontargeted detection of DNA adducts (measurement of the DNA adductome). Central Finding. Of the specific DNA adductome assays that have emerged, the only one that is truly a discovery assay is based on isotopologue labeling of the phosphate group of nucleotides prior to detection by mass spectrometry. This assay normalizes the response of nucleotides, is very sensitive, and discriminates deoxynucleotides from ribonucleotides. Influence of the finding. This finding so far has led to the discovery of 6-oxothymine in DNA, corrected an incorrect DNA adduct assignment made by ^{32}P-postlabeling, and discovered of a benzoquinone DNA adduct of 5-hydroxymethylcytosine. We have developed the first and only method for polar DNA adductomics based on mass tag labeling (reference d below). Specific Role. My laboratory has advanced mass tag mass spectrometry for DNA adductomics.

   a. Wang, P., Fisher, D., Rao, A., Giese, R.W. (2012) Nontargeted Nucleotide Analysis Based on Benzoylhistamine Labeling-MALDI-TOF/TOF-MS: Discovery of Putative 6-Oxo-Thymine in DNA, Anal. Chem. 84, 3811-3819. PMCID:22409256.

   b. Wang, P., Zhang, Q., Yao, Y., Giese, R. W. (2015) Cationic Xylene Tag for Increasing Sensitivity

in Mass Spectrometry, J. Am. Soc. Mass Spectrom. 26, 1713-1721. Published online. Doi:10.1007/s13361-015-1200-4. PMCID: PMC4567951

c. Wang, P., Shah, G.L., Landau, H., Coulter, M.E., Walsh, C.A., Roider, E., Kramer, C.S., Beuning, P.J., Giese, R.W. (2020) Jettison-MS of Nucleic Acid Species. J. Am. Soc. Mass Spectrom. 31, 1641 – 1646. Doi.org/10.1021/jasms.0c00084 PMID: **32551641**

d. Wang, P., Roider, E, Coulter, M.E., Walsh, C.A., Kram, C.S., Beuning, P.J., Giese, R.G. (2021) DNA Adductomics by Mass Tag Prelabeling. Rapid Comm. Mass Spectrom. 2021;35:e9095. Doi.org/10.1002/rcm.9095 PMID: **33821547**

Complete List of Published Work in MyBibliography:
https://www.ncbi.nlm.nih.gov/sites/myncbi/1p7WtAMPw9i5z/bibliography/47682399/public/?sort=date&%20direction=ascending