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a. Professional Preparation

Universite Rene Descartes, Paris V, France	Life Sciences	B.S.	1996
Universite de Technologie Compiegne, France	Biological Engineering	M.S.	2000
North Carolina State University, Raleigh, NC	Food Science	M.S.	2000
North Carolina State University, Raleigh, NC	Functional Genomics	Ph.D.	2004
University of Wisconsin, Madison, WI	Business Administration	M.B.A.	2011

b. Appointments

2018-	Professor of Food Science, North Carolina State University, NC
2016-	Todd R. Klaenhammer Distinguished Professor in Probiotics Research, NC State University Scholar, NC State University
2016-	University Scholar, NC State University
2013-2018	Associate Professor of Food Science, North Carolina State University, NC
2010-2018	Adjunct Professor of Food Science, Pennsylvania State University, PA
2011-2013	R&D Director, Genomics, DuPont, WI
2007-2011	Group Manager, Genomics DuPont, WI
2006-2007	Sr. Scientist, Cultures Development, DuPont (Danisco), WI
2005-2006	Scientist, Cultures Development, DuPont (Danisco), WI

NC State University affiliations

- Food, Bioprocessing and Nutrition Sciences (home Department)
- Microbiology graduate program
- Biotechnology graduate program
- Functional Genomics graduate program
- Genetics graduate Program
- Comparative Medicine Institute
- Genetic Engineering and Society Center
- Southeast Dairy Foods Research Center

c. Professional Scholarly Activities

2020-	Co-Founder and Chief Executive Officer, CRISPR Biotechnologies
2020-	Scientific Advisory Board, Innovative Genomics Institute, UC Berkeley
2020-	Scientific advisory Board, Provacus
2020-	National Academies Food Forum Board
2020-	Editorial Board member, <i>BioDesign Research</i>
2019-	Co-Founder and Chief Scientific Officer, Ancilia Biosciences
2019-	National Academies Food and Nutrition Board
2019-	Co-Founder, President and Chief Scientific Officer, TreeCo
2019-	Scientific Advisory Board, Invaio
2018-	Scientific Advisory Board, Inari Ag
2017-	Editor in Chief, <i>The CRISPR Journal</i>

- 2017- Editorial Board member *Annual Reviews in Food Science and Technology*
- 2017-2019 NC Biolabs Advisory Board
- 2017- Editorial Board member, *Genome Biology*
- 2016-2018 Co-Founder, Chief Scientific Officer and SAB Chairman, Locus Biosciences
- 2016- NC Ag Foundation Board of Directors
- 2015- Editorial Board Member *Applied and Environmental Microbiology*
- 2014- Co-Founder and member of the Scientific Advisory Board, Intellia Therapeutics
- 2013-2016 Board of Directors and Chairman of the Board, Caribou Biosciences

d. Honors and awards

- 2019 Elected Fellow of the US National Academy of Inventors
- 2019 Elected into the US National Academy of Engineering
- 2019 Triangle Business Journal Research Innovator
- 2018 Elected into the US National Academy of Sciences
- 2018 National Academy of Sciences Prize in Food and Agriculture Sciences
- 2018 Fellow of the American Academy of Microbiology
- 2017 National Academy of Sciences Award in Molecular Biology
- 2017 (since) Clarivate (former Thomson Reuters) Highly Cited Researcher (I-2878-2014)
- 2016 Canada Gairdner International Award
- 2016 Warren Alpert Foundation Prize
- 2016 Todd R. Klaenhammer Distinguished Scholar in Probiotics Research
- 2016 NC State University John S. Risley Entrepreneur of the year Award
- 2015 NC State University Faculty Scholar
- 2015 NC State University Alumni Association Outstanding Research Award
- 2014 (since) Thomson Reuters Highly Cited Researcher (I-2878-2014)
- 2014 Inducted into Phi Tau Sigma, the Honor Society for Food Science
- 2011 NC State Food Science Outstanding Young Alumni award recipient
- 2011 Distinguished Lecture in Microbiology, UW-Madison
- 2010 Sixth Annual Leo W. Parks Distinguished Lecture, NCSU
- 2009 Danisco Project Management Program
- 2008 Danisco Innovation Award Recipient
- 2008 Danisco Americas Management Program
- 2003 National Science Foundation IGERT Fellow

e. Publications (205 papers published, 35,425 citations, 71 h-index, 156 i10-index)

- 205. Barrangou R. (2021) The CRISPR chronicles and the power of storytelling. *CRISPR J* 4:158-159
- 204. Saha K, Sontheimer EJ and the SCGE. (2021) The NIH Somatic Cell Genome Editing program. *Nature* 592: 195-204
- 203. Barrangou R. (2021) Political Support Sets the Tone for CRISPR Enthusiasts. *CRISPR J* 4:1-2
- 202. Kuiken T, **Barrangou R**, Grieger K. (2021) (Broken) Promises of Sustainable Food and Agriculture through New Biotechnologies: The CRISPR Case. *CRISPR J* 4:25-31
- 201. Foley MH, O'Flaherty S, Allen G, Rivera AJ, Stewart AK, **Barrangou R**, Theriot CM. (2021) *Lactobacillus* bile salt hydrolase substrate specificity governs bacterial fitness and host

colonization. *Proc Natl Acad Sci U S A* 118(6):e2017709118. doi: 10.1073/pnas.2017709118.

200. Goh YJ, **Barrangou R**, Klaenhammer TR. (2021) *In Vivo* Transcriptome of *Lactobacillus acidophilus* and Colonization Impact on Murine Host Intestinal Gene Expression. *mBio* 12(1):e03399-20. doi: 10.1128/mBio.03399-20.

199. Goh YJ, **Barrangou R**. (2021) A portable CRISPR-Cas9N system for flexible genome engineering in *Lactobacillus acidophilus*, *Lactobacillus gasseri* and *Lactobacillus paracasei*. *Appl Environ Microbiol*. doi: 10.1128/AEM.02669-20.

198. McClements DJ, **Barrangou R**, Hill C, Kokini JL, Ann Lila M, Meyer AS, Yu L. (2021) Building a Resilient, Sustainable, and Healthier Food Supply through Innovation and Technology. *Annu Rev Food Sci Technol*. doi: 10.1146/annurev-food-092220-030824.

197. **Barrangou R**. (2020) Sharpening the CRISPR Toolbox. *CRISPR J*. 3:421. doi: 10.1089/crispr.2020.29114.rba.

196. Brandt K, **Barrangou R**. (2020) Adaptive response to iterative passages of five *Lactobacillus* species in simulated vaginal fluid. *BMC Microbiol*. 20:339. doi: 10.1186/s12866-020-02027-8.

195. Angrist M, **Barrangou R**, Baylis F, Brokowski C, Burgio G, Caplan A, Chapman CR, Church GM, Cook-Deegan R, Cwik B, Doudna JA, Evans JH, Greely HT, Hercher L, Hurlbut JB, Hynes RO, Ishii T, Kiani S, Lee LH, Levrier G, Liu DR, Lunshof JE, Macintosh KL, Mathews DJH, Meslin EM, Mills PHR, Montoliu L, Musunuru K, Nicol D, O'Neill H, Qiu R, Ranisch R, Sherkow JS, Soni S, Terry S, Topol E, Williamson R, Zhang F, Davies K. (2020) Reactions to the National Academies/Royal Society Report on Heritable Human Genome Editing. *CRISPR J*. 3:332-349. doi: 10.1089/crispr.2020.29106.man.

194. **Barrangou R**. (2020) Nobel Dreams Come True for Doudna and Charpentier. *CRISPR J*. 3:317-318. doi: 10.1089/crispr.2020.29109.rba.

193. **Barrangou R**. (2020) Commissions, Consensus, and CRISPR. *CRISPR J*. 2020 3:316-317. doi: 10.1089/crispr.2020.29107.rba.

192. O'Flaherty S, Foley MH, Rivera AJ, Theriot CM, **Barrangou R**. (2020) Complete Genome Sequence of *Lactobacillus johnsonii* NCK2677, Isolated from Mice. *Microbiol Resour Announc* 9:e00918-20. doi:10.1128/MRA.00918-20

191. Monte DFM, Nethery MA, **Barrangou R**, Landgraf M, Fedorka-Cray PJ. (2020) Whole-genome sequencing analysis and CRISPR genotyping of rare antibiotic-resistant *Salmonella enterica* serovars isolated from food and related sources. *Food Microbiol* 93:103601. Doi: 10.1016.j.fm.2020.103601

190. LaManna CM, Pythila B, **Barrangou R**. (2020) Sharing the CRISPR Toolbox with an Expanding Community. *CRISPR J* 3:248-252. doi: 10.1089/crispr.2020.0075

189. **Barrangou R**. (2020) In times like these, we all need a moment of science. *CRISPR J* 3:223 doi: 10.1089/crispr.2020.29102.rba

188. Klotz C, Goh YJ, O'Flaherty S, **Barrangou R.** (2020) S-layer associated proteins contribute to the adhesive and immunomodulatory properties of *Lactobacillus acidophilus* NCFM. *BMC Microbiol* 20:248. doi: 10.1186/s12866-020-01908-2.
187. **Barrangou R,** Sontheimer EJ. (2020) Shutting down RNA-targeting CRISPR. *Science* 369:31-32. doi: 10.1126/science.abc8243
186. **Barrangou R.** (2020) Finding SECURE Ground: USDA Edits the Biotechnology Regulatory Framework. *CRISPR J* 3:136–137 doi: 10.1089/crispr.2020.29096.rba
185. Roberts A, **Barrangou R.** (2020) Applications of CRISPR-Cas systems in Lactic Acid Bacteria. *FEMS Microbiol Rev* doi: 10.1093/femsre/fuaa016
184. Pan M, Nethery MA, Hidalgo-Cantabrana C, **Barrangou R.** (2020) Comprehensive Mining and Characterization of CRISPR-Cas Systems in *Bifidobacterium*. *Microorganisms* doi: 10.3390/microorganisms8050720
183. Brandt K, Nethery MA, O'Flaherty S, **Barrangou R.** (2020) Genomic characterization of *Lactobacillus fermentum* DSM 20052. *BMC Genomics* 21(1):328. doi: 10.1186/s12864-020-6740-8
182. Davies K, **Barrangou R.** (2020) COVID-19 and the CRISPR Community Response. *CRISPR J* 3:66. doi: 10.1089/crispr.2020.29092.rba
181. Reed AD, Nethery MA, Stewart A, **Barrangou R,** Theriot CM. (2020) Strain-dependent inhibition of *Clostridioides difficile* by commensal Clostridia encoding the bile acid inducible (bai) operon. *J Bacteriol* pii: JB.00039-20. doi: 10.1128/JB.00039-20
180. Klotz C, Goh YJ, O'Flaherty S, Johnson B, **Barrangou R.** (2020) Deletion of S-Layer Associated Ig-Like Domain Protein Disrupts the *Lactobacillus acidophilus* Cell Surface. *Front Microbiol* 11:345. doi: 10.3389/fmicb.2020.00345
179. Selle K, Fletcher JR, Tuson H, Schmitt DS, McMillan L, Vridhambal GS, Rivera AJ, Montgomery SA, Fortier L-C, **Barrangou R,** Theriot CM, Ousterout DG. (2020) *In vivo* targeting of *Clostridioides difficile* using phage delivered CRISPR-Cas3 antimicrobials. *mBio* 11:e00019-20. DOI: 10.1128/mBio.00019-20.
178. **Barrangou R,** Sontheimer EJ. (2020) CRISPR Shields: Fending Off Diverse Cas Nucleases with Nucleus-like Structures. *Mol Cell* 77:934-936. doi: 10.1016/j.molcel.2020.02.015.
177. **Barrangou R.** (2020) Ushering in the next CRISPR decade. *CRISPR J* 3:2 DOI: 10.1089/crispr.2020.29085.rba
176. Pan M, **Barrangou R.** (2020) Combining omics technologies with CRISPR-based genome editing to study food microbes. *Curr Opin Biotechnol* 61:198-208. doi:10.1016/j.copbio.2019.12.027
175. M Pan, C Hidalgo-Cantabrana, **R Barrangou.** (2020) Host and body site-specific adaptation of *Lactobacillus crispatus* genomes. *NAR Genomics & Bioinformatics* 2, lqaa001

174. Pan M, Hidalgo-Cantabrana C, Goh YJ, Sanozky-Dawes R, **Barrangou R.** (2020) Comparative Analysis of *Lactobacillus gasseri* and *Lactobacillus crispatus* Isolated From Human Urogenital and Gastrointestinal Tracts. *Front Microbiol* doi: 10.3389/fmicb.2019.03146
173. Hidalgo-Cantabrana C, **Barrangou R.** (2020) Characterization and applications of Type I CRISPR-Cas systems. *Biochem Soc Trans* doi: 10.1042/BST20190119
172. Makarova KS, Wolf YI, Iranzo J, Shmakov SA, Alkhnbashi OS, Brouns SJJ, Charpentier E, Cheng D, Haft DH, Horvath P, Moineau S, Mojica FJM, Scott D, Shah SA, Siksnyš V, Terns MP, Venclovas Č, White MF, Yakunin AF, Yan W, Zhang F, Garrett RA, Backofen R, van der Oost J, **Barrangou R,** Koonin EV. (2019) Evolutionary classification of CRISPR-Cas systems: a burst of class 2 and derived variants. *Nat Rev Microbiol* doi:10.1038/s41579-019-0299-x.
171. **Barrangou R.** (2019) Partnering with bioRxiv. *CRISPR J* 2:342 doi:10.1089/crispr.2019.29076.rba
170. **Barrangou R.** (2019) Foresight is 2020: ten bold predictions for the new CRISPR year. *CRISPR J* 2:341-342 DOI: 10.1089/crispr.2019.29075.rba
169. Nethery MA, Henriksen ED, Daughtry KV, Johanningsmeier SD, **Barrangou R.** (2019) Comparative genomics of eight *Lactobacillus buchneri* strains isolated from food spoilage. *BMC Genomics* 20:902. doi: 10.1186/s12864-019-6274-0.
168. Young JK, Gasior SL, Jones S, Wang L, Navarro P, Vickroy B, **Barrangou R.** (2019) The repurposing of type I-E CRISPR-Cascade for gene activation in plants. *Comm Biol* doi: 10.1038/s42003-019-0637-6
167. Huang Y, Porter A, Zhang Y, **Barrangou R.** (2019) Collaborative networks in gene editing. *Nat Biotechnol.* 37:1107-1109. doi: 10.1038/s41587-019-0275-z
166. **Barrangou R.** (2019) Thinking about CRISPR: the ethics of human genome editing. *CRISPR J* 2:247-248 doi: 10.1089/crispr.2019.29072.rba
165. Pickar-Oliver A, Black JB, Lewis MM, Mutchnick KJ, Klann TS, Gilcrest KA, Sitton MJ, Nelson CE, Barrera A, Bartelt LC, Reddy TE, Beisel CL, **Barrangou R,** Gersbach CA. (2019) Targeted transcriptional modulation with type I CRISPR-Cas systems in human cells. *Nat Biotechnol.* doi: 10.1038/s41587-019-0235-7
164. **Barrangou R.** (2019) Bringing CRISPR to the cinema. *CRISPR J* 2:187 doi: 10.1089/crispr.2019.29070.rba
163. Davis TH. (2019) Profile of **Rodolphe Barrangou.** *Proc Natl Acad Sci U S A* 116:15754-15756. doi: 10.1073/pnas.1911079116.
162. Hidalgo-Cantabrana C, Goh YJ, Pan M, Sanozky-Dawes R, **Barrangou R.** (2019) Genome editing using the endogenous type I CRISPR-Cas system in *Lactobacillus crispatus*. *Proc Natl Acad Sci U S A* 116:15774-15783. doi: 10.1073/pnas.1905421116.
161. Selle K, Andersen JM, **Barrangou R.** (2019) Short communication: Transcriptional response to a large genomic island deletion in the dairy starter culture *Streptococcus*

thermophilus. *J Dairy Sci*. 102:7800-7806. doi: 10.3168/jds.2019-16397

160. **Barrangou R.** (2019) Taking CRISPR to New Heights. *CRISPR J* 2:133 doi: 10.1089/crispr.2019.29064.rba.

159. Cañez C, Selle K, Goh YJ, **Barrangou R.** (2019) Outcomes and characterization of Chromosomal Self-Targeting by Native CRISPR-Cas Systems in *Streptococcus thermophilus*. *FEMS Microbiol Lett*. 366 doi: 10.1093/femsle/fnz105

158. **Barrangou R,** Notebaart RA. (2019) CRISPR-Directed Microbiome Manipulation across the Food Supply Chain. *Trends Microbiol* S0966-842X(19)30070-8. doi: 10.1016/j.tim.2019.03.006

157. **Barrangou R.** (2019) Time To Let CRISPR B.E.? *CRISPR J* 2: 67. doi: 10.1089/crispr.2019.29055.rdb

156. Brandt K, **Barrangou R.** (2019) Applications of CRISPR Technologies Across the Food Supply Chain. *Annu Rev Food Sci Technol* 25:10:133-150. doi: 10.1146/annurev-food-032818-121204

155. Varble A, Meaden S, **Barrangou R,** Westra ER, Marraffini LA. (2019) Recombination between phages and CRISPR-cas loci facilitates horizontal gene transfer in staphylococci. *Nat Microbiol* doi: 10.1038/s41564-019-0400-2

154. Foley MH, O’Flaherty S, **Barrangou R,** Theriot CM. (2019) Bile salt hydrolases: Gatekeepers of bile acid metabolism and host-microbiome crosstalk in the gastrointestinal tract. *PLoS Pathogens* doi: 10.1371/journal.ppat.1007581

153. **Barrangou R.** (2019) CRISPR on the move in 2019. *CRISPR J* 2:1-2. doi: 10.1089/CRISPR.2019.29043.rba

152. Nethery MA, **Barrangou R.** (2019) Predicting and visualizing features of CRISPR-Cas systems. *Methods Enzymol* 616:1-25. doi: 10.1016/bs.mie.2018.10.016.

151. Goh YJ, **Barrangou R.** (2019) Harnessing CRISPR-Cas systems for precision engineering of designer probiotic lactobacilli. *Curr Op Biotechnol* 56, 163-171

150. **Barrangou R.** (2018) CRISPR crossroad for genome editing. *CRISPR J* 1:349-350. Doi: 10.1089/crispr.2018.29040.rba

149. **Barrangou R.** (2018) Expanding the CRISPR Landscape on a *cas* by *cas* Basis. *CRISPR J* 1:303-303. doi: 10.1089/crispr.2018.29035.rba

148. Morovic W, Roos P, Zabel B, Hidalgo-Cantabrana C, Kiefer A, **Barrangou R.** (2018) Transcriptional and functional analysis of *Bifidobacterium animalis* subsp. *lactis* exposure to tetracycline. *Appl Environ Microbiol*. pii: AEM.01999-18. doi: 10.1128/AEM.01999-18.

147. Hidalgo-Cantabrana C, Goh YJ, **Barrangou R.** (2018) Characterization and Repurposing of Type I and Type II CRISPR-Cas Systems in Bacteria. *J Mol Biol*. S0022-2836(18)31107-0. doi:

146. Klotz C, **Barrangou R** (2018) Engineering components of the *Lactobacillus* S-layer for biotherapeutic applications. *Frontiers Microbiol* doi: 10.3389/fmicb.2018.02264

145. Bikard D, **Barrangou R** (2018) CRISPR-Cas systems as weapons against pathogenic bacteria. *Biol Auj* 211:265-270. doi: 10.1051/jbio/2018004

144. Hidalgo-Cantabrana C, Sanozky-Dawes R, **Barrangou R**. (2018) Insights into the human virome using CRISPR spacers from microbiomes. *Viruses* 10:479. doi: 10.3390/v10090479

143. Nethery MA, **Barrangou R**. (2018) CRISPR Visualizer: rapid identification and visualization of CRISPR loci via an automated high-throughput processing pipeline. *RNA Biol*. doi: 10.1080/15476286.2018.1493332.

142. Faure G, Shmakov SA, Makarova KS, Wolf YI, Crawley AB, **Barrangou R**, Koonin EV. (2018) Comparative genomics and evolution of trans-activating RNAs in Class 2 CRISPR-Cas systems. *RNA Biol*. doi: 10.1080/15476286.2018.1493331.

141. Curchoe CL, **Barrangou R**. (2018) Pomp and circumstance: making the case for CRISPR. *CRISPR J* 1:252-253. doi: 10.1089/crispr/2018.2930.oxf

140. **Barrangou R**. (2018) CRISPR craziness: a response to the EU court ruling. *CRISPR J* 1:250-251. doi: 10.1089/crispr.2018.29025.edi

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137. Stout EA, Sanozky-Dawes R, Goh YJ, Crawley AB, Klaenhammer TR, **Barrangou R**. (2018) Deletion-based escape of CRISPR-Cas9 targeting in *Lactobacillus gasseri*. *Microbiology*. doi: 10.1099/mic.0.000689

136. Davies K, **Barrangou R**. (2018) MasterChef at Work. *CRISPR J* 1:219-222. doi: 10.1089/crispr.2018.29015.int

135. **Barrangou R**. (2018) The Democratization of CRISPR. *CRISPR J* 1:203-204. doi: 10.1089/crispr.2018.29019.rba

134. LaManna CM, **Barrangou R**. (2018) Enabling the Rise of a CRISPR World. *CRISPR J* 1:105-208. doi: 10.1089/crispr.2018.0022

133. Brandt K, **Barrangou R**. (2018) Using glycolysis enzyme sequences to inform *Lactobacillus* phylogeny. *Microb Genom*. doi: 10.1099/mgen.0.000187

132. O'Flaherty S, Briner Crawley A, Theriot CM, **Barrangou R**. (2018) The *Lactobacillus* Bile

Salt Hydrolase Repertoire Reveals Niche-Specific Adaptation. *mSphere* 3: e00140-18. doi: 10.1128/mSphere.00140-18.

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Books, book chapters and Magazine features:

6. Foegeding EA, Klaenhammer TR, **Barrangou R** (2019) Unlocking the Genomics of Lactic Acid Bacteria. *Food Technol* 73:72-78.
5. **Barrangou R**, van der Oost J. eds. (2012) CRISPR-Cas systems: RNA-mediated adaptive immunity in bacteria and archaea. Springer Science & Business Media
4. Horvath P, Gasiunas G, Siksnys V, **Barrangou R**. (2012) Applications of the versatile CRISPR-Cas systems. CRISPR-Cas systems: RNA-mediated adaptive immunity in bacteria and archaea. Springer Science & Business Media 267-286
3. **Barrangou R**, Lahtinen SJ, Ibrahim F, Ouwehand AC. (2012) Genus lactobacillus. Lactic acid bacteria. Microbiological and functional aspects, 73
2. **Barrangou R**, Horvath P. (2011) Lactic Acid Bacteria Defenses Against Phages. Stress Responses of Lactic Acid Bacteria. Springer US, 459-478
1. **Barrangou R**, Horvath P. (2010) Protection against foreign DNA. Bacterial stress responses. American Society for Microbiology Press, 333-348

f. Collaborators & Grants

Collaborators

Casey Theriot, NC State University: probiotics & CRISPR-based solutions against *C. difficile*
 Charlie Gersbach, Duke University : applications of CRISPR-Cas systems in eukaryotes
 Jack Wang, NC State University: genome editing of trees and forestry applications
 Gregg Dean, Colorado State University: engineering of probiotics for viral immunization
 Marco Ventura, University of Parma: occurrence and activity of CRISPR in bifidobacteria

Current Research Support

Elysium (PI, PINS 91983) *Selection and formulation of next-generation probiotics in combination with bioactive compounds*
 NC Ag Foundation (PI, PINS 1475) *Functional genomics of Lactobacillus acidophilus*
 DuPont (PI, PINS 0495) *Functional Genomics of Probiotic Lactobacillus species and beneficial cultures.*
 BASF (PI, PINS 88784) *Investigating novel DNA delivery polymers*
 DOE (co-PI, PINS 86711) *Microbial community analysis and functional evaluation in soils.*

NIH (R01 co-PI PINS 92135) *Identification and characterization of novel CRISPR-based genome editing systems.*
NIH (R01 co-PI PINs) *Novel recombinant rotavirus vaccine utilizing the probiotic microorganism Lactobacillus acidophilus*
NSF (EAGER co-PI, PINS 91035) *Electrically driving the microbial conversion of nitrogen gas into ammonia.*
North Carolina State University Chancellor Innovation Fund (co-PI, PINS 3078). *Transgene-free CRISPR-based genome editing in forest trees.*
Novozymes (PI, PINs) *CRISPR-based genome editing in Bacillus*

Past Research Support

LifeEDIT (PI, PINS 86919, 2017-2018) *Mining novel CRISPR-Cas systems*
NSF BBBE (co-PI). (CBET-1403135, 2014-2017) *Engineering highly specific and orthogonal CRISPR-Cas systems.*
NIH (R21 co-PI, PINS 62045, 2015-2017) *A biotherapeutic CRISPR-delivery platform to eradicate Clostridium difficile.*
DuPont Pioneer (PI, PINS 63352, 2015-2017) *GRAS CRISPR-Cas9 systems for genome editing in plants*
USDA-NIFA (co-PI, PINS 61227), (2015-2016) *Development of Methods for Knockout Chickens: CRISPR-Cas Genome Editing To Understand Foodborne Pathogen-Host Interactions In Poultry*
FNU (Denmark Research council) (co-PI). (2014-2016). *Occurrence and diversity of CRISPR-Cas systems in clostridia.*
Danish Council for Independent Research (PI, PINS 63956) *Prebiotic utilization by probiotic bacteria.*
North Carolina State University Chancellor Innovation Fund (PI, PINS 56415). (2014-2015). *Novel CRISPR Systems for Genome Editing.*
North Carolina Biotechnology Center (PI, PINS 57198). (#558507, 2014-2015). *Novel CRISPR-Cas9 systems for enhanced genome editing.*
North Carolina State University CALS enhancement grant (co-PI, PINS 55185). (2013-2014) *Enhancer Excision based on CRISPR technology: a tool for deciphering gene regulation.*

g. Patents

Patents issued

1. 10,787,654 Methods and compositions for sequence guiding Cas9 targeting
2. 10,711,267 Recombinant type I CRISPR-Cas system
3. 10,662,227 Bifidobacteria CRISPR sequences
4. 10,640,778 Method of modulating cell resistance
5. 10,584,358 Compositions and methods related to a type-II CRISPR-Cas system in *Lactobacillus buchneri*
6. 10,543,239 Lactic acid bacteria and bifidobacteria for treating endotoxemia
7. 10,450,584 Cas9 proteins and guiding features for DNA targeting and genome editing
8. 10,136,649 Methods for screening bacteria, archaea, algae, and yeast using CRISPR nucleic acids
9. 10,066,233 Method of modulating cell resistance
10. 9,951,342 Cultures with improved phage resistance
11. 9,879,269 Method for modulating resistance
12. 9,816,140 Tagged microorganisms and methods of tagging
13. 9,399,801 Tagged microorganisms and methods of tagging

14. 9,259,447 Lactic acid bacteria and bifidobacteria for treating endotoxemia
15. 8,361,725 Detection and typing of bacterial strains
16. 8,178,337 *Lactobacillus acidophilus* nucleic acid sequences encoding carbohydrate utilization-related proteins and uses therefor
17. 7,919,277 Detection and typing of bacterial strains
18. 7,838,276 *Lactobacillus acidophilus* nucleic acid sequences encoding carbohydrate utilization-related proteins and uses therefor
19. 7,824,894 *Lactobacillus acidophilus* nucleic acids encoding fructo-oligosaccharide utilization compounds and uses thereof
20. 7,495,092 Compositions comprising promoter sequences and methods of use
21. 7,459,289 *Lactobacillus acidophilus* nucleic acid sequences encoding carbohydrate utilization-related proteins and uses therefor
22. 7,407,787 *Lactobacillus acidophilus* nucleic acids encoding fructo-oligosaccharide utilization compounds and uses thereof

Patents pending

1. 20190021343 METHODS FOR SCREENING BACTERIA, ARCHAEA, ALGAE, AND YEAST USING CRISPR NUCLEIC ACIDS
2. 20180371405 METHODS AND COMPOSITIONS FOR DELIVERY OF CRISPR BASED ANTIMICROBIALS
3. 20170275648 NOVEL CAS9 PROTEINS AND GUIDING FEATURES FOR DNA TARGETING AND GENOME EDITING
4. 20170037416 Method of Modulating Cell Resistance
5. 20170002339 Methods and Compositions for Sequences Guiding Cas9 Targeting
6. 20160345578 METHODS FOR SCREENING BACTERIA, ARCHAEA, ALGAE, AND YEAST USING CRISPR NUCLEIC ACIDS
7. 20160289700 COMPOSITIONS AND METHODS RELATED TO A TYPE-II CRISPR-CAS SYSTEM IN *LACTOBACILLUS BUCHNERI*
8. 20160113976 LACTIC ACID BACTERIA AND BIFIDOBACTERIA FOR TREATING ENDOTOXEMIA
9. 20150093473 CULTURES WITH IMPROVED PHAGE RESISTANCE
10. 20150056628 DETECTION AND TYPING OF BACTERIAL STRAINS
11. 20140199767 USE (of *cas* genes)
12. 20130158245 Detecting and Typing of Bacterial Strains
13. 20130011828 Use (of *cas* genes)
14. 20120196325 *LACTOBACILLUS ACIDOPHILUS* NUCLEIC ACID SEQUENCES ENCODING CARBOHYDRATE UTILIZATION-RELATED PROTEINS AND USES THEREFOR
15. 20120183516 Lactic acid bacteria and bifidobacteria for treating endotoxemia
16. 20110300541 Detection and typing of bacterial strains
17. 20110300538 BIFIDOBACTERIA CRISPR SEQUENCES
18. 20110081707 *LACTOBACILLUS ACIDOPHILUS* NUCLEIC ACID SEQUENCES ENCODING CARBOHYDRATE UTILIZATION-RELATED PROTEINS AND USES THEREFOR
19. 20110008292 *LACTOBACILLUS ACIDOPHILUS* NUCLEIC ACIDS ENCODING FRUCTO-OLIGOSACCHARIDE UTILIZATION COMPOUNDS AND USES THEREOF
20. 20110002889 Cultures with Improved Phage Resistance
21. 20100104690 Tagged Microorganisms and Methods of Tagging
22. 20100093617 Use (of *cas* genes)

23. 20090155913 COMPOSITIONS COMPRISING PROMOTER SEQUENCES AND METHODS OF USE
24. 20090093021 *LACTOBACILLUS ACIDOPHILUS* NUCLEIC ACID SEQUENCES ENCODING CARBOHYDRATE UTILIZATION-RELATED PROTEINS AND USES THEREFOR
25. 20090005311 *LACTOBACILLUS ACIDOPHILUS* NUCLEIC ACIDS ENCODING FRUCTO-OLIGOSACCHARIDE UTILIZATION COMPOUNDS AND USES THEREOF
26. 20080124725 Tagged microorganisms and methods of tagging
27. 20070003668 *Lactobacillus acidophilus* nucleic acid sequences encoding carbohydrate utilization-related proteins and uses therefor
28. 20060199190 Detection and typing of bacterial strains
29. 20060166323 Compositions comprising promoter sequences and methods of use
30. 20050123941 *Lactobacillus acidophilus* nucleic acids encoding fructo-oligosaccharide utilization compounds and uses thereof

Recent applications:

1. **R. Dewey et al.** “Adaptation of the CRISPR-Cas9 system of *Lactobacillus gasseri* for genome editing in *Nicotiana tabacum*” (IDF 19178)
2. **R. Barrangou et al.** “Use of PDX in combination with CRISPR constructs to edit or alter microbiomes” (IDF 19195)
3. **R. Barrangou et al.** “Development of RNP-based CRISPR-Cas systems for editing in trees” (IDF 19150)
4. **R. Barrangou et al.** “Novel Type I CRISPR-Cas systems for eukaryote genome editing” (IDF 18291)
5. **R. Barrangou et al.** “Use of endogenous Type I CRISPR-Cas systems for editing and screening in bacteria” (IDF 18220)
6. **R. Barrangou et al.** “Catabolism of and adaptation to plant compounds by probiotic lactobacilli” (IDFs 18127, 18224)
7. **M. Nethery and R. Barrangou** “Automated pipeline to detect CRISPR-Cas systems” (IDF 18144)
8. **R. Barrangou et al.** “Engineering a novel *Lactobacillus acidophilus* strains for PKU” (IDF18134)
9. **R. Barrangou et al.** “Compositions and methods for increasing phytochemical bioavailability and bioactivity” (62/536,209; IDF 17229).
10. **R. Barrangou et al.** “Altering guide RNAs for modulating Cas9 activity and methods of use” (62/511,462)

h. Select seminars and conference highlights (select recent presentations)

- First international conference on BioDesign Research (December 2020)
- APLU Experimental Station Annual Meeting (September 2020)
- Ontario Genomics Annual Meeting (September 2020)
- NCFAR Annual Meeting (July 2020)
- Pepsi Research Academy Keynote (December 2019)
- Genetics of Industrial Microbes (Keynote speaker, September 2019)
- 5th international conference on microbial diversity (September 2019)
- CPH:DOX international film conference (March 2019)
- Keystone Genome editing conference (co-organizer and speaker, February 2019)
- Rosalind Franklin Society (November 2018)

- ASHG Genome and transcriptome engineering conference, San Diego (October 2018)
- AAAS Science Matters series, Washington D.C. (September 2018)
- Annual CRISPR conference, Vilnius Lithuania (June 2018), speaker and co-organizer
- FASEB genome editing conference, Florence Italy (June 2018)
- RTI symposium, Worcester MA (June 2018)
- Annual CRISPR conference, Bozeman MT (June 2017)
- Alexandria Ag Summit, New York City NY (February 2017)
- Conference Legrain, Paris France (January 2017)
- Warren Alpert Symposium, Harvard Medical School (October 2016)
- Genome editing 4.0, MIT/Broad Institute, Boston (May 2016)
- Seminars presented at: University of Missouri, University of Arizona, Emory University, University of Georgia, North Carolina State University, the Pennsylvania State University, the University of Illinois at Urbana-Champaign, University of Wisconsin-Madison, Duke University, University of Michigan, University of North-Carolina Chapel Hill, The Georgia Institute of Technology, University of Lethbridge, University of Toronto, Guelph University, Waterloo University, Western University, University Laval, Colorado State University, University of British Columbia, University of Quebec at Montreal, NIEHS.
- Invited CRISPR seminars presented at commercial and industrial stakeholders: DuPont, Caribou Biosciences, Pioneer, AgBiome, Intellia Therapeutics, Dharmacon, GE Healthcare, GSK, Raleigh Science Museum, Syngenta, Syngenta Ventures, Biogemma/Limagrain, Precision Biosciences, STI Ag, Novozymes, Chr Hansen, Locus Biosciences, AgriMetis, AmpliPhi, BASF, Altria, Elysium, Bayer, ChemChina, Nestle, RTI, AgTech Accelerator, Pioneer, Ontario Genomics, Genome Canada, Burrows Wellcome Fund, Epibiome, Alltech, Inari, Invaio, BRI, Illumina, NCREN, NC Biolabs, Pepsi, Bayer, Pairwise Plants, APLU, Wacker, Soredab, Mammoth Biosciences, CSL, Schreiber, and others.

i. Student advising

Graduated, chair or co-chair

Briner,Alexandra E	FBNS	MS ‘Spring 2015
Daughtry,Katheryne V	FBNS	MS ‘Spring2016
Dekam,Emily Ae-Hui	FBNS	MS ‘Summer 2016
Hymes,Jeffrey	FBNS	MS ‘Spring 2016
Johnson,Brant R	Micro	PhD ‘Spring 2016
Selle,Kurt M	Genomics	PhD ‘Spring 2016
Canez,Casie Lynn	Genomics	MS ‘Spring 2018
Briner,Alexandra E	Genomics	PhD ‘Spring2018
Brandt,Katelyn	Genomics	PhD ‘Spring 2019
Klotz,Courtney	Genomics	PhD ‘Spring 2019
Pan, Meichen	Food Science	MS ‘Spring 2019
Andersen, Stefanie	Bioinformatics	MR ‘Spring 2020
Fideler-Moore, Jennifer	FBNS	PhD ‘Spring 2021

In progress, chair or co-chair

Nethery,Matt	Genomics	PhD advisor
Avery Roberts	Genomics	PhD advisor
Pan, Meichen	Genomics	PhD advisor
Wagner, Camry	Genomics	PhD advisor
Mary Claire Chamberlain	Food Science	MS advisor

Graduated, Committee Member

Manuel, Clyde Simmons	FBNS	PhD 'Spring 2016
Mahmoud Gomaa, Ahmed	ChemE	PhD 'Summer 2016
Almand, Erin Ahmo	FBNS	PhD 'Spring 2017
Cauley, Sarah M	FBNS	PhD 'Spring 2017
Parsons, Cameron T	FBNS	PhD 'Spring 2017
Luo, Michelle Lynn	ChemE	PhD 'Spring 2017
Palatini, Kimberly	FBNS	PhD 'Spring 2017
Leenay, Ryan T	ChemE	PhD 'Spring 2018
Toms, Alice	Genomics	PhD 'Spring 2020

In progress, Committee Member

Fan, Sicun	FBNS	PhD Committee member
Zeldes, Benjamin	ChemE	PhD Committee member
Straub, Christopher T	ChemE	PhD Committee member
Collias, Daphne	ChemE	PhD Committee member
Yang, Sophia	Biochem	PhD Committee member

Visiting scholars and post docs

Claudio Hidalgo-Cantabrana	FBNS	visiting scholar Dec'16-now
Joakim Andersen	FBNS	visiting scholar May'14-16
Mia Theilmann	FBNS	visiting student May/15-16

At Penn State University, Committee Member

Zhaoyong, Ba	Food Science	PhD 2015
Shuang, Yin	Food Science	PhD 2014
Joseph Loquasto	Food Science	PhD 2013
Liu, Fenyun	Food Science	MS 2010

i. Instruction

2020 Spring Term

BBS 201-001 (Class 1342) Introduction to Biopharmaceutical Sciences, 23 enrolled
FS 695-001 (Class 2967) MR Thesis Research, 1 enrolled
FS 725-001 (Class 5368) Fermentation Microbiology, 10 enrolled
FS 893-001 (Class 2975) DR Supervised Research, 4 enrolled
MB 725-001 (Class 12272) Fermentation Microbiology, 2 enrolled

2019 Spring Term

BBS 201-001 (Class) Introduction to Biopharmaceutical Sciences, 23 enrolled
FS 695-001 (Class) MR Thesis Research, 1 enrolled
FS 893-001 (Class 2975) DR Supervised Research, 4 enrolled
MB 725-001 (Class 12272) Fermentation Microbiology, 2 enrolled

2018 Spring Term

BBS 201-001 (Class 1342) Introduction to Biopharmaceutical Sciences, 23 enrolled
FS 695-001 (Class 2967) MR Thesis Research, 1 enrolled
FS 725-001 (Class 5368) Fermentation Microbiology, 10 enrolled
FS 893-001 (Class 2975) DR Supervised Research, 4 enrolled

MB 725-001 (Class 12272) Fermentation Microbiology, 2 enrolled

2017 Fall Term

FS 693-001 (Class3834) MR Supervised Research, 1 enrolled

FS 893-001 (Class3845) DR Supervised Research, 3 enrolled

FS 895-001 (Class1846) DR Dissertation Research, 1 enrolled

2017 Spring Term

BBS 201-001 (Class1359) Introduction to Biopharmaceutical Science, 24 enrolled

FS 693-001 (Class3048) MR Supervised Research, 1 enrolled

FS 893-001 (Class3057) DR Supervised Research, 2 enrolled

FS 895-001 (Class3059) DR Dissertation Research, 1 enrolled

2016 Fall Term

FS 693-001 (Class3953) MR Supervised Research, 1 enrolled

FS 893-001 (Class3965) DR Supervised Research, 3 enrolled

2016 Spring Term

BBS 201-001 (Class 1391) Introduction to Biopharmaceutical Sciences, 22 enrolled

FS 693-001 (Class 3506) MR Supervised Research, 1 enrolled

FS 725-001 (Class6686) Fermentation Microbiology, 14 enrolled

FS 893-001 DR Supervised Research, 3 enrolled

MB 725-001 Fermentation Microbiology, 3 enrolled

2015 Fall Term

FS 693-001 (Class 4147) MR Supervised Research, 1 enrolled

FS 893-001 (Class 4159) DR Supervised Research, 3 enrolled

MB 695-001 (Class 12154) MR Thesis Research, 1 enrolled

2015 Spring Term

BBS 201-001 (Class1411) Introduction to Biopharmaceutical Sciences, 15 enrolled

FS 693-001 (Class 3630) MR Supervised Research, 1 enrolled

FS 699-001 (Class 3632) MR Thesis Preparation, 1 enrolled

2014 Fall Term

FS 693-001 (Class 4622) MR Supervised Research, 1 enrolled

2014 Spring Term

BBS 201-001 (class#1532) Introduction to Biopharmaceutical Sciences, 24 enrolled

FS 693-001 (class#4386) MR Supervised Research, 1 enrolled

2013 Fall Term

FS 693-001 (class#5306) MR Supervised Research, 1 enrolled

k. Committees and service

A. FBNS Department

- Food Science Club Advisor and Executive Board Member 2013-2014
- FBNS Preliminary examination, committee member 2013-2020

- FBNS Strategic Planning, committee chair, 2013-2014; 2014-2015
- FBNS Undergraduate Curriculum Committee, member 2015-2016
- FBNS Graduate Curriculum Committee, Member 2016-2018
- FBNS Microbiome position hiring committee (PHHI), Member, 2017-2018
- FBNS Graduate Curriculum Committee, Chair 2017-2018
- FBNS Food Chemistry faculty hiring committee 2018-2019
- FBNS Dairy Enterprise Director committee, Chair, 2020

B. CALS

- CALS Big Ideas Committee (2014)
- CALS Efficiency and Innovation Committee (2015)
- CALS Stewart of the Future Committee Chair (2015-2016)
- CALS Plant Sciences Initiative (2016-2017)
- Plant Pathology Department, open position hiring committee (2016-2017)
- NC Ag Foundation, and NC Dairy Foundation, member of the Board of Directors (since 2015)

C. University

- Provost Task Force on Brand and Reputation (2020)
- PSI Director hire committee (2019-2020)
- Microbiome cluster hire committee (2015-2017)
- Microbiology interdisciplinary program faculty member
- Biotechnology interdisciplinary program faculty member
- Genomic Sciences interdisciplinary program faculty member
- Comparative Medicine Institute faculty member
- Genome Engineering and Society Center faculty member
- Genetics Department Associate Faculty member

D. Professional Associations

- US National Academy of Engineering (since 2019)
- US National Academy of Sciences (since 2018)
- ASM General Membership (since 2013)
- AEM Editorial Board member (since 2015)
- Genome Biology, Editorial Board member (since 2017)
- Current Opinion in Microbiology special issue guest editor (2017)
- PLoS Genetics guest editor (2017)
- CRISPR Journal, Editor in Chief (2018)
- Center for Food Integrity, Gene Editing Responsible Use Guidelines working group (2017-2018)
- 2017-2019 Co-Editor, ASM book on CRISPR Microbiology, ASM Press

E. Peer reviewing

Ad hoc reviewer and referee for Science, Nature, Cell, Nature Biotechnology, Molecular Cell, PLoS Genetics, Nature Communications, Nature Methods, Nature Microbiology, PNAS, Genome Biology, CRISPRj, Molecular Biology, EMBO J, Nucleic Acids Research, BMC Genomics, BMC Microbiology, mBio, Journal of Virology, PLoS ONE, Journal of Bacteriology, ISME Journal and others. A total of 324 manuscripts (29 in 2013, 35 in 2014, 48 in 2015, 44 in

2016, 46 in 2017, 40 in 2018, 40 in 2019, 44 in 2020) have been reviewed since joining NC State in 2013.