

Curriculum Vitae: Raul J. Cano, Ph.D.

I. PERSONAL INFORMATION

NAME: Raul J. Cano
OFFICE ADDRESS: Biological Sciences Department, 53-210E
California Polytechnic State University
San Luis Obispo, CA 93407
OFFICE TELEPHONE: (805) 756-1358
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II. FORMAL EDUCATION

PRECOLLEGIATE:

Maristas Brothers
La Habana, Havana, Cuba
Years attended: 1950-62

HIGHER EDUCATION

UNIVERSITY	YEARS ATTENDED	DEGREE EARNED
University of Montana Missoula, Montana	1972-1974	Ph.D. Microbiology
University of Seville	1985-1986	M.S. Clinical/Molecular Microbiology
Eastern Washington University	1970-1972	M.S. Biology – Fungal Genetics
Eastern Washington University	1969-1970	B.S. Biological Sciences
Spokane Falls Community College	1968-1969	A.A. Liberal Arts

III. PROFESSIONAL EXPERIENCE

OCCUPATION AND POSITIONS HELD

1996 – present	Director , Environmental Biotechnology Institute, California Polytechnic State University, San Luis Obispo, California.
2000 – present	Unocal Chair for Environmental Studies . Endowed Chair, California Polytechnic State University, San Luis Obispo, California.
2001 – 2006	Founder and President , Environmental Diagnostics, Inc., San Luis Obispo, CA
1995 – 2000	Founder, Chief Scientific Officer , Ambergene Corporation San Carlos, CA
1986 – present	Visiting Researcher . Department of Microbiology, School of Medicine, University of Seville, Seville, Spain.
1987 – present	Visiting Researcher , Department of Microbiology, University of the Balearic Islands, Palma de Mallorca, Spain.
1983 – present	Professor of Microbiology . California Polytechnic State University, San Luis Obispo, CA

CURRENT RESEARCH

Microbial diversity and signature analysis of marine sediments and other subsurface samples for natural product discovery and petroleum exploration efforts.

Biological reclamation of waste glycerol from biodiesel production

CONSULTING

Unocal Corporation, Fullerton CA
Unocal Corporation, Sugar Land, TX
Chevron Corporation, San Luis Obispo, CA
Lanahan & Reilly, LLP, San Jose, CA
Gavin & Cunningham, Palo Alto, CA
Lewis Brisbois Bisgaard Smith, San Jose, CA
Robinson & Wood, LLP
Magellan Biosciences, Tampa, FL
Shea Homes, San Jose, CA
LaPlante & Spinelli, Donald, Nott, Sacramento, CA
Nereus Pharmaceuticals, Inc., San Diego, CA
XOMA (US) LLC, Berkeley, CA
Roche Diagnostics, Inc., Spain, Switzerland, Alameda, CA
Microcide Pharmaceuticals, Inc., Mountain View, CA
Intrabiotics, Inc., Mountain View, CA
Applied Biosystems, Inc., Foster City, CA
Dako Corporation, Carpinteria, CA
Nunc, Copenhagen, DK

CERTIFICATES AND LICENSES

Public Health Microbiologist. Certified in 1978 by California Department of Public Health Services

FOREIGN LANGUAGES

Spanish

SCIENTIFIC AFFILIATIONS

American Society for Microbiology
American Academy for Microbiology
International Society for Human and
Animal Mycology
Society for Industrial Microbiology
International Society of Environmental
Forensics
American Conference of Governmental
Industrial Hygienists
European Society for Microbiology

IV. GRANTS, AWARDS, PATENTS

GRANTS AND CONTRACTS

2003 Microbial Diversity of Petroleum Contaminated Soils and Groundwater, UNOCAL Corporation, \$431,000.

2003 Microbial Diversity of Marine Actinobacteria, Nereus Pharmaceuticals, Inc. \$33,000.
2002 Elucidation of the role of Actinobacteria on the bioremediation of petroleum contaminated sands. Unocal Corporation, \$219,000.
2002 Development of a Molecular Analysis tool for the characterization of actinobacterial communities in environmental samples. Unocal Corporation, \$209,000.
2001 Construction of EBI Research Facility, UNOCAL Corporation, \$2,000,000
2000 *Lactobacillus Acidophilus* Genome Sequencing and Functional Analysis. Rhodia Corporation, \$211,962.
2000 Phytoremediation of C8 plume. (3-year study) UNOCAL Corporation \$1,500,000
2000 *Lactobacillus Acidophilus* Genome Sequencing and Functional Analysis. Rhodia Corporation, \$211,962.
1999 Assessment of Petroleum-degrading diversity in sand dunes. UNOCAL Corp. \$280,000
1999. Bioinformatics of *Lactobacillus acidophilus*. SUN Microsystems, Inc. \$ 29,500
1998 *Lactobacillus acidophilus* genome project. Dairy Mangement, Inc., \$407,950.
1997 Environmental detection of *Listeria* spp. by TaqMan PCR. , Dairy Mangement, Inc., \$146,000
1997 Microbial Diversity Studies in sand dunes. UNOCAL, \$1,316,918.
19 additional grants (\$288,950.00)

AWARDS

2003 California Polytechnic State University President's Diversity Award
2001 MDS/Pharma Biotechnology Research Award
2001 Burroughs-Wellcome Fund *Visiting Professorship*
2000 Unocal Chair for Environmental Studies
1997 Carski Foundation Distinguished Teacher Award.
1998 Fellow. American Academy of Microbiology
1998 Foundation for Microbiology Distinguished Lecturer
1997 Meritorious Performance Award.
1996 Meritorious Performance Award.
1994 California Polytechnic State University Outstanding Professor Award.
1994 The California State University Trustees Outstanding Professor Award.
1993 The California State University Biotechnology Research Lecturer Award
1992 Summer Research Fellowship, The California State University
1991 Summer Research Fellowship, The California State University
1990 Meritorious Performance Award The California State University.
1989 Meritorious Performance Award. The California State University.
1987 Meritorious Performance Award. The California State University.

PATENTS

Ancient bacteria from amber inclusions
DNA Array chip for the detection of petroleum degraders in ecosystems. – (Pending)
Induction of Class I and Class III Heat Shock Genes to Provide Stress Protection to *Lactobacillus acidophilus*.

V. PUBLICATIONS

PEER REVIEWED JOURNALS

O McAuliffe, RJ Cano, TR Klaenhammer. 2005. Genetic Analysis of Two Bile Salt Hydrolase Activities in *Lactobacillus Acidophilus* NCFM. . *Appl Environ Microbiol* 71(8): 4925-9

- MA Azcarate-Peril, E Altermann, RL Hoover-Fitzula, RJ Cano, TR Klaenhammer. 2004. Identification and Inactivation of Genetic Loci Involved with *Lactobacillus acidophilus* Acid Tolerance. *Appl Environ Microbiol* 70(9): 5315-22
- E Altermann, LB Buck, R Cano, TR Klaenhammer. 2004. Identification and Inactivation of Genetic Loci Involved with *Lactobacillus Acidophilus* Acid Tolerance. *Gene* 342(1): 189-97
- Title: PS Yeung, CL Kitts, R Cano, PS Tong, ME Sanders. 2004. Application of Genotypic and Phenotypic Analyses to Commercial Probiotic Strain Identity and Relatedness. *J Appl Microbiol* 97(5): 1095-104
- MD Braid, JL Silhavy, CL Kitts, RJ Cano, MM Howe. 2004. Complete Genomic Sequence of Bacteriophage B3, a Mu-like Phage of *Pseudomonas aeruginosa*: *J Bacteriol.* 186(19): 6560-74
- CL Greenblatt, J Baum, BY Klein, S Nachshon, V Koltunov, RJ Cano. 2004. *Micrococcus luteus* -- Survival in Amber. *Microb Ecol* 48(1): 120-7
- E Altermann, WM Russell, MA Azcarate-Peril, R Barrangou, BL Buck, O McAuliffe, N Souther, A Dobson, T Duong, M Callanan, S Lick, A Hamrick, R Cano, TR Klaenhammer. 2004. Complete Genome Sequence of the Probiotic Lactic Acid Bacterium *Lactobacillus Acidophilus* NCFM. *Proc Natl Acad Sci* 102(11): 3906-12
- R Barrangou, E Altermann, R Hutkins, R Cano, TR Klaenhammer. 2003. Functional and Comparative Genomic Analyses of an Operon Involved in Fructooligosaccharide Utilization by *Lactobacillus acidophilus*. *Proc Natl Acad Sci U S A* 100(15): 8957-62
- T Klaenhammer, E Altermann, F Arigoni, A Bolotin, F Breidt, J Broadbent, R Cano, et al. 2002. Discovering Lactic Acid Bacteria by Genomics. *Antonie Van Leeuwenhoek* 82:29-58
- Quereshi, A., Mughler, J., Cano, R., Galazzo, J, and Lee, M. 2001. MF-EA-705a and MF-EA-705b, New fungal metabolites from microbial fermentation of a *Streptomyces* sp. *J. Antibiotics.* 54:1100-1103
- Cano, R. J. F. Rollo, M. Ubaldi, C. del Cueto, S. Luciani, T. Cox, P. Orkand, K. H. Kÿnzell, and F. Tiefenbrunner. 2000. Sequence analysis of bacterial DNA in the colon and stomach of the Tyrolean Iceman. *Am J Phys Anthropol.* 112 (3): 297-309.
- Greenblatt C. L, A. Davis, B. G. Clement, C. L. Kitts, T. Cox, and R. J. Cano. 1999. Microbial Diversity of Amber. *Microbial Ecology* 38:58-68.
- Cox, T; Frazier, C; Tuttle, J; Flood, S; Yagi, L; Yamashiro, CT; Behari, R; Paszko, C; Cano, R J. 1998. Rapid detection of *Listeria monocytogenes* in dairy samples utilizing a PCR-based fluorogenic 5' nuclease assay. *J. Industrial Microbiol. Biotechnol.* 21 (3): 167-172.
- Ubaldi M, Luciani S, Marota I, Fornaciari G, Cano RJ, Rollo F. 1998. Sequence analysis of bacterial DNA in the colon of an Andean mummy. *Am J Phys Anthropol* 107(3):285-95
- Cox, T., Frazier, C., Flood, S. and R. J. Cano. 1998. Development of a Fluorescent 5' Exonuclease Assay for the Detection of *Listeria monocytogenes* in Food and Dairy Products. *J. Industrial Microbiol. Biotechnol.*
- Lambert, L. H., T. Cox, K. Mitchell, R. Rossello-Mora, C. del Cueto, D. E. Dodge, P. Orkand, and R. J. Cano. 1998. *Staphylococcus succinus* sp. nov. from Dominican Amber. *Int. J. Sys. Bacteriol.* 48: 511-518
- Cano, R. J. 1997. Isolation, characterization, and diversity of microorganisms from amber. SPIE Symposium, San Diego, CA
- Cano, R. J. 1996 Recovery and Characterization of Ancient *Bacillus sphaericus* from Dominican Amber. 1996. *Quimica.* 60:8-14. Cano, R. J. 1996. Characterizing Ancient microorganisms from amber. *Analytical Chemistry* 68:609 A - 611. Cano, R. J. 1996. Analysing Ancient DNA *Endeavour.* 20: 162-167.
- Cano, R.J. and M. Borucki. 1995. Age of bacteria in amber. *Science* 270:2015-2017
- Cano, R.J. and M. Borucki. 1995. Isolation of viable *Bacillus* sp. from Dominican amber (25-40 million-years-old). *Science* 268:1060-1064
- Cano, R.J. 1994. Ancient *Bacillus* DNA: A window to ancient symbiotic relationships? *ASM News.* 60(3):129-134.

- Cano, R.J., Norton, D., Inzunza, A, and Oste, C. 1995. Fluorescent detection PCR of *Listeria monocytogenes* in dairy foods. *Journal of Food Protection* 58:614-620
- Cano, R.J., Borucki, M., Schweitzer, M., Poinar, H., Poinar, G.O., and Pollard, K. 1994. Ancient Bacillus DNA: A window to ancient symbiotic relationships? *Applied and Environmental Microbiology*. 60(6):2164-2167.
- Palomares, J.C. and R. J. Cano. 1994. "Antisense" therapy and clinical diagnostics: a Review. *Enfermedades Infecciosas y Microbiolog'ía Clínica* 11(9):502-507
- Rasmussen, S., Rasmussen, H., Larsen, M., Hoff-Jørgensen, R., and Cano, R. J. 1994. Combined Polymerase Chain Reaction -Hybridization Microplate Assay for the Detection of Bovine Leukemia Virus and *Salmonella*. Amplification and Hybridization take place in the same microwell. *Clinical Chemistry* 40(2):200-205
- Alados-Arboleda, J.C., Miranda, C., Ortiz, F. and Cano, R. J. 1994. Disseminated Histoplasmosis in Spain. *Eur. J. Clin. Microbiol. Infect. Disease*. 12:793-794
- Cano, R.J., H.N. Poinar, N.S Pieniezak, and G.O. Poinar, Jr. 1993. Enzymatic amplification and nucleotide sequencing of DNA from 120-135 million year old weevil *Nature* 363:536-538
- Poinar, H. N., Poinar Jr., G. O., and Cano, R. J. 1993. Molecular phylogeny of an extinct legume (*Hymenaea protera*) from Dominican amber. *Nature* 363:677.
- Cano, R.J. and H. N. Poinar. 1993. Rapid Isolation of DNA from Fossil and Museum Specimens Suitable for the Polymerase Chain Reaction. *Biotechniques*. 15:432-436
- Cano, R.J. 1993. Fluorescent detection of Salmonella. *LabMedica International*. 6:25-33
- Cano, RJ, Rasmussen SR, Sanchez G, Palomares, JC 1993: Fluorescent Detection-polymerase chain reaction (FD-PCR) Assay on Microwell Plates as a screening test for Salmonellas in foods. *J. Appl Bacteriol* 75:247-253
- Poinar, G.O., H.N. Poinar, and R.J. Cano. 1993. *Extraction of DNA from Amber Inclusions*. Ancient DNA Newsletter 2:15-18.
- Cano, R.J., H.N. Poinar, D.W. Roubick, and G.O. Poinar, Jr. 1992. Enzymatic amplification and nucleotide sequencing of portions of the 18s rRNA gene of the bee *Proplebeia dominicana* (Apidae:Hymenoptera) isolated from 25-40 million year old Dominican amber. *Medical Science Research*. 20 (17):619-623
- Torres, M.J., Cano, R.J., Rodr'guez, A., and Palomares, J.C. 1992. Detection of *Chlamydia trachomatis* by DNA-RNA hybridization. *Enfermedades Infecciosas y Microbiolog'ía Clínica* 10(3):152-155
- Cano, R.J., Palomares, J.C. and Torres. M.J. 1992. Evaluation of a fluorescent DNA hybridization assay for the detection of *Neisseria gonorrhoeae*. *European Journal of Clinical Microbiology and Infectious Diseases* 11:602-604
- Cano, R.J, Torres, M.J., and Palomares, J.C. 1992. Detection of *Salmonella* spp by EI-PCR. *Enfermedades Infecciosas Y Microbiolog'ía Clínica* 10(3):42-44
- Cano, R.J., Poinar, H., and Poinar, Jr. G.O. 1992. Isolation and Partial Characterization of DNA from the bee *Proplebeia dominicana* (Apidae: Hymenoptera) in 25-40-million year old amber. *Medical Science Research* 20:249-251

25 additional research (peer-reviewed) publications

OTHER PUBLICATIONS

Cano, R. J. 2002. The Microbiology of Spore-forming bacteria in Amber. In: Archaeology of infectious diseases. Greenblatt, C. Editor. Jerusalem, Israel.

Cano, R. J. and Klaenhammer. T. 2002. The Complete Genome of *Lactobacillus acidophilus*. 7th

International Conference of Lactic Acid Bacteria. Amsterdam.

Cano, R. J. 2000. Biomolecular Methods. In: *Molecular Methods in Ancient DNA studies of Art*. E.

Ciliberto and G. Spotto, eds. Wiley Interscience, New York, NY. Balaban Publishers, Jerusalem, Israel
Stansfield, W., R. J. Cano, and J.S. Colome. 1996. *Schaum's Outlines in Molecular Biology*. John Wiley,
New York.

Cano, R.J. 1996. M. Enzymatic amplification of ancient DNA. *Nucleic acid amplification methods for the
analyses of environmental samples*. Technomic Publishing Co, Inc.

Poinar, G.O., H.N. Poinar, and R.J. Cano. 1993. *DNA from Amber Inclusions*. Herrmann and Hummel eds.
pp 92-106. Springer Verlag, Berlin.

Cano, R.J. 1988. *Laboratory Exercises in Molecular Biology*. Second Edition. California Polytechnic State
University.

Cano, R.J. and J.S. Colome. 1988. *Essentials of Microbiology*. West Educational Publishing, St. Paul, MN.

Cano, R.J. and J.S. Colome. 1986. *Microbiology*. West Educational Publishing Company. St. Paul, MN.

Colome, J., A.M. Kubinski, R.J. Cano, and D. Grady. 1986. *Laboratory Exercises in Microbiology*. West
Educational Publishing Company. St. Paul, M.

18 additional publications

STANDING COMMITTEES

Guidelines Committee. American Academy for Microbiology.

Chairman, Research and Professional Development, California Polytechnic State University.

Scientific Advisory Board National Center for Toxicological Research, Food and Drug Administration.

Scientific Advisory Board XOMA (US) LLC, Berkeley, CA.

Executive Committee, CSU Program for Research and Education in Biotechnology. California State
University (CSU), Sacramento, CA.

Chairman, Board, Environmental Diagnostics, Inc. San Luis Obispo, CA.

Board Member, CHOSeN Corporation, Fremont, CA.

Chairman, Biotechnology Industrial Advisory Board, College of Sciences and Mathematics, Cal Poly, San
Luis Obispo, CA.