CURRICULUM VITÆ

PERSONAL DATA

Last Name: **SANTOS**
Name: **Helena**
Nationality: Portuguese

WORKING ADDRESS

Instituto de Tecnologia Química e Biológica
Universidade Nova de Lisboa
Av da República-EAN
Apartado 127
2780-157 Oeiras, Portugal
Tel: 214469541; Fax: 214469543; E-mail: santos@itqb.unl.pt

EDUCATION

Chemical Engineering Degree (18/20), Instituto Superior Técnico, Lisboa (Technical University of Lisbon), 1974.
M.Sc. in Inorganic Physical Chemistry (First Class), New University of Lisbon, 1978. Supervisor: A. V. Xavier.
Ph.D. in Biophysics (First Class), New University of Lisbon, 1984. Supervisor: A. V. Xavier.
Honorary Research Fellow, Leicester University, UK, 1984-1985
"Agregação" in Biological Sciences, New University of Lisbon, 2000.

RESEARCH STATUS:

Full Professor at New University of Lisbon since 2002 and Head of the "Cell Physiology & NMR" group at Instituto de Tecnologia Química e Biológica since 1989. Coordinator of CERMAX, the NMR Facility at ITQB since 2007.

TEACHING EXPERIENCE

Full Professor (2002-present), New University of Lisbon, Instituto de Tecnologia Química e Biológica (ITQB), Oeiras, Portugal.
Associate Professor, ITQB, New University of Lisbon (1997-2002)
Associate Professor, New University of Lisbon, Faculty of Science and Technology (1991-1997)
Assistant Professor, Faculty of Sciences and Technology, New University of Lisbon (1984-1990)
Teaching Assistant, Faculty of Sciences and Technology, New University of Lisbon (1978-1984)
Teaching Assistant, Instituto Superior Técnico, Technical University of Lisbon (1974-1978)
Lab. Demonstrator, IST, Technical University of Lisbon (1971-1974)

SUPERVISION OF Ph. D. THESES

Twenty (21) Ph. D. theses have been completed under my supervision; I was the main supervisor in 20 of them.
Years: 1995 (three); 1997 (one); 1999 (one); 2000 (one); 2001 (two); 2002 (one); 2004 (one); 2005 (two); 2006 (one); 2007 (one); 2008 (three); 2009 (one); 2011 (two); 2012 (one).

SUPERVISION OF MASTER THESES

Two M.Sc. theses have been completed under my supervision. **Years**: 2009; 2010.

SUPERVISION OF UNDERGRADUATE PROJECTS

Twenty four (24) last year undergraduate projects (1-year duration) have been completed under my supervision.

CURRENT COMPOSITION OF MY RESEARCH TEAM

Ph.D. students: 3 as the Principal Supervisor and 1 as co-supervisor.
Post Doc. students: 5
Undergraduate students or technicians: 3
Research Associate: 1 (Dr. Nuno Borges)

PUBLICATIONS WITHIN REFEREED INTERNATIONAL JOURNALS: **218**

INTERNATIONAL PATENTS: **5**

BOOK CHAPTERS: **9**

ARTICLES IN CONFERENCE PROCEEDINGS: **13**

ARTICLES FOR A BROAD AUDIENCE: **4**

CURRENT RESEARCH TOPICS

Research at the Cell Physiology & NMR Lab is focused on beneficial microbes, *i.e.*, microorganisms that promote human health or well-being, or are sources of new metabolites and enzymes with potential application in biotechnology.

1. Metabolic Engineering of Bacteria with Industrial Relevance (*Lactococcus lactis* and *Corynebacterium glutamicum*) for acquisition of useful traits such as, increased resistance to acid, production of added-value compounds (butanediol, mannitol, erythritol). We use in vivo NMR to monitor the dynamics of intracellular metabolite and provide guidelines for engineering strategies.

2. Biochemical Strategies of Osmo- and Thermo-Adaptation in Hyperthermophilic Organisms with a focus on osmolytes: biosynthetic pathways and regulation, physiological role, molecular basis for protein stabilization, and novel applications. This research line unfolded from our findings that hyperthermophiles accumulate unique ionic osmolytes with excellent stabilizing properties.

INTERNATIONAL AND NATIONAL PROJECTS

I participated as a Team Leader in 15 European projects and was the Coordinator of two of them. Also, I participated as a Team Leader in Projects funded by NIH and NSF. I was the Coordinator of 18 National Projects from the National Research Foundation (FCT-MES).

ORGANIZATION OF ADVANCED COURSES

FEBS ADVANCED COURSE on **APPLICATIONS OF *IN VIVO* NMR TECHNIQUES TO PROBE METABOLISM IN YEAST AND OTHER ORGANISMS**, Oeiras, Portugal, September 6-18, 1992.

TWO-DIMENSIONAL NUCLEAR MAGNETIC RESONANCE, Summer Course in collaboration with BRUKER-France, Oeiras, Portugal, September 19-23, 1993 (40 participants).

FEBS ADVANCED COURSE on **ADVANCED TECHNOLOGIES TO METABOLIC ENGINEERING IN BIOTECHNOLOGY AND MEDICINE**, Oeiras, Portugal, September 7 – 13, 2002.

ORGANIZATION OF SCIENTIFIC CONFERENCES

1º ENCONTRO DA ASSOCIAÇÃO PORTUGUESA DE RESSONÂNCIA MAGNÉTICA EM CIÊNCIA E MEDICINA, Luso, Portugal, July 5-7, 1990, (80 participants).

1st Meeting of the T-BRIDGE Project, **BIOTECHNOLOGY OF LACTIC ACID BACTERIA**, Estoril, Portugal, April 7 - 10, 1991 (90 participants).

3rd Meeting on **Metabolism and Screening** of T Project BRIDGE, **BIOTECHNOLOGY OF LACTIC ACID BACTERIA,** Funchal, Portugal, 7 - 9 November, 1993 (35 participants).

FIRST INTERNATIONAL CONGRESS ON EXTREMOPHILES, Estoril, Portugal, June 2-6, 1996, (310 participants). Co-chair.

-NATO/ESF ADVANCED RESEARCH WORKSHOP on **Biological Electron Transfer Chains: Genetics**, **Composition and Mode of Action**, Tomar, Portugal, May 3 - 7, 1997 (80 participants).

1st Meeting of Project **"STRATEGIC AND APPLIED RESEARCH ON LACTIC ACID BACTERIA" EU BIOTECH** Program, Ericeira, Portugal, 31 May to June 3rd, 1997 (90 participants).

EUROCONFERÊNCIA DA EUROPEAN FEDERATION OF BIOTECHNOLOGY - Microbial Responses to Stress: what's new and how can it be applied?, Sesimbra, Portugal, March 15 to 18, 1997, (120 participants).

TRIS 99, **ANNUAL MEETING OF THE FAST REACTIONS IN SOLUTION DISCUSSION GROUP**, Universidade Técnica de Lisboa, Instituto Superior Técnico, August 30 to September 1, 1999, (70 participants).

1st Workshop of the COST Action 624, **OPTIMAL MANAGEMENT OF WASTEWATER SYSTEMS**, Tomar, Portugal, 3 –6 October, 1999, (100 participants).

8TH INTERNATIONAL CONGRESS ON EXTREMOPHILES, Ponta Delgada, Azores, Portugal, June 12-16, 2010, (320 participants). Congress President.

PRIZES

1998. Prémio Gulbenkian de Ciência 1998, Applied Sciences and Technology.

2004. "Estímulo à Excelência", Prize for scientific productivity, Portuguese Ministry of Science, Innovation and High Education

2007. "Prémio Câmara Pestana 2007".

2009. ELECTED MEMBER OF THE **PORTUGUESE ACADEMY OF SCIENCES.**

MEMBERSHIP OF EDITORIAL BOARDS OF SCIENTIFIC JOURNALS

Member of the Editorial Board of "**Extremophiles**" (2001-2011).
Managing Editor of "**Extremophiles**" (2008-2011).
Reviews Editor of "**Extremophiles**" (2008-2011).
Member of the Scientific Advisory Board of "**FEBS Journal**" (2006-2009)

OTHER FUNCTIONS

President of the "**International Society for Extremophiles**" (2010-present).

Elected Member of the Institute Council (Conselho de Instituto) at ITQB (2010-2013 and 2013-present)

Elected Member of the Coordinating Committee of the Scientific Council at Instituto de Tecnologia Química e Biológica (1999 to present).

Vice-President of the "**International Society for Extremophiles**" (2006-2010).

Member of the Scientific Advisory Board for the **ERA-Chemistry Programme** of the EU (2006-2010).

Member of the Evaluating Panel for Advanced Grants sponsored by the ERC, "European Research Council" (2008-2009).

Coordinator of the Proposal for NMR equipment "**National Facility for High-Field Nuclear Magnetic Resonance: from Molecular Structure and Dynamics to Protein Function, Cell Regulation, and Novel Materials**". Rated "Excellent" in August 2004.

Principal Investigator of the **National NMR Network Project** (6.5 M Euros for NMR re-equipment) (2003-2007).

Member of the **Scientific Advisory Board** of the Company **STAB-VIDA (**2003-present).

Member of the **National Advisory Board on Biology and Biotechnology**, Fundação para a Ciência e a Tecnologia (2003-2007).

Elected Member of the Evaluation Committee for FEBS Advanced Courses (FEBS Advanced Course Committee) (1998-2002).

Coordinator of the Biology Division at ITQB (1999-2006 and 2008-2010).

Member of the Evaluation Panel of Research Grants (Serviço de Formação de Recursos Humanos da Fundação para a Ciência e a Tecnologia) for the area of Biotechnology and Biochemical Engineering (1996 - 2012).

Coordinator of the Leaf "***Product Engineering: Organic Compounds***", comprising 13 partners in the EU Project "**Extremophiles as Cell Factories",** Program BIOTECH, CE-DGXII, contract nº BIO 4-CT 96-0488 (1996-1999).

Member of the Committee for Project Selection and Monitoring in the framework of the National Program PRAXIS XXI (1995-1996).

Coordinator of the **"Cell Biotechnology Program"** at Instituto de Tecnologia Química e Biológica (1994-1999).

National Delegate to the IVth Framework Program for the Biotechnology Area (1994-1998).

PUBLICATIONS IN INTERNATIONAL JOURNALS (ISI)

FIVE REPRESENTATIVE ARTICLES IN THE AREA OF HYPERTHERMOPHILES

BIOSYNTHETIC PATHWAYS OF INOSITOL AND GLYCEROL PHOSPHODIESTERS USED FOR STRESS ADAPTATION IN *Archaeoglobus fulgidus*
N. Borges, L. G. Gonçalves, M. V. Rodrigues, R. Ventura, C. Maycock, P. Lamosa, & **H. Santos**
Journal of Bacteriology, **188**, 8128-8135 (2006).

BIFUNCTIONAL CTP:INOSITOL-1-PHOSPHATE CYTIDYLYLTRANSFERASE/ CDP-INOSITOL:INOSITOL-1-PHOSPHATE TRANSFERASE, THE KEY ENZYME FOR DI-*MYO*-INOSITOL-PHOSPHATE SYNTHESIS IN SEVERAL (HYPER)THERMOPHILES
M. V. Rodrigues, N. Borges, M. Henriques, P. Lamosa, R. Ventura, C. Fernandes, N. Empadinhas, C. Maycock, M. S. da Costa & **H. Santos**
Journal of Bacteriology, **189**, 5405-5412 (2007).

DESIGN OF NEW ENZYME STABILIZERS INSPIRED BY GLYCOSIDES OF HYPERTHERMOPHILIC MICROORGANISMS
T. Q. Faria, A. Mingote, F. Siopa, R. Ventura, C. Maycock & **H. Santos**
Carbohydrate Research, **343**, 3025-3033 (2008).

Thermococcus kodakarensis MUTANTS DEFICIENT IN DI-*MYO*-INOSITOL PHOSPHATE USE ASPARTATE TO COPE WITH HEAT STRESS
N. Borges, R. Matsumi, T. Imanaka, H. Atomi & **H. Santos**
Journal of Bacteriology, **192**, 191-197 (2010).

MANNOSYLGLYCERATE STABILIZES STAPHYLOCOCCAL NUCLEASE WITH RESTRICTION OF SLOW β-SHEET MOTIONS
T. M. Pais, P. Lamosa, M. Matzapetakis, D. L. Turner & **H. Santos**
Protein Science, **21**, 1126-1137 (2012).

FIVE REPRESENTATIVE ARTICLES IN THE AREA OF METABOLIC ENGINEERING AND *IN VIVO* NMR

HIGH YIELDS OF 2,3-BUTANEDIOL AND MANNITOL IN *Lactococcus lactis* THROUGH ENGINEERING NAD^+ COFACTOR RECYCLING
P. Gaspar, A. R. Neves, M. J. Gasson, C. A. Shearman & **H. Santos**
Applied and Environmental Microbiology, **77**, 6826-6835 (2011).

ENGINEERING TREHALOSE SYNTHESIS IN *Lactococcus lactis* FOR IMPROVED STRESS TOLERANCE
A. L. Carvalho, Filipa S. Cardoso, A. Bohn, A. R. Neves & **H. Santos**
Applied and Environmental Microbiology, **77**, 4189-4199 (2011).

YEAST LIFESPAN EXTENSION BY CALORIE RESTRICTION IS INDEPENDENT OF NAD FLUCTUATION
R. M. Anderson, M. Latorre-Esteves, A. R. Neves, S. Lavu, O. Medvedik, C. Taylor, K. T. Howitz, **H. Santos** & D. A. Sinclair
Science, **302**, 2124-2126 (2003).

IS THE GLYCOLYTIC FLUX IN *Lactococcus lactis* PRIMARILY CONTROLLED BY THE REDOX CHARGE? KINETICS OF NAD^+ AND NADH POOLS DETERMINED *IN VIVO* BY ^{13}C-NMR
A. R. Neves, R. Ventura, N. Mansour, C. Shearman, M. J. Gasson, C. Maycock, A. Ramos & H. Santos
Journal of Biological Chemistry, **277**, 28088-28098 (2002).

MODEL FOR CARBON METABOLISM IN BIOLOGICAL PHOSPHORUS REMOVAL PROCESSES BASED ON *IN VIVO* ^{13}C-NMR LABELLING EXPERIMENTS
H. Pereira, P. C. Lemos, M. A. M. Reis, J. P. S. G. Crespo, M. J. T. Carrondo & **H. Santos**
Water Research, **30**, 2128-2138 (1996).

FULL LIST OF REFEREED ARTICLES

218. HIGH RESOLUTION STRUCTURE OF AN ATYPICAL α-PHOSPHOGLUCOMUTASE RELATED TO EUKARYOTIC PHOSPHOMANNOMUTASES
P. Nogly, P. Matias, M. de Rosa, R. Castro, **H. Santos**, A. R. Neves & M. Archer
Acta Chrystallographica Section D **69***,* 2008-2016 (2013).

217. FROM PHYSIOLOGY TO SYSTEMS METABOLIC ENGINEERING FOR THE PRODUCTION OF BIOCHEMICALS BY LACTIC ACID BACTERIA
P. Gaspar, A. L. Carvalho, S. Vinga, **H. Santos** & A. R. Neves
Journal of Biotechnology Advances, **31**, 764-788 (2013).

216. METABOLIC AND TRANSCRIPTIONAL ANALYSIS OF ACID STRESS IN *Lactococcus lactis*, WITH A FOCUS ON THE KINETICS OF LACTIC ACID POOLS
A. L. Carvalho, D. L. Turner, L. L. Fonseca, A. Solopova, T. Catarino, O. P. Kuipers, E. O. Voit, A. R. Neves & **H. Santos**
PLOS ONE, 8 (7), e68470. doi:10.1371/journal.pone.0068470 (2013).

215. ^{23}Na MULTIPLE QUANTUM FILTERED NMR CHARACTERIZATION OF Na^+ BINDING AND DYNAMICS IN ANIMAL CELLS – A COMPARATIVE STUDY AND EFFECT OF Na^+/Li^+ COMPETITION
C. P. Fonseca, L. L. Fonseca, L. P. Montezinho, P. M. Alves, **H. Santos**, M. M. C. A. Castro & C. F. Geraldes
European Biophysics Journal, 42, 503-519 (2013).

214. MANNITOL, A COMPATIBLE SOLUTE SYNTHESIZED BY *Acinetobacter baylyi* IN A TWO-STEP PATHWAY INCLUDING A SALT-INDUCED AND SALT-DEPENDENT MANNITOL-1-PHOSPHATE DEHYDROGENASE
M. Sand, A. I. Mingote, **H. Santos**, V. Müller & B. Averhoff
Environmental Microbiology, **15**, 2187-2197 (2013).

213. INHIBITION OF FORMATION OF α-SYNUCLEIN INCLUSIONS BY MANNOSYLGLYCERATE IN A YEAST MODEL OF PARKINSON´S DISEASE
C. Faria, C. D. Jorge, N. Borges, S. Tenreiro, T. F. Outeiro & **H. Santos**
Biochimica Biophysica Acta – General Subjects, **1830***,* 4065-4072 (2013).

212. ORGANIC SOLUTES IN THE DEEPEST PHYLOGENETIC BRANCHES OF THE BACTERIA: IDENTIFICATION OF α(1-6)GLUCOSYL- α(1-2)GLUCOSYLGYCERATE IN *Persephonella marina*
P. Lamosa, M. V. Rodrigues, L. G. Gonçalves, J. Carr, R. Ventura, C. Maycock, N. D. Raven & **H. Santos**
Extremophiles, **17**, 137-146 (2013).

211. THE FATE OF ACETIC ACID DURING GLUCOSE CO-METABOLISM BY THE SPOILAGE YEAST *Zygosaccharomyces bailli*
F. Rodrigues, M. J. Sousa, P. Ludovico, **H. Santos**, M- Côrte-Real & C. Leão
PLOS ONE, 10.1371/journal.pone.0052402 (2012).

210. MANNOSYLGLYCERATE STABILIZES STAPHYLOCOCCAL NUCLEASE WITH RESTRICTION OF SLOW β-SHEET MOTIONS
T. M. Pais, P. Lamosa, M. Matzapetakis, D. L. Turner & **H. Santos**
Protein Science, **21**, 1126-1137 (2012).

209. PRODUCTION AND CRYSTALLIZATION OF α-PHOSPHOGLUCOMUTASE FROM *Lactococcus lactis*
P. Nogly, R. Castro, M. de Rosa, A. R. Neves, **H. Santos** & M. Archer
Acta Crystallographica Section F Structural Biology Crystallography Communications, **68**, 1113-1115 (2012).

208. EVOLUTION OF THE BIOSYNTHESIS OF DI-*MYO*-INOSITOL PHOSPHATE, A MARKER OF ADAPTATION TO HOT MARINE ENVIRONMENTS
L. G. Gonçalves, N. Borges, F. Serra, P. L. Fernandes, H. Dopazo & **H. Santos**
Environmental Microbiology, **14**, 691-701 (2012).

207. THE THREE-DIMENSIONAL STRUCTURE OF MANNOSYL-3-PHOSPHOGLYCERATE PHOSPHATASE FROM *Thermus thermophilus* HB27: A NEW MEMBER OF THE HALOALKANOID ACID DEHALOGENASE SUPERFAMILY
S. Gonçalves, A. M. Esteves, **H. Santos**, N. Borges, & P. Matias
Biochemistry, **50**, 9551-9567 (2011).

206. HIGH YIELDS OF 2,3-BUTANEDIOL AND MANNITOL IN *Lactococcus lactis* THROUGH ENGINEERING NAD^+ COFACTOR RECYCLING
P. Gaspar, A. R. Neves, M. J. Gasson, C. A. Shearman & **H. Santos**
Applied and Environmental Microbiology, **77**, 6826-6835 (2011).

205. SALT ADAPTATION IN *Acinetobacter baylyi*: IDENTIFICATION AND CHARACTERIZATION OF A SECONDARY GLYCINE BETAINE TRANSPORTER
M. Sand, V. de Berardinis, A. I. Mingote, **H. Santos**, S. Göttig, V. Müller & B. Averhoff
Archives of Microbiology, **193**, 723-730 (2011).

204. ARCHAEAL *abl*-LIKE GENES IN BACTERIA: PRODUCTION OF THE ARCHAEAL OSMOLYTE Nε–ACETYL-β-LYSINE BY HOMOLOGOUS OVEREXPRESSION OF THE *yodP-kamA* GENES IN *Bacillus subtilis*
S. Müller, T. Hoffmann, **H. Santos,** S. H. Saum, E. Bremer & V. Müller
Applied Microbiology and Biotechnology, **91**, 689-697 (2011).

203. ENGINEERING TREHALOSE SYNTHESIS IN *Lactococcus lactis* FOR IMPROVED STRESS TOLERANCE
A. L. Carvalho, Filipa S. Cardoso, A. Bohn, A. R. Neves & **H. Santos**
Applied and Environmental Microbiology, **77**, 4189-4199 (2011).

202. GLUCONEOTREHALOSE IS THE PRINCIPAL ORGANIC SOLUTE IN THE PSYCHROTOLERANT BACTERIUM *Carnobacterium* STRAIN 17-4
P. Lamosa, A. I. Mingote, T. Groudieva, B. Klippel, K. Egorova, D. Jabbour, **H. Santos*** & G. Antranikian
Extremophiles, **15**, 463-472 (2011).

201. COMPLEX COORDINATION OF MULTI-SCALE CELLULAR RESPONSES TO ENVIRONMENTAL STRESS
L. L. Fonseca, C. Sánchez, **H. Santos** & E. O. Voit
Molecular BioSystems, **7**, 731-741 (2011).

200. CRYSTALLIZATION AND PRELIMINARY X-RAY ANALYSIS OF MANNOSYL-3-PHOSPHOGLYCERATE PHOSPHATASE FROM *Thermus thermophilus* HB27
S. Gonçalves, A. M. Esteves, N. Borges, **H. Santos** & P. M. Matias
Acta Crystallographica Section F Structural Biology Crystallography Communications, **67**, 390-396 (2011).

199. CRYSTAL STRUCTURE OF *Archaeoglobus fulgidus* CTP:INOSITOL-1-PHOSPHATE CYTIDYLYLTRANSFERASE, A KEY ENZYME FOR DI-*MYO*-INOSITOL PHOSPHATE SYNTHESIS IN (HYPER)THERMOPHILIC
J. A. Brito, N. Borges, C. Vonrhein, **H. Santos** & M. Archer
Journal of Bacteriology, **193**, 2177-2185 (2011).

198. ASSESSMENT OF THE EFFICACY OF SOLUTES FROM EXTREMOPHILES ON PROTEIN AGGREGATION IN CELL MODELS OF HUNTINGTON´S AND PARKINSON'S DISEASES
C. D. Jorge, R. Ventura, C. Maycock, T. F. Outeiro, **H. Santos** & J. Costa
Neurochemical Research, **36**, 1005-1011 (2011).

197. STATISTICAL INFERENCE METHODS FOR SPARSE BIOLOGICAL TIME SERIES DATA
J. Ndukum, L. L. Fonseca, **H. Santos**, E. O. Voit & S. Datta
BMC Systems Biology, **5**, 57-65 (2011).

196. *Thermococcus kodakaraensis* MUTANTS DEFICIENT IN DI-*MYO*-INOSITOL PHOSPHATE USE ASPARTATE TO COPE WITH HEAT STRESS
N. Borges, R. Matsumi, T. Imanaka, H. Atomi & **H. Santos**
Journal of Bacteriology, **192**, 191-197 (2010).

195. TWO ALTERNATIVE PATHWAYS FOR THE SYNTHESIS OF THE RARE COMPATIBLE SOLUTE MANNOSYL-ALPHA-1,2-GLUCOSYLGLYCERATE IN *Petrotoga mobilis*
C. Fernandes, V. Mendes, J. Costa, N. Empadinhas, C. Jorge, P. Lamosa, **H. Santos** & M. S. da Costa
Journal of Bacteriology, **192**, 1624-1633 (2010).

194. STRUCTURAL ANALYSIS OF *Thermus thermophilus* HB27 MANNOSYL-3-PHOSPHOGLYCERATE SYNTHASE PROVIDES EVIDENCE FOR A SECOND CATALYTIC

METAL ION AND NEW INSIGHT INTO THE RETAINING MECHANISM OF GLYCOSYLTRANSFERASES
S. Gonçalves, N. Borges, A. M. Esteves, B. Victor, C. M. Soares, **H. Santos** & P. Matias
Journal of Biological Chemistry, **285**, 17857-17868 (2010).

193. THERMAL UNFOLDING KINETICS OF UBIQUITIN IN THE MICROSECOND-TO-SECOND TIME RANGE PROBED BY TYR-59 FLUORESCENCE
M. Noronha, H. Gerbelová, T. Q. Faria, D. N. Lund, D. Alaistair Smith, **H. Santos** & A. L. Maçanita
Journal of Physical Chemistry B, **114**, 9912-9919 (2010).

192. BACKBONE AND SIDE CHAIN ^{1}H, ^{15}N AND ^{13}C ASSIGNMENTS FOR A THIOL-DISULPHIDE OXIDOREDUCTASE FROM THE ANTARCTIC BACTERIUM *Pseudoalteromonas haloplanktis* TAC12
T. Collins, M. Matzapetakis & **H. Santos**
Biomolecular NMR Assignments, **4**, 151-154 (2010).

191. SUBCELLULAR METABOLIC ORGANIZATION IN THE CONTEXT OF DYNAMIC ENERGY BUDGET AND BIOCHEMICAL SYSTEMS THEORIES
S. Vinga, A. R. Neves, **H. Santos**, B. W. Brandt & S. A. L. M. Kooijman
Philosophical Transactions of the Royal Society B Biological Sciences, **365**, 3429-3442 (2010).

190. ARE COMPATIBLE SOLUTES COMPATIBLE WITH BIOLOGICAL TREATMENT OF SALINE WASTEWATER? BATCH AND CONTINUOUS STUDIES USING USING SUBMERGED ANAEROBIC MEMBRANE BIOREACTORS (SAMBRs)
I. Vyrides, **H. Santos**, A. Mingote, M. J. Ray & D. C. Stuckey
Environmental Science & Technology, **44**, 7437-7442 (2010).

189. TOWARDS ENHANCED GALACTOSE UTILIZATION IN *Lactococcus lactis*
A. R. Neves, W. A. Pool, A. Solopova, J. Kok, **H. Santos** & O. P. Kuipers
Applied and Environmental Microbiology, **76**, 7048-7060 (2010).

188. PRODUCTION, CRYSTALLIZATION AND PRELIMINARY X-RAY ANALYSIS OF CTP:INOSITOL-1-PHOSPHATE CYTIDYLYLTRANSFERASE FROM *Archaeoglobus fulgidus*
J. A. Brito, N. Borges, **H. Santos** & M. Archer
Acta Crystallographica Section F Structural Biology Crystallography Communications, **66**, 1463-1465 (2010).

187. THE METABOLIC pH RESPONSE IN *Lactococcus lactis*: AN INTEGRATIVE EXPERIMENTAL AND MODELLING APPROACH
A. Z. Andersen, A. L. Carvalho, A. R. Neves, **H. Santos**, U. Kummer & L. F. Olsen
Computational Biology and Chemistry, **33**, 71-83 (2009).

186. CHARACTERIZATION OF THE INDIVIDUAL GLUCOSE UPTAKE SYSTEMS OF *Lactococcus lactis*: MANNOSE-PTS, CELLOBIOSE-PTS AND THE NOVEL GlcU PERMEASE
R. Castro, A. R. Neves, L. L. Fonseca, W. A. Pool, J. Kok, O. P. Kuipers & **H. Santos**
Molecular Microbiology, **71**, 795-806 (2009).

185. A NOVEL LIMB IN THE OSMOREGULATORY NETWORK OF *Methanosarcina mazei* Gö1: N˙-ACETYL-▪-LYSINE CAN BE SUBSTITUTED BY GLUTAMATE AND ALANINE
R. Saum, A. Mingote, **H. Santos** & V. Müller
Environmental Microbiology, **11**, 1056-1065 (2009).

184. ENHANCING THE FLUORESCENCE OF TYR-59 IN UBIQUITIN BY BLOCKING PROTON TRANSFER
M. Noronha, H. Gerbelova, T. Q. Faria, M-M. Sampaio, R. Rudolph, A. L. Maçanita & **H. Santos**
Physical Chemistry Chemical Physics, **11**, 3580-3583 (2009). FI=3,34

183. FLUORESCENCE LIFETIMES OF TYROSINE RESIDUES IN CYTOCHROME *c*″ AS LOCAL PROBES TO STUDY PROTEIN UNFOLDING
M. Noronha, R. Santos, E. Paci, **H. Santos** & A. L. Maçanita
Journal of Physical Chemistry B, **113**, 4466-4474 (2009).

182. GENETIC ANALYSIS OF THE ROLE OF THE ABC TRANSPORTER OTA AND OTB IN GLYCINE BETAINE TRANSPORT IN *Methanosarcina mazei* Gö1
R. Saum, A. Mingote, **H. Santos** & V. Müller
Archives of Microbiology, **191**, 291-301(2009)

181. CRYSTALLIZATION AND PRELIMINARY X-RAY ANALYSIS OF MANNOSYL-3-PHOSPHOGLYCERATE SYNTHASE FROM *Thermus thermophilus* HB27
S. Gonçalves, N. Borges, **H. Santos** & P. M. Matias
Acta Crystallographica Section F Structural Biology Crystallography Communications **65**, 1014-1017 (2009).

180. RELATIONSHIP BETWEEN PROTEIN STABILIZATION AND PROTEIN RIGIDIFICATION INDUCED BY MANNOSYLGLYCERATE
T. M. Pais, P. Lamosa, B. Garcia-Moreno, D. L. Turner & **H. Santos**
Journal of Molecular Biology, **394**, 237-250 (2009).

179. A UNIQUE BETA-1,2-MANNOSYLTRANSFERASE OF *Thermotoga maritima* THAT USES DI-*MYO*-INOSITOL PHOSPHATE AS MANNOSYL ACCEPTOR
M. V. Rodrigues, N. Borges, C. P. Almeida, P. Lamosa & **H. Santos**
Journal of Bacteriology, **191**, 6105-6115 (2009).

178. CONTRIBUTION OF CITRATE METABOLISM TO THE GROWTH OF *Lactococcus lactis* AT LOW pH
C. Sánchez, A. R. Neves, J. Cavalheiro, M. Moreira dos Santos, N. Garcia-Quintáns, P. López & **H. Santos**
Applied and Environmental Microbiology, **74**, 1136-1144 (2008).

177. ROLE OF PERIPLASMIC TREHALASE IN UPTAKE OF TREHALOSE BY THE THERMOPHILIC BACTERIUM *Rhodothermus marinus*
C. Jorge, Luís L. Fonseca, W. Boos & **H. Santos**
Journal of Bacteriology, **190**, 1871-1878 (2008).

176. USE OF IN VIVO ^{13}C NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY TO ELUCIDATE L-ARABINOSE METABOLISM IN YEAST
C. Fonseca, A. R. Neves, A. M. M. Antunes, J. P. Noronha, B. Hahn-Hägerdal, **H. Santos** & I. Spencer-Martins
Applied and Environmental Microbiology, **74**, 1845-1855 (2008).

175. DI-*MYO*-INOSITOL PHOSPHATE AND NOVEL UDP-SUGARS ACCUMULATE IN THE EXTREME HYPERTHERMOPHILE *Pyrolobus fumarii*
L. G. Gonçalves, P. Lamosa, R. Huber & **H. Santos**
Extremophiles, **12**, 383-389 (2008).

174. DESIGN OF NEW ENZYME STABILIZERS INSPIRED BY GLYCOSIDES OF HYPERTHERMOPHILIC MICROORGANISMS
T. Q. Faria, A. Mingote, F. Siopa, R. Ventura, C. Maycock & **H. Santos**
Carbohydrate Research, **343**, 3025-3033 (2008).

173. A HIGHLY THERMOSTABLE TREHALASE FROM THE THERMOPHILIC BACTERIUM *Rhodothermus marinus*
C. Jorge, M.-M. Sampaio, G. Ó. Hreggvidsson, J. K. Kristjánson, & **H. Santos**
Extremophiles, **11**, 115-122 (2007).

172. BIOCHEMICAL AND GENETIC CHARACTERIZATION OF THE PATHWAYS FOR TREHALOSE METABOLISM IN *Propionibacterium freudenreichii* AND THEIR ROLE IN STRESS RESPONSE
F. S. Cardoso, R. F. Castro, N. Borges & **H. Santos**
Microbiology-SGM, **153**, 270-280 (2007).

171. TRACKING LOCAL CONFORMATIONAL CHANGES OF RIBONUCLEASE A USING PICOSECOND TIME-RESOLVED FLUORESCENCE OF THE SIX TYROSINE RESIDUES
M. Noronha, J. C. Lima, E. Paci, **H. Santos** & A. L. Maçanita
Biophysical Journal, **92**, 4401-4414 (2007).

170. Alpha-D-MANNOPYRANOSYL-(1→2)-alpha-D-GLUCOPYRANOSYL-(1→2)-GLYCERATE IN THE THERMOPHILIC BACTERIUM *Petrotoga miotherma*: STRUCTURE, CELLULAR CONTENT AND FUNCTION
C. Jorge, P. Lamosa & **H. Santos**
FEBS Journal, **274**, 3120-3127 (2007).

169. HIGH YIELD OF MANNOSYLGLYCERATE PRODUCTION BY UPSHOCK FERMENTATION AND BACTERIAL MILKING OF TREHALOSE-DEFICIENT MUTANT *Thermus thermophilus* RQ-1
K. Egorova, T. Grudieva, C. Morinez, J. Kube, **H. Santos**, M. S. da Costa & G. Antranikian
Applied Microbiology & Biotechnology, **75**, 1039-1045 (2007).

168. ORGANIC SOLUTES IN *Rubrobacter xylanophilus*: THE FIRST EXAMPLE OF DI-*MYO*-INOSITOL PHOSPHATE IN A THERMOPHILE
N. Empadinhas, V. Mendes, C. Simões, M. S. Santos, A. Mingote, P. Lamosa, **H. Santos** & M. S. da Costa
Extremophiles, **11**, 667-673 (2007).

167. BIFUNCTIONAL CTP:INOSITOL-1-PHOSPHATE CYTIDYLYLTRANSFERASE/ CDP-INOSITOL:INOSITOL-1-PHOSPHATE TRANSFERASE, THE KEY ENZYME FOR DI-*MYO*-INOSITOL-PHOSPHATE SYNTHESIS IN SEVERAL (HYPER)THERMOPHILES
M. V. Rodrigues, N. Borges, M. Henriques, P. Lamosa, R. Ventura, C. Fernandes, N. Empadinhas, C. Maycock, M. S. da Costa & **H. Santos**
Journal of Bacteriology, **189**, 5405-5412 (2007).

166. ELUCIDATION OF METABOLIC PATHWAYS IN GLYCOGEN-ACCUMULATING ORGANISMS WITH *IN VIVO* ^{13}C NUCLEAR MAGNETIC RESONANCE
P. C. Lemos, Y. Dai, Z. Yuan, J. Keller, **H. Santos** & A. M. Reis
Environmental Microbiology, **9**, 2694-2706 (2007).

165. AUTOMATED SMOOTHER FOR THE NUMERICAL DECOUPLING OF DYNAMICS MODELS
M. Vilela, C. C. H. Borges, S. Vinga, A. T. R. Vasconcelos, **H. Santos**, E. O. Voit & J. S. Almeida
BMC Bioinformatics, **8**, 305-312 (2007).

164. PSEUDOVITAMIN B_{12} IS THE CORRINOID PRODUCED BY *Lactobacillus reuteri* CRL1098 UNDER ANAEROBIC CONDITIONS
F. Santos, J. L. Vera, P. Lamosa, G. F. de Valdez, W. M. de Vos, **H. Santos**, F. Sesma & J. Hugenholtz
FEBS Letters, **581,** 4865-4870 (2007).

163. THE LACTATE DEHYDROGENASES ENCODED BY THE *ldh* AND *ldhb* GENES IN *Lactococcus lactis* EXHIBIT DISTINCT REGULATION AND CATALYTIC PROPERTIES: COMPARATIVE MODELLING TO PROBE THE MOLECULAR BASIS
P. Gaspar, A. R. Neves, C. A. Shearman, M. J. Gasson, A. M. Baptista, D. L. Turner, C. M. Soares & **H. Santos**
The FEBS Journal, **274**, 5924-5936 (2007).

162. CHARACTERIZATION OF THE BIOSYNTHETIC PATHWAY OF GLUCOSYLGLYCERATE IN THE ARCHAEON *Methanococcoides burtonii*
J. Costa, N. Empadinhas, L. Gonçalves, P. Lamosa, **H. Santos** & M. S. da Costa
Journal of Bacteriology, **188**, 1022-1030 (2006).

161. STRUCTURAL EVIDENCE FOR A PROTON TRANSFER PATHWAY COUPLED WITH HAEM REDUCTION OF CYTOCHROME *c*' FROM *Methylophilus methylotrophus.*
F. J. Enguita, E. Pohl, D. L. Turner, **H. Santos** & M. A. Carrondo
Journal of Biological Inorganic Chemistry, **11**, 189-196 (2006).

160. ANNUAL CHANGES IN THE CONCENTRATION OF MINERALS AND ORGANIC COMPOUNDS OF *Quercus suber* LEAVES
J. A. P. Passarinho, P. Lamosa, J. P. Baeta, **H. Santos** & C. P. P. Ricardo
Physiologia Plantarum, **127**, 100-110 (2006).

159. THE INTRICATE SIDE OF SYSTEMS BIOLOGY
E. O. Voit, A. R. Neves & **H. Santos**
Proceedings of the National Academy of Sciences, U.S.A., **103**, 9452-9457 (2006).

158. NATURAL SWEETENING OF FOOD PRODUCTS: ENGINEERING *Lactococcus lactis* FOR GLUCOSE PRODUCTION
W. A. Pool, A. R. Neves, J. Kok, **H. Santos** & O. P. Kuipers
Metabolic Engineering, **8**, 456-464 (2006).

157. CHARACTERIZATION AND QUANTIFICATION OF COMPATIBLE SOLUTES IN (HYPER)THERMOPHILIC MICROORGANISMS
H. Santos, N. Borges & P. Lamosa
Methods in Microbiology, **35,** 173-199 (2006).

156. OCCURRENCE OF 1-GLYCERYL-1-*MYO*-INOSITYL-PHOSPHATE IN HYPERTHERMOPHILES
P. Lamosa, L. G. Gafeira, M. V. Rodrigues, L. O. Martins, N. D. H. Raven & **H. Santos**
Applied and Environmental Microbiology, **72**, 6169-6173 (2006).

155. REGULATION OF GLYCOLYSIS IN *Lactococcus lactis*: AN UNFINISHED SYSTEMS BIOLOGICAL CASE STUDY
E. O. Voit, J. Almeida, S. Marino, R. Lall, G. Goel, A. R. Neves & **H. Santos**
Systems Biology (Stevenage)*,* **153**, 286-298 (2006).

154. BIOSYNTHETIC PATHWAYS OF INOSITOL AND GLYCEROL PHOSPHODIESTERS USED FOR STRESS ADAPTATION IN *Archaeoglobus fulgidus*
N. Borges, L. G. Gonçalves, M. V. Rodrigues, R. Ventura, C. Maycock, P. Lamosa, & **H. Santos**
Journal of Bacteriology, **188**, 8128-8135 (2006).

153. Alpha-PHOSPHOGLUCOMUTASE OF *Lactococcus lactis* IS UNRELATED TO THE ·-D-PHOSPHOHEXOMUTASE SUPERFAMILY AND ENCODED BY THE ESSENTIAL GENE *yfgH*
A. R. Neves, W. A. Pool, R. Castro, A. Mingote, F. Santos, J. Kok, O. P. Kuipers & **H. Santos**
Journal of Biological Chemistry, **281**, 36864-36873 (2006).

152. THE HIGH-AFFINITY MALTOSE/TREHALOSE ABC TRANSPORTER IN THE EXTREMELY THERMOPHILIC BACTERIUM *Thermus thermophilus* HB27 ALSO RECOGNIZES SUCROSE AND PALATINOSE
Z. Silva, M.-M. Sampaio, A. Henne, A. Böhm, R. Gutzat, W. Boos, M. S. da Costa & **H. Santos**
Journal of Bacteriology, **187**, 1210-1218 (2005).

151. DISTRIBUTION OF GENES FOR SYNTHESIS OF TREHALOSE AND MANNOSYLGLYCERATE IN *Thermus* spp. AND DIRECT CORRELATION WITH HALOTOLERANCE
S. Alarico, N. Empadinhas, C. Simões, Z. Silva, A. Henne, A. Mingote, **H. Santos** & M. S. da Costa
Applied and Environmental Microbiology, **71**, 2460-2466 (2005).

150. STRUCTURAL DETERMINANTS OF PROTEIN STABILIZATION BY SOLUTES: THE IMPORTANCE OF THE HAIRPIN LOOP IN RUBREDOXINS
T. M. Pais, P. Lamosa, W. dos Santos, J. LeGall, D. L. Turner & **H. Santos**
The FEBS Journal, **272**, 999-1011(2005).

149. CULTURES OF RAT ASTROCYTES CHALLENGED WITH A STEADY SUPPLY OF GLUTAMATE: NEW MODEL TO STUDY FLUX DISTRIBUTION IN THE GLUTAMATE-GLUTAMINE CYCLE
L. L. Fonseca, M. A. R. Monteiro, P. M. Alves, M. J. T. Carrondo & H. Santos
Glia, **51**, 286-296 (2005).

148. OVERVIEW ON SUGAR METABOLISM AND ITS CONTROL IN *Lactococcus Lactis* - THE INPUT FROM *IN VIVO* NMR STUDIES
A. R. Neves, W. A. Pool, J. Kok, O. P. Kuipers & **H. Santos**
FEMS Reviews Microbiology, **29**, 531-554 (2005).

147. COMPATIBLE SOLUTES OF THE HYPERTHERMOPHILE *Palaeococcus ferrophilus*: OSMOADAPTATION AND THERMOADAPTATION IN THE ORDER THERMOCOCCALES
C. Neves, M. S. da Costa **& H. Santos**

Applied and Environmental Microbiology, **71**, 8091-8098 (2005).

146. STRESS RESPONSE BY SOLUTE ACCUMULATION IN ARCHAEA
V. Müller, R. Spanheimer & **H. Santos**
Current Opinion in Microbiology, **8**, 729-736 (2005).

145. IDENTIFICATION OF GLUCOSELYSINE-6-PHOSPHATE DEGLYCASE, AN ENZYME INVOLVED IN THE METABOLISM OF THE FRUCTATION PRODUCT GLUCOSELYSINE
E. Wiame, P. Lamosa, **H. Santos** & E. van Schaftingen
Biochemical Journal, **392**, 263-269 (2005).

144. ENHANCEMENT OF TREHALOSE PRODUCTION IN DAIRY PROPIONIBACTERIA THROUGH MANIPULATION OF ENVIRONMENTAL CONDITIONS
F. S. Cardoso, P. Gaspar, J. Hugenholtz, A. Ramos & **H. Santos**
International Journal of Food Microbiology, **91**, 195-204 (2004).

143. ENGINEERING *Lactococcus lactis* FOR THE PRODUCTION OF MANNITOL: HIGH YIELDS FROM FOOD-GRADE STRAINS DEFICIENT IN LACTATE DEHYDROGENASE AND THE MANNITOL TRANSPORT SYSTEM
P. Gaspar, A. R. Neves, A. Ramos, M. J. Gasson, C. A. Shearman, & **H. Santos**
Applied and Environmental Microbiology, **70**, 1466-1474 (2004).

142. EFFECT OF PYRUVATE KINASE OVERPRODUCTION ON GLUCOSE METABOLISM OF *Lactococcus lactis*
A. Ramos, A. R. Neves, R. Ventura, C. Maycock & **H. Santos**
Microbiology-SGM, **150**, 1103-1111 (2004).

141. SPECIALIZED ROLES OF THE TWO PATHWAYS FOR THE SYNTHESIS OF MANNOSYLGLYCERATE IN OSMOADAPTATION AND THERMOADAPTATION OF *Rhodothermus marinus*
N. Borges, J. D. Marugg, N. Empadinhas, M. S. da Costa & **H. Santos**
The Journal of Biological Chemistry, **279**, 9892-9898 (2004).

140. A GENE FROM THE MESOPHILIC BACTERIUM *Dehalococcoides ethenogenes* ENCODES A NOVEL MANNOSYLGLYCERATE SYNTHASE
N. Empadinhas, L. Albuquerque, J. Costa, S. H. Zinder, M. A. S. Santos, **H. Santos** & M. S. da Costa
Journal of Bacteriology, **186**, 4075-4084 (2004).

139. INTRAMOLECULAR FLUORESCENCE QUENCHING OF TYROSINE BY THE PEPTIDE ·-CARBONYL GROUP REVISITED
M. Noronha, J. C. Lima, P. Lamosa, **H. Santos**, C. Maycock, R. Ventura & A. L. Maçanita
Journal of Physical Chemistry A, **108,** 2155-2166 (2004).

138. UNFOLDING OF UBIQUITIN STUDIED BY PICOSECOND TIME-RESOLVED FUORESCENCE OF THE TYROSINE RESIDUE
M. Noronha, J. C. Lima, M. Bastos, **H. Santos** & A. L. Maçanita
Biophysical Journal, **87**, 2609-2620 (2004).

137. PROTEIN STABILIZATION BY OSMOLYTES FROM HYPERTHERMOPHILES: EFFECT OF MANNOSYLGLYCERATE ON THERMAL UNFOLDING OF SNase STUDIED BY PICOSECOND TIME-RESOLVED FLUORESCENCE AND CALORIMETRY
T. Q. Faria, J. C. Lima, M. Bastos, A. L. Maçanita & **H. Santos**
The Journal of Biological Chemistry, **279**, 48680-48691(2004).

136. SYNTHESIS OF GDP-MANNOSE AND MANNOSYLGLYCERATE FROM LABELED MANNOSE BY ENGINEERED *Escherichia coli* WITHOUT LOSS OF SPECIFIC ISOTOPIC ENRICHMENT
M.-M. Sampaio, **H. Santos** & W. Boos
Applied and Environmental Microbiology, **69**, 233-240 (2003).

135. METABOLIC PATHWAY FOR PROPIONATE UTILISATION BY PHOSPHORUS ACCUMULATING ORGANISMS IN ACTIVATED SLUDGE: ^{13}C-LABELLING AND *IN VIVO* NMR
P. Lemos, C. Vieira, L. S. Serafim, M. M. Santos, M. A. M. Reis & **H. Santos**
Applied and Environmental Microbiology, **69**, 241-251 (2003).

134. A VARIANT OF THE HYPERTHERMOPHILE *Archaeoglobus fulgidus* ADAPTED TO GROW AT HIGH SALINITY
L. G. Gonçalves, R. Huber, M. S. da Costa & **H. Santos**
FEMS Letters, **218**, 239-244 (2003).

133. *Salinisphaera shabanense* GEN. NOV., SP. NOV., A NOVEL, MODERATELY HALOPHILIC BACTERIUM FROM THE BRINE-SEAWATER INTERFACE OF THE SHABAN DEEP, RED SEA
A. Antunes, W. Eder, P. Fareleira, **H. Santos** & R. Huber
Extremophiles, **7**, 29-34 (2003).

132. RESPONSE OF A STRICT ANAEROBE TO OXYGEN: SURVIVAL STRATEGIES IN *Desulfovibrio gigas*
P. Fareleira, B. S. Santos, C. António, P. Moradas-Ferreira, J. LeGall, A. V. Xavier & **H. Santos**
Microbiology, **149**, 1513-1522 (2003).

131. THE BACTERIUM *Thermus thermophilus,* LIKE HYPERTHERMOPHILIC ARCHAEA, USES A TWO-STEP PATHWAY FOR THE SYNTHESIS OF MANNOSYLGLYCERATE.
N. Empadinhas, L. Albuquerque, A. Henne, **H. Santos** & Milton S. da Costa
Applied and Environmental Microbiology, **69**, 3272-3279 (2003).

130. CRYSTALLIZATION AND PRELIMINARY X-RAY CHARACTERIZATION OF CYTOCHROME *c*' FROM THE OBLIGATE METHYLOTROPH *Methylophilus methylotrophus***.**
F. J. Enguita, L. Rodrigues, M. Archer, L. Sieker, A. Rodrigues, E. Pohl, D. L. Turner, **H. Santos** & M. A. Carrondo
*Acta Crystallographica D Biological Crystallography***, 59**, 580-583 (2003).

129. PROTEIN STABILISATION BY COMPATIBLE SOLUTES: EFFECT OF MANNOSYLGLYCERATE ON UNFOLDING THERMODYNAMICS AND ACTIVITY OF RIBONUCLEASE A
T. Q. Faria, S. Knapp, R. Ladenstein, A. L. Maçanita & **H. Santos**
ChemBioChem, **4**, 734-741 (2003).

128. LYSINE-2,3-AMINOMUTASE AND ß-LYSINE ACETYLTRANSFERASE GENES OF METHANOGENIC ARCHAEA ARE SALT INDUCED AND ARE ESSENTIAL FOR THE BIOSYNTHESIS OF N-ACETYL- ß -LYSINE AND GROWTH AT HIGH SALINITY
K. Pflüger, S. Baumann, G. Gottschalk, W. Lin, **H. Santos** & V. Müller
Applied and Environmental Microbiology, **69**, 6047-6055 (2003).

127. PROTEIN STABILISATION BY COMPATIBLE SOLUTES: EFFECT OF DIGLYCEROL PHOSPHATE ON THE DYNAMICS OF *Desulfovibrio gigas* RUBREDOXIN STUDIED BY NMR
P. Lamosa, D. L. Turner, R. Ventura, C. Maycock & **H. Santos**
European Journal of Biochemistry, **270**, 4606-4614 (2003).

126. YEAST LIFESPAN EXTENSION BY CALORIE RESTRICTION IS INDEPENDENT OF NAD FLUCTUATION
R. M. Anderson, M. Latorre-Esteves, A. R. Neves, S. Lavu, O. Medvedik, C. Taylor, K. T. Howitz, **H. Santos** & D. A. Sinclair
Science, **302**, 2124-2126 (2003).

125. *Leuconostoc ficulneus sp. nov.*, A NEW LACTIC ACID BACTERIUM ISOLATED FROM RIPE FIGS, AND THE RECLASSIFICATION OF *Lactobacillus fructosus* AS *Leuconostoc fructosus comb. nov.*
A. Antunes, F. A. Rainey, M. F. Nobre, P. Schumann, A. Ramos, **H. Santos** & M. S. da Costa
International Journal of Systematic Bacteriology and Evolution, **52**, 647-655 (2002).

124. COMPARATIVE STUDY ON THE THERMOSTABILISING EFFECT OF MANNOSYLGLYCERATE AND OTHER COMPATIBLE SOLUTES ON MODEL ENZYMES
N. Borges, A. Ramos, N. D. H. Raven, R. J. Sharp & **H. Santos**
Extremophiles, **6**, 209-216 (2002).

123. METHODS FOR DETECTION AND VISUALIZATION OF INTRACELLULAR POLYMERS STORED BY POLYPHOSPHATE-ACCUMULATING MICROORGANISMS
L. S. Serafim, P. C. Lemos, C. Levantesi, V. Tandoi, **H. Santos** & M. A. M. Reis
Journal of Microbiology Methods, **51**, 1-18 (2002).

122. NUTRACEUTICAL PRODUCTION BY PROPIONIBACTERIA
J. Hugenholtz, J. Hunik, **H. Santos** & E. Smid
Lait, **82**, 103-112 (2002).

121. IS THE GLYCOLYTIC FLUX IN *Lactococcus lactis* PRIMARILY CONTROLLED BY THE REDOX CHARGE? KINETICS OF NAD^+ AND NADH POOLS DETERMINED *IN VIVO* BY ^{13}C-NMR
A. R. Neves, R. Ventura, N. Mansour, C. Shearman, M. J. Gasson, C. Maycock, A. Ramos & H. Santos
*Journal of Biological Chemistr*y, **277**, 28088-28098 (2002).

120. METABOLISM OF LACTIC ACID BACTERIA STUDIED BY NUCLEAR MAGNETIC RESONANCE
A. Ramos, A. R. Neves & **H. Santos**
Antonie van Leeuwenhoek, **82**, 249-261 (2002).

119. COMPATIBLE SOLUTES OF ORGANISMS THAT LIVE IN HOT SALINE ENVIRONMENTS
H. Santos & M. S. da Costa
Environmental Microbiology, **4**, 501-509 (2002).

118. CATABOLISM OF MANNITOL IN *Lactococcus lactis* MG1363 AND A MUTANT DEFECTIVE IN LACTATE DEHYDROGENASE
A. R. Neves, A. Ramos, C. Shearman, M. J. Gasson & **H. Santos**
Microbiology, **148**, 3467-3476 (2002).

117. INVOLVEMENT OF FREE AND CONJUGATED POLYAMINES AND FREE AMINO ACIDS IN THE ADVENTITIOUS ROOTING OF MICROPROPAGATED CORK OAK AND GRAPEVINE SHOOTS
C. Neves, **H. Santos**, L. Vilas-Boas & S. Amâncio
Plant Physiology and Biochemistry, **40**, 1071-1080 (2002).

116. COMPATIBLE SOLUTES IN MICROORGANISMS THAT GROW AT HIGH TEMPERATURE
M. S. da Costa & **H. Santos**
In "Encyclopedia of Life Support Systems" (EOLSS), Eolss Publishers, Oxford, UK. [http://www.eolss.net]

115. EFFECT OF DIFFERENT NADH OXIDASE LEVELS ON GLUCOSE METABOLISM OF *Lactococcus lactis*: KINETICS OF INTRACELLULAR METABOLITE POOLS BY *IN VIVO* NMR
A. R. Neves, A. Ramos, H. Costa, I. I. van Swam, J. Hugenholtz, M. Kleerebezem, W. de Vos & **H. Santos**
Applied and Environmental Microbiology, **68**, 6332-6342 (2002).

114. RELATIONSHIP BETWEEN GLYCOLYSIS AND EXOPOLYSACCHARIDE BIOSYNTHESIS IN *Lactococcus lactis*

A. Ramos, I. C. Boels, W. M. de Vos & **H. Santos**
Applied and Environmental Microbiology, **67**, 33-41 (2001).

113. DIFFERENT GLYCOLYTIC PATHWAYS FOR GLUCOSE AND FRUCTOSE IN THE HALOPHILIC ARCHAEON *Halococcus saccharolyticus*
U. Johnsen, M. Selig, K. B. Xavier, **H. Santos** & P. Schönheit
Archives Microbiology, **175**, 52-61 (2001).

112. SOLUTION STRUCTURE OF *Methylophilus methylotrophus* CYTOCHROME *c*": INSIGHTS INTO THE STRUCTURAL BASIS OF HAEM-LIGAND DETACHMENT
L. Brennan, D. L. Turner, P. Fareleira & **H. Santos**
Journal of Molecular Biology, **308**, 353-365 (2001).

111. ORGANIC SOLUTES FROM THERMOPHILES AND HYPERTHERMOPHILES
H. Santos & M. S. da Costa
Methods in Enzymology, "Hyperthermophilic Enzymes" (M. W. W. Adams & R. M. Kelly, Eds.), Vol 334, Part C, 302-315 (2001).

110. NMR STRUCTURE OF *Desulfovibrio gigas* RUBREDOXIN – A MODEL FOR STUDYING PROTEIN STABILISATION BY COMPATIBLE SOLUTES
P. Lamosa, L. Brennan, H. Vis, D. L. Turner & **H. Santos**
Extremophiles, **5**, 303-311 (2001).

109. PATHWAY FOR THE SYNTHESIS OF MANNOSYLGLYCERATE IN THE HYPERTHERMOPHILIC ARCHAEON *Pyrococcus horikoshii*: BIOCHEMICAL AND GENETIC CHARACTERIZATION OF KEY-ENZYMES
N. Empadinhas, J. D. Marugg, N. Borges, **H. Santos** & M. S. da Costa
Journal of Biological Chemistry, **276**, 43580-43588 (2001).

108. DIFFERENT PHYSIOLOGICAL ROLES OF ATP- AND PPi-DEPENDENT PHOSPHOFRUCTOKINASE ISOENZYMES IN THE METHYLOTROPHIC ACTINOMYCETE *Amycolatopsis methanolica*
A. M. C. R. Alves, G. J. W. Euverink, **H. Santos** & L. Dijkhuizen
Journal of Bacteriology, **183**, 7231-7240 (2001).

107. EFFECT OF ETHANOL ON THE METABOLISM OF PRIMARY ASTROCYTES STUDIED BY ^{13}C- AND ^{31}P-NMR SPECTROSCOPY
L. L. Fonseca, P. M. Alves, M. J. T. Carrondo & **H. Santos**
Journal of Neuroscience Research, **66**, 803-811 (2001).

106. THERMOSTABILIZATION OF PROTEINS BY DIGLYCEROL PHOSPHATE, A NOVEL COMPATIBLE SOLUTE FROM THE HYPERTHERMOPHILE *Archaeoglobus fulgidus*
P. Lamosa, A. Burke, R. Peist, R. Huber, M.-Y. Liu, G. Silva, C. Rodrigues-Pousada, J. LeGall, C. Maycock & **H. Santos**
Applied and Environmental Microbiology, **66**, 1974-1979 (2000).

105. STRUCTURAL BASIS FOR THE NETWORK OF FUNCTIONAL COOPERATIVITIES IN CYTOCHROME c_3 FROM *Desulfovibrio gigas*: SOLUTION STRUCTURES OF THE OXIDISED AND REDUCED STATES.
L. Brennan, D. L. Turner, A. C. Messias, M. L. Teodoro, J. LeGall, **H. Santos** & A. V. Xavier
Journal of Molecular Biology, **298**, 61-82 (2000).

104. CONSTRUCTION OF A BRANCHED-CHAIN AT C-3 OF A HEXOPYRANOSIDE. SYNTHESIS OF MIHARAMYCIN SUGAR MOIETY ANALOGUES
A. Rauter, M. Ferreira, C. Borges, T. Duarte, F. Piedade, M. Silva & **H. Santos**
Carbohydrate Research, **325**, 1-15 (2000).

103. METABOLIC CHARACTERIZATION OF *Lactococcus lactis* DEFICIENT IN LACTATE DEHYDROGENASE USING ^{13}C-NMR
A. R. Neves, A. Ramos, C. Shearman, M. J. Gasson, J. S. Almeida & **H. Santos**
European Journal of Biochemistry, **267**, 3859-3868 (2000).

102. DEMONSTRATION OF A NOVEL GLYCOLYTIC PATHWAY IN THE HYPERTHERMOPHILIC ARCHAEON *Thermococcus zilligii* BY ^{13}C-LABELING EXPERIMENTS AND NMR ANALYSIS
K. B. Xavier, M. S. da Costa & **H. Santos**
Journal of Bacteriology, **182**, 4632-4636 (2000).

101. SUCROSE SYNTHESIS IN NITRATE FED DETACHED MAIZE AND WHEAT LEAVES AS ANALYZED BY ^{13}C-NMR
S. Amâncio, **H. Santos** & M. L. Champigny
Phyton (Austria), **40**, 5-14 (2000).

100. EFFECT OF pH ON AXIAL LIGAND COORDINATION OF CYTOCHROME *c*′ FROM *Methylophilus Methylotrophus* AND HORSE HEART CYTOCHROME *c*
B. Indiani, G. de Sanctis, F. Neri, **H. Santos**, G. Smulevich & M. Coletta
Biochemistry, **39**, 8234-8242 (2000).

99. IDENTIFICATION, CLONING AND HETEROLOGOUS EXPRESSION OF A MAMMALIAN FRUCTOSAMINE-3-KINASE
G. Delpierre, M. H. Rider, F. Collard, V. Stroobant, F. Vanstapel, **H. Santos** & E. Van Schaftingen
Diabetes, **49**, 1627-1634 (2000)

98. HIGH YIELD OF *Methylophilus methylotrophus* CYTOCHROME *c*″ BY COEXPRESSION WITH CYTOCHROME *c* MATURATION GENE CLUSTER FROM *Escherichia coli*
N. J. Price, L. Brennan, T. Q. Faria, E. Vijgenboom, G. W. Canters**,** D. L. Turner & **H. Santos**
Protein Expression and Purification, **20**, 444-450 (2000).

97. METABOLISM OF [3-^{13}C]MALATE IN PRIMARY CULTURES OF MOUSE ASTROCYTES

P. M. Alves, R. Nunes, C. Zhang, C. D. Maycock, U. Sonnewald, M. J. T. Carrondo & **H. Santos**
Developmental Neuroscience, **22**, 456-462 (2000).

96. NMR STUDIES ON ENERGY METABOLISM OF IMMOBILIZED PRIMARY NEURONS AND ASTROCYTES DURING HYPOXIA, ISCHEMIA AND HYPOGLYCEMIA
P. M. Alves, L. L. Fonseca, C. C. Peixoto, A. C. Almeida, M. J. T. Carrondo & **H. Santos**
NMR in Biomedicine, **13**, 438-448 (2000).

95. NMR STUDIES OF WINE CHEMISTRY AND WINE BACTERIA
A. Ramos & **H. Santos**
Annual Reports on NMR Spectroscopy, **37**, 179-202 (1999).

94. A ^{31}P NUCLEAR MAGNETIC RESONANCE STUDY OF PHOSPHATE LEVELS IN ROOTS OF ECTOMYCORRHIZAL AND NONMYCORRHIZAL PLANTS OF *Castanea sativa* Mill
A. Martins, M. Santos, **H. Santos** & M. Salomé Pais
Trees, **13**, 168-172 (1999).

93. COMBINED EFFECT OF THE GROWTH TEMPERATURE AND SALINITY OF THE MEDIUM ON THE ACCUMULATION OF COMPATIBLE SOLUTES BY *Rhodothermus marinus* AND *Rhodothermus obamensis*
Z. Silva, N. Borges, L. O. Martins, R. Wait, M. S da Costa & **H. Santos**
Extremophiles, **3**, 163-172 (1999).

92. MALTOSE METABOLISM IN THE HYPERTHERMOPHILIC ARCHAEON *Thermococcus litoralis*: PURIFICATION AND CHARACTERIZATION OF KEY ENZYMES
K**.** B. Xavier, R. Peist, M**.** Kossmann, W**.** Boos & **H. Santos**
Journal of Bacteriology, **181**, 3358-3367 (1999).

91. *IN VIVO* NUCLEAR MAGNETIC RESONANCE STUDIES OF GLYCOLYTIC KINETICS IN *Lactococcus lactis*
A. R. Neves, A. Ramos, M. C. Nunes, M. Kleerebezem, J. Hugenholtz, W. M. de Vos, J. S. Almeida & **H. Santos**
Biotechnology & Bioengineering, **64**, 200-212 (1999).

90. CYTOCHROME *c*' FROM THE OBLIGATE METHYLOTROPH *Methylophilus methylotrophus*, AN UNEXPECTED HOMOLOG OF SPHAEROIDES HEME PROTEIN FROM THE PHOTOTROPH *Rhodobacter sphaeroides*
K. Klarskov, D. Leys, K. Backers, H. S. Costa, **H. Santos**, Y. Guisez & J. J. Van Beeumen
Biochimica Biophysica Acta, **1412**, 47-55 (1999).

89. ACETATE UTILIZATION IN *Lactococcus lactis* DEFICIENT IN LACTATE DEHYDROGENASE: A RESCUE PATHWAY FOR MAINTAINING REDOX BALANCE

P. Hols, A. Ramos, J. Hugenholtz, J. Delcour, W. M. de Vos, **H. Santos** & M. Kleerebezem
Journal of Bacteriology, **181**, 5521-5526 (1999).

88. PROTEOLYTIC ACTIVITY IN INFECTED AND NONINFECTED INSECT CELLS: DEGRADATION OF HIV-1 Pr55gag PARTICLES
P. E. Cruz, P. C. Martins, P. M. Alves, C. C. Peixoto, **H. Santos**, J. L. Moreira & M. J. T. Carrondo
Biotechnology & Bioengineering, **65**, 133-143 (1999).

87. GLUCOSE METABOLISM AND KINETICS OF PHOSPHORUS REMOVAL BY THE FERMENTATIVE BACTERIUM *Microlunatus phosphovorus*
M. M. Santos, P. C. Lemos, M. A. M. Reis & **H. Santos**
Applied and Environmental Microbiology, **65**, 3920-3928 (1999).

86. THE ROLE OF *N*γ-ACETYLDIAMINOBUTYRATE AS AN ENZYME STABILIZER AND AN INTERMEDIATE IN THE BIOSYNTHESIS OF HYDROXYECTOINE
D. Cánovas, N. Borges, C. Vargas, A. Ventosa, J. J. Nieto & **H. Santos**
Applied and Environmental Microbiology, **65**, 3774-3779 (1999).

85. CLONING AND SEQUENCE ANALYSIS OF THE GENE ENCODING *Methylophilus methylotrophus* CYTOCHROME *c*", A UNIQUE PROTEIN WITH A PERPENDICULAR ORIENTATION OF THE HISTIDINYL LIGANDS
N. J. Price, E. Vijgenboom, G. Ribeiro, J. V. Costa, G. W. Canters & **H. Santos**
Biochimica Biophysica Acta, **1413**, 55-61 (1999).

84. SOLUTION STRUCTURE OF PLANTARICIN C, A NOVEL LANTIBIOTIC
D. L. Turner, L. Brennan, H. E. Meyer, C. Lohaus, C. Siethoff, H. S. Costa, B. Gonzalez, **H. Santos** & J. E. Suárez
European Journal of Biochemistry, **264**, 833-839 (1999).

83. BIOSYNTHESIS OF MANNOSYLGLYCERATE IN THE THERMOPHILIC BACTERIUM *Rhodothermus marinus*. BIOCHEMICAL AND GENETIC CHARACTERIZATION OF A MANNOSYLGLYCERATE SYNTHASE
L. O. Martins, N. Empadinhas, J. D. Marugg, C. Miguel, C. Ferreira, M. S. da Costa & **H. Santos**
The Journal of Biological Chemistry, **274**, 35407-35414 (1999).

82. ARCHAEAL BINDING PROTEIN-DEPENDENT ABC TRANSPORTER: MOLECULAR AND BIOCHEMICAL ANALYSIS OF THE TREHALOSE/MALTOSE TRANSPORT SYSTEM OF THE HYPERTHERMOPHILIC ARCHAEON *Thermococcus litoralis*
R. Horlacher, K. B. Xavier, **H. Santos**, J. DiRuggiero, M. Kossmann & W. Boos
Journal of Bacteriology, **180**, 680-689 (1998).

81. AN OVERVIEW OF THE ROLE AND DIVERSITY OF COMPATIBLE SOLUTES IN *BACTERIA* AND *ARCHAEA*

M. S. da Costa, **H. Santos** & E. A. Galinski
Advances in Biochemical Engineering Biotechnology, **61,** 117-153 (1998).

80. COLOR STABILISATION OF MALVIDIN 3-GLUCOSIDE: SELF-AGGREGATION OF THE FLAVYLIUM CATION AND COPIGMENTATION WITH THE *Z*-CHALCONE FORM
C. Houbiers, J. C. Lima, A. L. Maçanita & **H. Santos**
Journal of Physical Chemistry, **102,** 3578-3585 (1998).

79. SOLUTION STRUCTURE OF *Desulfovibrio vulgaris* (HILDENBOROUGH) FERROCYTOCHROME c_3: STRUCTURAL BASIS FOR FUNCTIONAL COOPERATIVITY
A. C. Messias, D. H. W. Kastrau, H. S. Costa, J. LeGall, D. L. Turner, **H. Santos** & A. V. Xavier
Journal of Molecular Biology, **281**, 719-739 (1998).

78. EFFECTS OF TEMPERATURE, SALINITY, AND MEDIUM COMPOSITION ON COMPATIBLE SOLUTE ACCUMULATION BY *Thermococcus* spp.
P. Lamosa, L. O. Martins, M. S. da Costa & **H. Santos**
Applied and Environmental Microbiology, **64**, 3591-3598 (1998).

77. EXCITED STATE PROTON TRANSFER IN SYNTHETIC FLAVYLIUM SALTS: 4-METHYL-7-HYDROXYFLAVYLIUM AND 4',7-DIHYDROXYFLAVYLIUM: EXAMPLE OF A FOUR-LEVEL MOLECULAR DEVICE TO INVERT THE POPULATION OF THE EXCITED STATE
F. Pina, M. J. Melo, **H. Santos**, J. C. Lima, I. Abreu, R. Ballardini & M. Maestri
New Journal of Chemistry, 1093-1098 (1998).

76. ASSIMILATION OF NITRATE AND AMMONIUM BY SULPHUR DEFICIENT *Zea mays* CELLS
S. Amâncio, D. T. Clarkson, E. Diogo, M. Lewis & **H. Santos**
Plant Physiology and Biochemistry, **35**, 41-48 (1997).

75. EFFECT OF EXTRACELLULAR ACIDIFICATION ON THE ACTIVITY OF PLASMA MEMBRANE ATPase AND ON THE CYTOSOLIC AND VACUOLAR pH OF *Saccharomyces cerevisiae*
V. Carmelo, **H. Santos** & I. Sá-Correia
Biochimica Biophysica Acta, **1325**, 63-70 (1997).

74. ORGANIC SOLUTES IN HYPERTHERMOPHILIC *ARCHAEA*
L. O. Martins, R. Huber, H. Huber, K. O. Stetter, M. S. da Costa & **H. Santos**
Applied and Environmental Microbiology, **63**, 896-902 (1997).

73. COMPARATIVE ANALYSIS OF EMBDEN-MEYERHOF AND ENTNER-DOUDOROFF TYPE GLYCOLYTIC PATHWAYS IN HYPERTHERMOPHILIC ARCHAEA AND THE BACTERIUM *Thermotoga*
M. Selig, K. B. Xavier, **H. Santos** & P. Schönheit
Archives of Microbiology, **167**, 217-232 (1997).

72. PATHWAYS FOR UTILIZATION OF CARBON RESERVES IN *Desulfovibrio gigas* UNDER FERMENTATIVE AND RESPIRATORY CONDITIONS
P. Fareleira, J. LeGall, A. V. Xavier & **H. Santos**
Journal of Bacteriology, **179**, 3972-3980 (1997).

71. BIOCHEMICAL BASIS FOR GLUCOSE-INDUCED INHIBITION OF MALOLACTIC FERMENTATION IN *Leuconostoc oenos*
M. Miranda, A. Ramos, M. Veiga-da-Cunha, M. C. Loureiro-Dias & **H. Santos**
Journal of Bacteriology, **179**, 5347-5354 (1997).

70. STABILIZATION OF ENZYMES AGAINST THERMAL STRESS AND FREEZE-DRYING BY MANNOSYLGLYCERATE
A. Ramos, N. D. H. Raven, R. J. Sharp, S. Bartolucci, M. Rossi, R. Cannio, J. Lebbink, J. van der Oost, W. M. de Vos, & **H. Santos**
Applied and Environmental Microbiology, **63**, 4020-4025 (1997).

69. pH-DEPENDENCE OF STRUCTURAL AND FUNCTIONAL PROPERTIES OF OXIDIZED CYTOCHROME *c*' FROM *Methylophilus methylotrophus*
M. Coletta, H. S. Costa, G. De Sanctis, F. Neri, G. Smulevich, D. L. Turner & **H. Santos**
Journal of Biological Chemistry, **272**, 24800-24804 (1997).

68. CITRATE AND SUGAR COFERMENTATION IN *Leuconostoc oenos*; A ^{13}C NUCLEAR MAGNETIC RESONANCE STUDY
A. Ramos & **H. Santos**
Applied and Environmental Microbiology, **62**, 2577-2585 (1996).

67. HIGH AFFINITY MALTOSE/TREHALOSE TRANSPORT SYSTEM IN THE HYPERTHERMOPHILIC ARCHAEON *Thermococcus litoralis*
K. B. Xavier, L. O Martins, R. Peist, M. Kossmann, W. Boos & **H. Santos**
Journal of Bacteriology, **178**, 4773-4777 (1996).

66. MODEL FOR CARBON METABOLISM IN BIOLOGICAL PHOSPHORUS REMOVAL PROCESSES BASED ON *IN VIVO* ^{13}C-NMR LABELLING EXPERIMENTS
H. Pereira, P. C. Lemos, M. A. M. Reis, J. P. S. G. Crespo, M. J. T. Carrondo & **H. Santos**
Water Research, **30**, 2128-2138 (1996).

65. UNCOUPLING EFFECT OF NITRITE DURING DENITRIFICATION BY *Pseudomonas fluorescens*: AN *IN VIVO* ^{31}P-NMR STUDY
W. F. H. Sijbesma, J. S. Almeida, M. A. M. Reis & **H. Santos**
Biotechnology and Bioengineering, **52**, 176-182 (1996).

64. NEW COMPATIBLE SOLUTES RELATED TO DI-*MYO*-INOSITOL-PHOSPHATE IN MEMBERS OF THE ORDER *THERMOTOGALES*
L. O. Martins, L. S. Carreto, M. S. da Costa & **H. Santos**

Journal of Bacteriology, **178**, 5644-5651 (1996).

63. IMMOBILIZATION OF PRIMARY ASTROCYTES AND NEURONS FOR ON LINE MONITORING OF BIOCHEMICAL PROCESSES BY NMR
P. M. Alves, U. Flögel, A. Brand, D. Leibfritz, M. J. T. Carrondo, **H. Santos** & U. Sonnewald
Developmental Neuroscience, **18**, 478-483 (1996).

62. LIGAND ORIENTATION AND HAEM ELECTRONIC STRUCTURE IN FERRICYTOCHROME *c*" FROM *Methylophilus methylotrophus* STUDIED BY ^{13}C NMR
H. S. Costa, **H. Santos** & D. L.Turner
European Biophysics Journal, **25**, 19-24 (1996).

61. ELECTRON-DENSE GRANULES IN *Desulfovibrio gigas* DO NOT CONSIST OF INORGANIC TRIPHOSPHATE BUT OF A GLUCOSE PENTAKIS (DI-PHOSPHATE)
C. M. H. Hensgens, **H. Santos**, C. Zhang, W. H. Kruizinga & T. Hansen
European Journal of Biochemistry, **242**, 327-331 (1996).

60. KINETIC ANALYSIS BY *IN VIVO* ^{31}P-NUCLEAR MAGNETIC RESONANCE OF INTERNAL P_i DURING THE UPTAKE OF *SN*-GLYCEROL-3-PHOSPHATE BY THE *pho* REGULON-DEPENDENT UGP SYSTEM AND THE *glp* REGULON-DEPENDENT GLPT SYSTEM
K. B. Xavier, M. Kossmann, **H. Santos** & W. Boos
Journal of Bacteriology, **177**, 699-704 (1995).

59. ENZYME BASIS FOR pH REGULATION OF CITRATE AND PYRUVATE METABOLISM BY *Leuconostoc oenos*
A. Ramos, J. S. Lolkema, W. N. Konings & **H. Santos**
Applied and Environmental Microbiology, **61**, 1303-1310 (1995).

58. COMPATIBLE SOLUTES IN THE THERMOPHILIC BACTERIA *Rhodothermus marinus* AND "*Thermus thermophilus*"
O. C. Nunes, C. M. Manaia, M. S. da Costa & **H. Santos**
Applied and Environmental Microbiology, **61**, 2351-2357 (1995).

57. ACCUMULATION OF MANNOSYLGLYCERATE AND DI-*MYO*-INOSITOL-PHOSPHATE BY *Pyrococcus furiosus* IN RESPONSE TO SALINITY AND TEMPERATURE
L. O. Martins & **H. Santos**
Applied and Environmental Microbiology, **61**, 3299-3303 (1995).

56. MALATE METABOLISM BY *Desulfovibrio gigas* AND ITS LINK TO SULFATE AND FUMARATE REDUCTION: PURIFICATION OF THE MALIC ENZYME AND DETECTION OF NAD(P)$^+$ TRANSHYDROGENASE ACTIVITY
L. Chen, J. LeGall, P. Fareleira, **H. Santos** & A. V. Xavier
Anaerobe, **1**, 227-235 (1995).

55. PHOTOCHROMISM OF THE SYNTHETIC 4',7-DEHYDROXYFLAVYLIUM CHLORIDE
P. Figueiredo, J. C. Lima, **H. Santos**, M.-C. Wigand, R. Brouillard, A. L. Maçanita & F. Pina
Journal of the American Chemical Society, **116**, 1249-1254 (1994).

54. ^{13}C-NUCLEAR MAGNETIC RESONANCE STUDIES OF CITRATE AND GLUCOSE COMETABOLISM BY *Lactococcus lactis*
A. Ramos, K. N. Jordan, T. M. Cogan & **H. Santos**
Applied and Environmental Microbiology, **60**, 1739-1748 (1994).

53. *IN VIVO* NUCLEAR MAGNETIC RESONANCE IN STUDY OF PHYSIOLOGY OF SULFATE REDUCING BACTERIA
H. Santos, P. Fareleira, J. LeGall & A. V. Xavier
Methods in Enzymology, **243**, 543-558 (1994).

52. UNIPORT OF ANIONIC CITRATE AND PROTON CONSUMPTION IN CITRATE METABOLISM GENERATES A PROTON MOTIVE FORCE IN *Leuconostoc oenos*
A. Ramos, B. Poolman, **H. Santos**, J. S. Lolkema & W. N. Konings
Journal of Bacteriology, **176**, 4899-4905 (1994).

51. AN UNUSUAL CONFORMATION OF THE METHIONINE HAEM LIGAND IN CYTOCHROME c_L ESTABLISHED BY TWO-DIMENSIONAL ^{1}H-NMR
H. S. Costa, **H. Santos** & D. L. Turner
European Journal of Biochemistry, **223**, 783-789 (1994).

50. GLUCOSE FERMENTATION TO ACETATE AND ALANINE IN RESTING CELL SUSPENSIONS OF *Pyrococcus furiosus*: PROPOSAL OF A NOVEL GLYCOLYTIC PATHWAY BASED ON ^{13}C LABELLING DATA AND ENZYME ACTIVITIES
T. Schäfer, K. B. Xavier, **H. Santos** & P. Schönheit
FEMS Microbiology Letters, **121**, 107-114 (1994)

49. COMPARISON OF GLUCOSE FERMENTATION BY SUSPENDED AND GEL-ENTRAPPED YEAST CELLS: AN *IN VIVO* NMR STUDY
M. A. Taipa, J. M. S. Cabral & **H. Santos**
Biotechnology and Bioengineering, **41**, 647-653 (1993).

48. PITFALLS IN ASSIGNING HEME AXIAL COORDINATION BY EPR: *c*-TYPE CYTOCHROMES WITH ATYPICAL MET-HIS LIGATION
M. Teixeira, A. P. Campos, A. P. Aguiar, H.S. Costa, **H. Santos**, D. L. Turner & A. V. Xavier
FEBS Letters, **317**, 233-236 (1993).

47. RUBREDOXIN OXIDASE, A NEW FLAVO-HEMO-PROTEIN, IS THE SITE OF OXYGEN REDUCTION TO WATER BY THE "STRICT ANAEROBE" *Desulfovibrio gigas*
L. Chen, M.-Y. Liu, J. LeGall, P. Fareleira, **H. Santos** & A. V. Xavier
Biochemical Biophysical Research Communications, **193**, 100-105 (1993).

46. PATHWAY AND REGULATION OF ERYTHRITOL FORMATION IN *Leuconostoc oenos*
M. Veiga da Cunha, **H. Santos** & E. van Schaftingen
Journal of Bacteriology, **175**, 3941-3948 (1993).

45. ELUCIDATION OF THE MULTIPLE EQUILIBRIA OF MALVIN IN AQUEOUS SOLUTION BY ONE- AND TWO-DIMENSIONAL NMR
H. Santos, D. L. Turner, J. C. Lima, P. Figueiredo, F. S. Pina & A. L. Maçanita
Phytochemistry, **33**, 1227-1232 (1993).

44. CHARACTERIZATION OF THE HAEM ENVIRONMENT IN *Methylophilus methylotrophus* FERRICYTOCHROME *c*" BY ^{1}H-NMR
H. S. Costa, **H. Santos** & D. L. Turner
European Journal of Biochemistry, **215**, 817-824 (1993).

43. PURIFICATION AND CHARACTERIZATION OF AN NADH-RUBREDOXIN OXIDOREDUCTASE INVOLVED IN THE UTILIZATION OF OXYGEN BY *Desulfovibrio gigas*
L. Chen, M.-Y. Liu, J. LeGall, P. Fareleira, **H. Santos** & A. V. Xavier
European Journal of Biochemistry, **216**, 443-448 (1993).

42. AEROBIC METABOLISM OF CARBON RESERVES BY THE "OBLIGATE ANAEROBE" *Desulfovibrio gigas*
H. Santos, P. Fareleira, A. V. Xavier, L. Chen, M.-Y. Liu & J. LeGall
Biochemical and Biophysical Research Communications, **195**, 551-557 (1993).

41. EFFECTS OF THE SOURCE OF INORGANIC NITROGEN ON C AND N INTERACTION IN MAIZE CALLUS TISSUE: PHOSPHOENOLPYRUVATE CARBOXYLASE ACTIVITY, CYTOSOLIC pH AND ^{15}N AMINO ACIDS
S. Amâncio, E. Diogo & **H. Santos**
Physiologia Plantarum, **89**, 618-625 (1993).

40. TWO-DIMENSIONAL NMR OF PARAMAGNETIC METALLOPROTEINS
A. V. Xavier, D. L. Turner & **H. Santos**
Methods in Enzymology, **227**, 1-17 (1993).

39. DETERMINATION OF THE METHIONINE HAEM LIGAND CONFORMATION IN CYTOCHROME c_H FROM *Methylophilus methylotrophus* BY TWO DIMENSIONAL ^{1}H-NMR
H. Santos & D. L. Turner
Magnetic Resonance in Chemistry, **31**, S90-S95 (1993).

38. NITRATE AND AMMONIUM ASSIMILATION BY ROOTS OF MAIZE (*Zea mays* L.) SEEDLINGS AS INVESTIGATED BY *IN VIVO* ^{15}N-NMR
S. Amâncio & **H. Santos**
Journal of Experimental Botany, **43**, 633-639 (1992).

37. ^{13}C AND PROTON NMR STUDIES OF HORSE CYTOCHROME *c*: SYSTEMATIC ASSIGNMENT OF METHYL AND METHINE RESONANCES IN BOTH OXIDATION STATES
H. Santos & D. L. Turner
European Journal of Biochemistry, **206**, 721-728 (1992).

36. APPLICATION OF ^{13}C-NMR TO ELUCIDATE THE UNEXPECTED BIOSYNTHESIS OF ERYTHRITOL BY *Leuconostoc oenos*
M. Veiga da Cunha, P. Firme, M. V. San Romão & **H. Santos**
Applied and Environmental Microbiology, **58**, 2271-2279 (1992).

35. STRUCTURE DETERMINATION OF A NOVEL CYCLIC PHOSPHOCOMPOUND ISOLATED FROM *Desulfovibrio desulfuricans*
D. L. Turner, **H. Santos**, P. Fareleira, I. Pacheco, J. LeGall & A. V. Xavier
Biochemical Journal, **285**, 387-390 (1992).

34. NODULATION IN CLOVER ROOTS: CORRELATION WITH VACUOLAR pH
A. P. Oliveira, J. F. Marques & **H. Santos**
FEMS Microbiology Letters, **96**, 119-124 (1992).

33. INVOLVEMENT OF A LABILE AXIAL HISTIDINE IN COUPLING ELECTRON AND PROTON TRANSFER IN *Methylophilus methylotrophus* CYTOCHROME *c*"
H. S. Costa, **H. Santos**, D. L. Turner & A. V. Xavier
European Journal of Biochemistry, **208**, 427-433 (1992).

32. ASSIGNMENT OF THE REDOX POTENTIALS TO THE FOUR HAEMS IN *Desulfovibrio vulgaris* CYTOCHROME c_3 BY 2D-NMR
C. Salgueiro, D. L. Turner, **H. Santos**, J. LeGall & A. V. Xavier
FEBS Letters, **314**, 155-158 (1992).

31. APPLICATION OF ^{59}Co NMR TO THE INVESTIGATION OF INTERACTIONS BETWEEN COBALT SEPULCHRATE AND VARIOUS COUNTERIONS
J. Sotomayor, **H. Santos** & F. Pina
Canadian Journal of Chemistry, **69**, 567-569 (1991).

30. *IN VIVO* ^{31}P-NMR STUDIES OF *Desulfovibrio* SPECIES: DETECTION OF A NOVEL PHOSPHORUS-CONTAINING COMPOUND
H. Santos, P. Fareleira, C. Pedregal, J. LeGall & A. V. Xavier
European Journal of Biochemistry, **201**, 283-287 (1991).

29. APPLICATION OF ^{31}P NMR TO MONITOR PHOSPHORUS COMPOUNDS AND THEIR CHANGES DURING GERMINATION OF LEGUME SEEDS
C. P. P. Ricardo & **H. Santos**
Journal of Experimental Botany, **41**, 79-87 (1990).

28. EFFECTS OF ETHANOL ON *Saccharomyces cerevisiae* AS MONITORED BY *IN VIVO* ^{31}P AND ^{13}C NUCLEAR MAGNETIC RESONANCE

M. C. Loureiro-Dias & **H. Santos**
Archives of Microbiology, **153**, 384-391 (1990).

27. *IN VIVO* NUCLEAR MAGNETIC RESONANCE STUDIES OF THE METABOLISM OF METHANOL AND PYRUVATE BY *Methanosarcina barkeri*
H. Santos, P. Fareleira, J. LeGall & A. V. Xavier
FEMS Microbiology Reviews, **87**, 361-366 (1990).

26. CYTOCHROME *c*' ISOLATED FROM *Methylophilus methylotrophus*: AN EXAMPLE OF BIS-HISTIDINE COORDINATED Fe^{3+} HAEM, WITH NEAR-PERPENDICULAR ORIENTATION OF THE LIGANDS
M. J. Berry, S. J. George, A. J. Thomson, **H. Santos** & D. L. Turner
Biochemical Journal, **270**, 413-417 (1990).

25. THE USE OF THE *n*-(9-ANTHROYLOXY) STEARIC ACIDS TO PROBE THE WATER CONTENT OF SODIUM DODECYL SULFATE, DODECYL-TRIMETHYLAMMONIUM CHLORIDE, AND TRITON X-100 MICELLES
E. C. C. Melo, S. M. B. Costa, A. L. Maçanita & **H. Santos**
Journal of Colloid Interface Science, **141**, 439-453 (1990).

24. EFFECTS OF 2-DEOXYGLUCOSE ON *Saccharomyces cerevisiae* AS OBSERVED BY *IN VIVO* ^{31}P-NMR
M. C. Loureiro-Dias & **H. Santos**
FEMS Microbiology Letters, **57**, 25-28 (1989).

23. THE 9-ANTHROATE CHROMOPHORE AS A FLUORESCENT PROBE FOR WATER
A. L. Maçanita, F. P. Costa, S. M. B. Costa, E. C. Melo & **H. Santos**
Journal of Physical Chemistry, **93**, 336-343 (1989).

22. *IN VIVO* ^{31}P- AND ^{13}C-NMR STUDIES OF ATP SYNTHESIS AND METHANE FORMATION BY *Methanosarcina barkeri*
H. Santos, P. Fareleira, R. Toci, J. LeGall, H. D. Peck Jr. & A. V. Xavier
European Journal of Biochemistry, **180**, 421-427 (1989).

21. CHARACTERIZATION AND NMR STUDIES OF A NOVEL CYTOCHROME *c* ISOLATED FROM *Methylophilus methylotrophus* WHICH SHOWS A REDOX LINKED CHANGE OF SPIN STATE
H. Santos & D. L. Turner
Biochimica Biophysica Acta, **954**, 277-286 (1988).

20. ENVIRONMENTAL REGULATION OF METHANOL AND FORMALDEHYDE METABOLISM BY *Methylophilus methylotrophus*
C. W. Jones, J. A. Greenwood, S. M. Burton, **H. Santos** & D. L. Turner
Journal of General Microbiology, **133**, 1511-1519 (1987).

19. PROTON NMR STUDIES OF HORSE FERRICYTOCHROME *c*: COMPLETION OF THE ASSIGNMENT OF THE WELL RESOLVED HYPERFINE SHIFTED RESONANCES
H. Santos & D. L. Turner
FEBS Letters, **226**, 179-185 (1987).

18. ^{13}C AND PROTON NMR STUDIES OF HORSE CYTOCHROME *c:* ASSIGNMENT AND TEMPERATURE DEPENDENCE OF METHYL RESONANCES
H. Santos & D. L. Turner
FEBS Letters, **194**, 73-77 (1986).

17. CHARACTERIZATION OF THE IMPROVED SENSITIVITY OBTAINED USING A FLOW METHOD FOR OXYGENATING AND MIXING CELL SUSPENSIONS IN NMR
H. Santos & D. L. Turner
Journal of Magnetic Resonance, **68**, 345-349 (1986).

16. ^{13}C NMR STUDIES OF HORSE FERROCYTOCHROME *c* ASSIGNMENT AND TEMPERATURE DEPENDENCE OF METHYL RESONANCES
H. Santos & D. L. Turner
FEBS Letters, **184**, 240-244 (1985).

15. NMR STUDIES OF ELECTRON TRANSFER MECHANISMS IN A PROTEIN WITH INTERACTING REDOX CENTRES: *Desulfovibrio gigas* CYTOCHROME c_3
H. Santos, J. J. G. Moura, I. Moura, J. LeGall & A. V. Xavier
European Journal of Biochemistry, **141**, 283-296 (1984).

14. TWO-DIMENSIONAL NMR STUDIES OF ELECTRON TRANSFER IN CYTOCHROME c_3
H. Santos, D. L. Turner , A. V. Xavier & J. LeGall
Journal of Magnetic Resonance, **59**, 177-180 (1984).

13. FOUR QUARTETS: APPLICATION TO TWO-DIMENSIONAL NMR
H. Santos, D. L. Turner & A. V. Xavier
Journal of Magnetic Resonance, **58**, 344-347 (1984).

12. THERMODYNAMICS OF ALL-OR-NONE WATER CHANNEL CLOSURE IN RED CELLS
T. F. Moura, R. I. Macey, D. Y. Chien, D. Karan & **H. Santos**
Journal of Membrane Biology, **81**, 105-111 (1984).

11. PROTEINS CONTAINING THE FACTOR F_{430} FROM *Methanosarcina barkeri* AND *Methanobacterium thermoautotrophicum* ISOLATION AND PROPERTIES
I. Moura, J. J. G. Moura, **H. Santos**, A. V. Xavier, G. Burch, H. D. Peck Jr. & J. LeGall
Biochimica Biophysica Acta, **742**, 84-90 (1983).

10. CONFORMATION OF PURINE MONONUCLEOTIDES BY H{H} AND P{H} NUCLEAR OVERHAUSER EFFECTS
H. Santos, A. V. Xavier & C. F. G. C. Geraldes

Canadian Journal of Chemistry, **61**, 1456-1464 (1983).

9. A DIFFERENCE METHOD FOR THE REDUCTION OF "AUTO" PEAKS IN AUTOCORRELATION SPECTRA
H. Santos, D. L. Turner & A. V. Xavier
Journal of Magnetic Resonance, **55**, 463-467 (1983).

8. SOLVENT EFFECTS ON THE CONFORMATION OF NUCLEOTIDES. Part I. THE CONFORMATION OF 5'-ADENOSINE MONOPHOSPHATE IN WATER-DIMETHYL SULPHOXIDE USING NUCLEAR OVERHAUSER EFFECTS AND LANTHANIDE RELAXATION PROBES
C. F. G. C. Geraldes & **H. Santos**
Journal of the Chemical Society Perkin Trans. II, 1693-1697 (1983).

7. AMINO ACID SEQUENCE OF A 3Fe:3S FERREDOXIN FROM THE "ARCHAEBACTERIUM" *Methanosarcina barkeri* (DSM 800)
R. P. Hausinger, I. Moura, J. J. G. Moura, A. V. Xavier, M. **H. Santos**, J. LeGall & J. B. Howard
Journal of Biological Chemistry, **257**, 14192-14197 (1982).

6. FERREDOXIN FROM *Methanosarcina barkeri:* EVIDENCE FOR THE PRESENCE OF A THREE-IRON CENTER
I. Moura, J. J. G. Moura, B. H. Huynh, **H. Santos**, J. LeGall & A. V. Xavier
European Journal of Biochemistry, **126**, 95-98 (1982).

5. ROLE OF VITAMIN B_{12} IN METHYL TRANSFER FOR METHANE BIOSYNTHESIS BY *Methanosarcina barkeri*
J. M. Wood, I. Moura, J. J. G. Moura, **M. H. Santos**, A. V. Xavier, J. LeGall & M. Scandellari
Science, **216**, 303-305 (1982).

4. ISOLATION OF P_{590} FROM *Methanosarcina barkeri*: EVIDENCE FOR THE PRESENCE OF SULFITE REDUCTASE ACTIVITY
J. J. G. Moura, I. Moura, **H. Santos**, A. V. Xavier, M. Scandellari & J. LeGall
Biochemical Biophysical Research Communications, **108**, 1002-1009 (1982).

3. NMR REDOX STUDIES OF *Desulfovibrio vulgaris* CYTOCHROME c_3 ELECTRON TRANSFER MECHANISMS
J. J. G. Moura, **H. Santos**, I. Moura, J. LeGall, G. R. Moore, R. J. P. Williams & A. V. Xavier
European Journal of Biochemistry, **127**, 151-155 (1982).

2. A PROTON RELAXATION STUDY OF THE CONFORMATIONS OF SOME PURINE MONONUCLEOTIDES IN AQUEOUS SOLUTION
C. F. G. C. Geraldes, **H. Santos** & A. V. Xavier
Canadian Journal of Chemistry, **60**, 2976-2983 (1982).

1. REDOX STUDIES ON RUBREDOXINS FROM SULPHATE AND SULPHUR REDUCING BACTERIA
I. Moura, J. J. G. Moura, M. **H. Santos**, A. V. Xavier & J. LeGall
FEBS Letters, **107**, 419-421 (1979).

PATENTS

INTERNATIONAL PATENTS

Thermostabilization, osmoprotection, and protection against desiccation of enzymes, cell components, and cells by mannosylglycerate
H. Santos, A. Ramos & M. S. da Costa
Patente Europeia submetida em 14/03/97 com o nº 97670002.1 e publicada em 07/01/98 Bulletin 1998/02 (EP 816509 A2, A3). Proponent: IBET. Licensed to bitop AG (Germany) in 2002.

Stabilization and protection against stress of enzymes and cell components by di-glycerol-phosphate
H. Santos, P. Lamosa, A. Burke & C. Maycock
Patente Europeia submetida em 08/04/1998 com o nº 98670002.1 e publicada em 22/12/1999, Bulletin 1999/51 (EP 9652681 A1). Proponent: IBET. Licensed to bitop AG (German) in 2002.

Diglycosyl glyceryl compounds for the stabilisation and preservation of biomaterials
H. Santos, P. Lamosa, C. Jorge & M. S. da Costa
Request submitted on 22/04/2003 with the nº PCT/PT03/000006 and published on 04/11/04 (International Publication Number WO 2004/094631 A1. Concedida pelo Instituto Europeu de Patentes em 4 de Março de 2009, com publicação no Boletim Europeu nº 10/2009. Proponent: IBET.

Identification of a bifunctional gene for mannosylglycerate synthesis and development of a high-scale-production heterologous system based on *Saccharomyces cerevisiae*
M. S. da Costa, N. Empadinhas, L. Albuquerque & **H. Santos**
International Patent submitted on 17/10/2003 (process nº 3398007Y). Proponent: BIOCANT.

Glycerophosphoinositol as a stabilizer and/or preservative of biological materials
H. Santos, P. Lamosa, N. D. Raven, L. Gafeira & M. V. Rodrigues
Submitted on 24 March 2005 to the European Patent Office (EP 05398004, EP 1705246). Proponent: IBET.

NATIONAL PATENTS

Utilização do fosfato de di-manosil-di-mio-inositol e de fosfato de 1,3'-di-*mio*-inositol na termo-estabilização, osmoprotecção e protecção contra a desidratação de componentes celulares e células
H. Santos, L. O. Martins, L. S. Carreto, M. S. da Costa.
Instituto Nacional da Propriedade Industrial. Patente de Invenção nº 101813. Submitted on 11-01-1996. Proponent: IBET. Licensed to bitop AG in 2002.

Utilização de manosilglicerato na termoestabilização, osmoprotecção e protecção contra a desidratação de componentes celulares e células
H. Santos, A. Ramos & M. S. da Costa
Instituto Nacional da Propriedade Industrial. Patente de Invenção, submetido o pedido em Junho 1996. Proponent: IBET.

Derivados sintéticos de manosilglicerato para a estabilização e/ou preservação de biomateriais
P. Lamosa, T. Q. Faria, M. R. Ventura, C. D. Maycock & **H. Santos**
Patent PAT 103442 P; 2006/02/24. Proponent: STAB VIDA, Lda.

RESEARCH FUNDING

LIST OF INTERNATIONAL PROJECTS (as Coordinator)

Structure/Function Relationships in Haemproteins
Network Contract: ERBCHRXCT940540
Duration: 01/10/1994 - 30/09/1998

Exploiting New Solutes from Hyperthermophiles for the Preservation of Biomaterials: Cell Factories for Production of Hypersolutes (10 partners)
Project in the Fifth Framework Programme of the European Union (contract nº QLK3-CT-2000-00640)
Duration: 2001-2004; Funding for my Team: 228 884.00 €

INTERNATIONAL PROJECTS (as Team Leader)

Metabolism and Growth Developments for the Expanded use of Lactic Acid Bacteria in Non-Dairy Agroindustries
Project nº BIOT-CT91-0263 from CE-DGXII in the Framework of the BRIDGE program.
Duration: 1991-1994.
Coordinator: Charles Daly, Cork, Ireland

Biotechnology of Extremophiles
BIOTECH Program, CE-DGXII, contract nº BIO2-CT93-0274
Duration: 1993-1996

Coordinator: Garo Antranikian, Hamburg, Germany

Study on the Role of Inorganic Phosphate on the Regulation of *Escherichia coli* Transport Systems
Integrated Action Portuguese-German, nº A-30/95
Duration: 1995; German Partner: Winfried Boos

Elucidation of the Pathway for the Synthesis of Maltotriose in *Escherichia coli*. Metabolism and Transport of Maltose in Hyperthermophilic Archaea
Integrated Action Portuguese-German, nº A-16/96
Duration: 1996; German Partner: Winfried Boos

Sugar Transport and Metabolism in the Hyperthermophilic Archaeon *Thermococcus litoralis*
NATO Science for Peace Program, Project CRG.970132
Duration: 1997-1999; Coordinator: Winfried Boos, Germany

Ecology and Bioenergetics of Extremely Halophilic Methanogenic and Acetogenic Bacteria
INTAS Project, INTAS-93-2531
Duration: June 1995- July 1997
Project Coordinator: Gerhard Gottschalk, Germany

Metabolism and Transport of Glutamate; Implications for Mental Health
BIOMED I Program, Concerted Action BHMH1-CT94-1248
Duration: Nov. 1994 – Nov. 1996
Project Coordinator: Ursula Sonnewald, Norway.

Extremophiles as Cell Factories
BIOTECH Program of the CE-DGXII, contract nº BIO 4-CT 96-0488
Duration: 1996-1999
I was the Coordinator of the Leaf "***Product Engineering: Organic Compounds***" comprising 13 teams.
Project Coordinator: Garo Antranikian, Hamburg, Germany

Cell Engineering of *Lactococcus lactis*
Project in the BIOTECH Program of the CE-DGXII, contract BIO 4-CT 96-0498
Duration: 1996-1999; Funding for my team: 200 000 Euros

Foundations for Controlling the Properties of Haem Proteins: Structure/Function Relationships in Archetypal Systems and the Development of an Interdisciplinary Methodology
TMR Network, European Commission (contract nº FMRX-CT98-0218)
Duration: 1998-2002
Coordinator: David L. Turner, Southampton, UK.

Increase in Nutritional Value of Food Raw Materials by Addition, Activity, or *In Situ* Production of Microbial Nutraceuticals
Fifth Framework Program of the European Union (contract nº QLK1-CT-2000-01376)
Duration: 2001-2004; Funding for my team: 200 000 Euros.
Coordinator: Jeroen Hugenholtz, Holland.

Fermentation of Food Products: Optimized Lactic Acid Bacteria Strains with Reduced Potential to Accumulate Biogenic Amines
Fifth Framework Program of the European Union (contract nº QLRT-2001-02380-DECARBOXYLATE)
Duration: 1 Mar 2003- 28 Feb 2006; Funding for my team: 200 000 Euros
Coordinator: Paloma Lopez, Madrid.

Increase in Nutritional Value of Food Raw Materials by Addition, Activity, or *In Situ* Production of Microbial Nutraceuticals
Fifth Framework Program of the European Union (contract nº QLK1-CT-2000-01376)
Duration: 2001-2004; Funding for my team: 200 000 Euros.
Coordinator: Jeroen Hugenholtz, Holland.

New Applications for Compatible Solutes from Extremophiles
Project funded by the VI Framework Program of the European Union (CRAFT, contract nº COOP-CT-2003-58644)
Duration: 1 Feb 2004- 31 Jan 2006; Funding for my team: 177 520 Euros.
Coordinator: *Miguel Santos*, STAB-Vida.

Assessment of Pathway Design through Multi-Level Modeling and Experimentation
National Science Foundation, Award nº: MCB-0517135
Duration: 1 May 2006 - 30 April 2009;
Funding for my team: 61,818 Dólares.
Coordinator: Eberhard Voit, Atlanta, Georgia.

Bio-based Production of Chemical Building Blocks: *Corynebacterium glutamicum* as a Platform for New and Efficient Bioprocesses
ERANET Project ERA-IB/BIO/0002/2008
Duration: 15 April 2009 – 30 November 2012
Funding for my group: 185 424 Euros
Coordinator: Bernard Eikmanns, Ulm, Germany.

NATIONAL PROJECTS (as Coordinator)

Studies of Energy Conversion in Microorganisms by Non-Invasive Techniques.
J.N.I.C.T., Programa Mobilizador, Project nº 832. 86. 178
Duration: 1986 - 1989

Study of Biotransformation Processes in Bacteria with Industrial Relevance by using Non-Invasive Techniques
J.N.I.C.T., "Programa Mobilizador", Project nº PMCT/C/BIO/873/90
Duration: 1990 - 1993

Malolactic Fermentation in Wine: Metabolism, Bioenergetics and Regulation
Program STRIDE of JNICT, STRDA/C/BIO/355/92
Duration: 1992-1994

Microorganismos in Extreme Environments: Mechanisms of Adaptation
Program PRAXIS XXI, Project PRAXIS/2/2.1/BIO/20/94
Duration: 08/1/1994 - 8/10/1998

Biochemical Strategies for Thermo-Stabilization in Hyperthermophilic Microorganisms
Program FCT PRAXIS XXI, Project PRAXIS/2/2.1/BIO/1109/95
Duration: 1996-1999

Characterization and Modeling of Metabolic Fluxes in Lactic Acid Bacteria towards the improvement of Industrial Strains
Program PRAXIS XXI, Project PRAXIS/PCNA/P/BIO/39/96
Duration: June 1997 - May 1999

Survival Strategies of Strictly Anaerobic Bacteria in the Presence of Oxygen
Program PRAXIS XXI, Projecto PRAXIS/PCNA/P/BIA/130/96
Duration: June 1997 - May 1999

Utilization of *Lactococcus lactis* as Cell Reactors: Modeling of Carbohydrate Metabolism Based on Non-Invasive Measurements
Program PRAXIS XXI, Project PRAXIS/C/BIA/11072/98
Duration: June 1999 – May 2001

Exploração de Solutos de Organismos Hipertermófilos com vista à sua Utilização como Estabilizantes de Enzimas
Program FCT/PRAXIS XXI, Project PRAXIS/P/BIO/12082/1998
Duration: April 2000 – October 2002

Molecular Basis of Protein Thermostabilization
Program FCT/Sapiens99, Project POCTI/35131/99
Duration: 15 Jan 2001- 14 Jan 2004

Exploring Metabolic Biodiversity: Sugar Metabolism in the Hyperthermophile *Archaeoglobus fulgidus*
Program FCT/Sapiens99, Project POCTI 35719/BIO/2000
Duration: 15 Jan 2001- 14 Jan 2004; Funding: 84 795,66 Euros

Towards the Utilization of Cell-Reactors for the Production of Mannosylglycerate, an Enzyme Stabilizer from Hyperthermophiles
Program FCT/Sapiens99, Project POCTI 35715/BIO/2000
Duration: 15 Jan 2001- 14 Jan 2004; Funding: 54 867,79 Euros

Metabolic Trafficking Between Neurons and Astrocytes Under Conditions Implicated in Neurological Disorders: ^{13}C-NMR and Flux Analysis
Program FCT/Sapiens, Project POCTI/BIO/39214/2001
Duration: 1 March 2003- 28 February 2006; Requerida transferência de Coordenação a favor de ***Paula Alves*** após avaliação e aprovação do Projecto.

Global Experimental Approaches to Study Central Metabolism in *Lactococcus lactis*: Modulation of the Levels of Key-Enzymes
Program FCT/Sapiens02, Projecto POCTI-BIO/48333/2002
Duration: 15 July 2004- 14 July 2007;
Funding for my group: 146 000 Euros

Lessons from the Physiology of Hyperthermophilic Microorganisms: Potential of New Biomolecules to Inhibit Protein Misfolding and Aggregation
FCT-MES, Project POCI/V.5/A0004/2005
Duration: 5 January 2005 - 31 December 2007;
Funding for my group: 100 000 Euros

Strategies of Life Adaptation to Hot Environments: Heat and Osmotic Stress Responses in the Extreme Thermophilic Bacterium *Rhodothermus marinus*
FCT-MES, Project POCI/BIA/59310/2004
Duration: 15 June 2005- 14 December 2008;
Funding for my group: 90 000 Euros

Structural Determinants of Protein Stabilization by Compatible Solutes from Hyperthermophiles: in Search of Guidelines for Solute Improvement
FCT-MES, Project POCI/BIA-PRO/57263/2004
Duration: 15 June 2005- 14 December 2008;
Funding for my group: 81 102 Euros

Understanding how Hyperthermophilic Microorganisms cope with Heat Stress: the role of unique polyolphosphodiester compounds
FCT-MES, Project PTDC/BIA-MIC/71146/2006
Duration 5 May 2008 – 4 May 2012
Funding for my group: 127,000 Euros

INVITED LECTURES AND EXTERNAL SEMINARS

100 Invited Lectures in International/National Conferences or Symposia.

102. NOVEL PROTEIN STABILIZERS FROM MICROORGANISMS ADAPTED TO HOT ENVIRONMENTS: EFFICACY ASSESSMENT IN A YEAST MODEL OF PARKINSON´S DISEASE
Escola de Ciências da Saúde, Universidade do Minho, Braga, 18 de Junho de 2013. Invited Lecture.

101. MICROORGANISMS ADAPTED TO HOT ENVIRONMENTS AS SOURCES OF BIOMOLECULES WITH BIOTECHNOLOGICAL INTEREST
First AEICBAS Biomedical Congress, 5 a 7 de Abril de 2013, Universidade do Porto, Portugal. Invited Lecture.

100. RECURSOS MARINHOS MICROBIANOS
Simpósio "O Mar", Academia das Ciências de Lisboa, 19 de Março de 2012.

99. PROTEIN STABILIZATION BY OSMOLYTES OF HYPERTHERMOPHILES: THE EFFECT OF MANNOSYLGLYCERATE ON PROTEIN DYNAMICS
9th International Conference on Protein Stabilization (ProStab2012), Lisboa, Portugal, 2 a 4 de Maio de 2012, Plenary Lecture

98. UNIQUE ORGANIC SOLUTES OF HYPERTHERMOPHILES: DO THEY PLAY A ROLE IN CELL PROTECTION AGAINST HEAT STRESS?
22nd IUBMB and 37th FEBS Congress – From Single Molecules to Systems Biology, Sevilha, Espanha, 4 a 9 de Setembro de 2012. Invited Lecture.

97. *VIDA INVISÍVEL* EM AMBIENTES EXTREMOS NO MAR PROFUNDO: EM BUSCA DE BIOMOLÉCULAS COM ELEVADO VALOR BIOTECNOLÓGICO
Academia da Marinha, 18 de Setembro de 2012, a convite do Almirante Nuno Gonçalo Vieira Matias.

96. VIDA EM AMBIENTES EXTREMOS: BIODIVERSIDADE, ADAPTAÇÃO e BIOTECNOLOGIA
Colóquio na Academia das Ciências de Lisboa, Portugal, 18 de Fevereiro de 2010.

95. DEEP SEA EXTREMOPHILES: BIOLOGICAL RESOURCES
Ciência 2010 – Encontro com a Ciência e Tecnologia em Portugal, Lisboa, 4 a 7 de Julho de 2010.

94. REDE NACIONAL DE RESSONÂNCIA MAGNÉTICA NUCLEAR
Ciência 2010 – Encontro com a Ciência e Tecnologia em Portugal, Lisboa, 4-7 July 2010.

93. MICROORGANISMS FROM MARINE, HOT ENVIRONMENTS AS SOURCES OF NEW PROTEIN STABILIZERS: PATENTING AND COMMERCIALIZATION

2nd UTEN International Workshop 2010 (Research Collaboration & Network Building for Commercialization in Marine and Bio-Sciences), Universidade do Algarve, Faro, Portugal, 27-28 September 2010, Invited Lecture.

92. ORGANIC SOLUTES OF MICROORGANISMS FROM HOT, MARINE ENVIRONMENTS: DO THEY PLAY A ROLE IN THERMOADAPTATION?
Workshop on Adaptation of Microorganisms to Osmotic Challenges, Max-Planck Institute for Terrestrial Microbiology, Marburg, Alemanha, 1 a 2 de Outubro de 2010. Invited Lecture.

91. HYPERTHERMOPHILES AS SOURCES OF NEW STABILIZERS: DIVERSITY, PERFORMANCE AND MODE OF ACTION
8th International Conference on Protein Stabilization (ProStab2009), Graz, Áustria, 14 a 17 de Abril de 2009, Plenary Lecture.

90. HYPERTHERMOPHILES AS SOURCES OF NEW STABILIZERS: DIVERSITY, PERFORMANCE AND MODE OF ACTION
3th Congress of European Microbiologists, FEMS 2009, Gothenburg, Suécia, 28 de Junho a 2 de Julho de 2009, Invited Lecture.

89. PROTEIN STABILIZATION BY OSMOLYTES OF THERMOPHILIC ORGANISMS: DIVERSITY, PERFORMANCE AND MODE OF ACTION
VIIth Iberoamerican Congress of Biophysics, Búzios, Rio de Janeiro, Brasil, 30 de Setembro a 3 de Outubro de 2009, Plenary Lecture.

88. ECONOMIA OCEÂNICA: RECURSOS BIOLÓGICOS
Conferência "Portugal e o Mar", Assembleia da República, Comissão Parlamentar de Defesa Nacional, Lisboa, 15 e 20 de Maio de 2008, Invited Lecture.

87. DYNAMICS OF INTRACELLULAR METABOLITE POOLS BY NMR: INPUT FOR SYSTEMS BIOLOGY
Workshop on Metabolomics and Environmental Biotechnology, EC-US Task Force on Biotechnology Research, Palma de Mallorca, Spain, 16-17 de Junho de 2008. Invited Lecture.

86. THE ORGANIC SOLUTES OF HYPERTHERMOPHILES: DO THEY PLAY A ROLE IN THERMOADAPTATION?
XII International Congress of Bacteriology and Applied Microbiology, Istambul, Turquia, 5 a 8 de Agosto de 2008, Invited Lecture.

85. TIME SERIES MEASUREMENTS OF METABOLITE POOLS IN BACTERIA BY IN VIVO NUCLEAR MAGNETIC RESONANCE
Frontiers in Multi-Scale Systems Biology, Georgia Tech, Atlanta, USA, 18 a 21 de Outubro de 2008, Invited Lecture.

84. HYPERTHERMOPHILES AS SOURCES OF NEW PROTEIN STABILISERS

Lecture delivered at Institute of Technical Microbiology, Hamburg University of Technology, by invitation of the Director, Prof. G. Antranikian, Hamburg, 23 July, 2007.

83. OSMOLYTES OF HYPERTHERMOPHILES: BIOSYNTHESIS, MODE OF ACTION AND APPLICATIONS
7th International Meeting of the Portuguese Carbohydrate Group (GLUPOR 7), ITQB, Oeiras, Portugal, 12 a 15 de Setembro de 2007. Plenary Lecture.

82. HYPERTHERMOPHILES AS A SOURCE OF NEW PROTEIN STABILIZERS
Third International Congress on Biocatalysis (biocat 2006), Hamburgo, Alemanha, 3-7 Setembro, 2006. Invited Lecture.

81. OSMOLYTES OF HYPERTHERMOPHILES: BIOSYNTHESIS, REGULATION AND MODE OF ACTION
6Th International Congress on Extremophiles, Extremophiles 2006, Brest, França, 17-21 Setembro, 2006. Invited Lecture.

80. DYNAMICS OF INTRACELLULAR METABOLITE POOLS IN BACTERIA BY NMR: INPUT FOR SYSTEMS BIOLOGY
28TH ANNUAL MEETING OF THE MAGNETIC RESONANCE DISCUSSION GROUP OF THE SOCIETY OF GERMAN CHEMISTS: "Principles and Novel Applications of Modern Magnetic Resonance Methods". Tübingen, Alemanha, 25-29 de Setembro de 2006. Invited Lecture.

79. ON LINE MONITORING OF METABOLISM IN LIVING CELLS BY NMR
III Biannual Meeting of the Spanish NMR Group, Alicante, Espanha, 15-18 Outubro, 2006. Invited Lecture.

78. MICRORGANISMOS EXTREMÓFILOS: DA FISIOLOGIA ÀS APLICAÇÕES BIOTECNOLÓGICAS
VIII Jornadas em Biologia Aplicada, Universidade do Minho, Braga, Portugal, 9 a 11 de Novembro 2006. Invited Lecture.

77. LESSONS FROM EXTREME ENVIRONMENTS ON PROTEIN STABILIZATION: NOVEL OSMOLYTES FROM HYPERTHERMOPHILES
ANNUAL MEETING OF THE AMERICAN CHEMICAL SOCIETY, Session on **"Biocatalysis and Biotransformations Under Extreme Conditions",** San Diego, USA, 13 a 17 de Março de 2005. Invited Lecture.

76. METABOLISM OF *Desulfovibrio gigas* AND RUBREDOXIN STABILIZATION BY OSMOLYTES FROM HYPERTHERMOPHILES: CASE STUDIES OF MY COLLABORATION WITH JEAN LeGALL
"**Metals in Microbial Metabolism, LeGall Symposium"**, Athens, Georgia, USA, 6 de Maio de 2005. Invited Lecture.

75. INSIGHTS INTO SUGAR METABOLISM AND ITS CONTROL IN LACTIC ACID BACTERIA - THE INPUT FROM *IN VIVO* NMR STUDIES
"**SYMPOSIUM ON LACTIC ACID BACTERIA: GENETICS, METABOLISM AND APPLICATIONS**" Egmond aan Zee, Holanda, 28 de Agosto a 1 de Setembro de 2005. Invited Lecture.

74. BIOSYNTHESIS AND REGULATION OF CHEMICAL CHAPERONES IN MICROORGANISMS FROM HOT, MARINE ENVIRONMENTS
"**SECOND INTERNATIONAL MEETING ON STRESS RESPONSES IN BIOLOGY AND MEDICINE**" Tomar, Portugal, 24 a 28 de Setembro de 2005. Invited Lecture.

73. BIOSYNTHESIS, REGULATION AND APPLICATIONS OF COMPATIBLE SOLUTES OF MICROORGANISMS FROM HOT, MARINE ENVIRONMENTS
"**INTERNATIONAL SYMPOSIUM ON EXTREMOPHILES AND THEIR APPLICATIONS**" Tóquio, Japão, 29 de Novembro a 2 de Dezembro de 2005. Invited Lecture.

72. APRENDER A ESTABILIZAR PROTEÍNAS COM MICRORGANISMOS HIPERTERMÓFILOS
Seminários do Departamento de Engenharia Química e Biológica, Instituto Superior Técnico, Lisboa, 15 de Dezembro de 2005.

71. UNDERSTANDING PROTEIN STABILIZATION BY OSMOLYTES FROM HYPERTHERMOPHILES
Workshop on **"UNDERSTANDING PROTEIN STABILITY"** Estocolmo, Suécia, 8 a 14 de Maio de 2004. Invited Lecture.

70. *IN VIVO* NMR AS A TOOL TO DIRECT METABOLIC ENGINEERING STRATEGIES IN LACTIC ACID BACTERIA
Invited Lecture at EMBL (European Molecular Biology Laboratory), Heidelberg, Alemanha, by invitation of Dr. Luis Serrano, 22nd November 2004.

69. ESTRATÉGIAS DE ADAPTAÇÃO A AMBIENTES EXTREMOS EM MICRORGANISMOS HIPERTERMÓFILOS
Ciclo de Conferências 2002-2003 do Departamento de Química da Universidade de Lisboa, Lisboa, 9th April 2003.

68. *IN VIVO* NMR TO MEASURE KINETICS OF INTRACELLULAR METABOLITE POOLS IN LACTIC ACID BACTERIA: INPUT DATA FOR METABOLIC ENGINEERING
1st FEMS CONGRESS OF EUROPEAN MICROBIOLOGISTS, Lubliana, Eslovénia, 29 de Junho a 3 de Julho de 2003. Invited Lecture.

67. OSMO/THERMO-ADAPTATION IN HYPERTHERMOPHILIC ORGANISMS
GORDON RESEARCH CONFERENCE on **"Cellular Osmoregulation: Sensors, Transducers and Regulators,** Bristol, Rhode Island, EUA, 10 a 13 de Agosto de 2003. Invited Lecture.

66. NOVEL COMPATIBLE SOLUTES OF HYPERTHERMOPHILES: APPLICATIONS IN ENZYME STABILIZATION
ECCO XXII "Biological Resource Centres and the Use of Microbes", Braga, Portugal, 17 a 19 de Setembro de 2003. Invited Lecture.

65. *IN VIVO* NMR AS A TOOL TO DIRECT METABOLIC ENGINEERING STRATEGIES IN DAIRY BACTERIA
II Portuguese-Brazilian NMR Meeting, Sintra, Portugal, 23 a 26 de Setembro de 2003. Invited Lecture.

64. STRUCTURAL APPROACHES IN METABOLIC ENGINEERING OF DAIRY BACTERIA
1st Annual Meeting of the Portuguese Proteomic Network – PROCURA, Lisboa**,** Portugal, 17 de Novembro de 2003. Invited Lecture.

63. EXTREMÓFILOS: MICRORGANISMOS À PROVA DE AGRESSÕES AMBIENTAIS EXTREMAS
Conferências em Biotecnologia, "*Na Vida o Futuro*", Universidade Lusófona de Humanidades e Tecnologias, Lisboa, 23-24 April de Abril de 2002.

62. GENES AND ENZYMES FOR THE SYNTHESIS OF MANNOSYLGLYCERATE
THE 4TH INTERNATIONAL CONGRESS ON EXTREMOPHILES, Naples, Italy, 22-26 September 2002. Invited Lecture.

61. NUCLEAR MAGNETIC RESONANCE AS A TOOL IN THE STUDY OF MICROBIAL METABOLISM
COST 624 WG4 MEETING on "Microbial Tools: Application in Wastewater Treatment Processes", Lisboa, Portugal, 3 - 4 May 2001. Invited Lecture.

60. MAGNETIC RESONANCE SPECTROSCOPY (MRS) STUDIES ON SUPERFUSED IMMOBILISED CELLS
BRAIN ENERGY METABOLISM. NEUROTRANSMISSION, FUNCTION AND DYSFUNCTION, Trondheim, Norway, 19-23 May 2001. Invited Lecture.

59. HIPERTERMÓFILOS COMO FONTES DE NOVOS SOLUTOS COMPATÍVEIS: APLICAÇÃO DE HIPERSOLUTOS EM ESTABILIZAÇÃO DE ENZIMAS
Seminário proferido no INETI, Paço do Lumiar, Lisboa, 31st May 2001.

58. MONITORING THE KINETICS OF INTRACELLULAR METABOLITE POOLS IN *Lactococcus lactis* BY *IN VIVO* NMR
TENTH EUROPEAN CONGRESS ON BIOTECHNOLOGY, Madrid, Espanha, 8-11 July 2001. Invited Lecture.

57. COMPATIBLE SOLUTES FROM THERMOPHILES AND HYPERTHERMOPHILES: PROTAGONISTS WITH OVERLAYING ROLES IN OSMO- AND THERMOADAPTATION
HALOPHILES 2001. INTERNATIONAL CONFERENCE ON HALOPHILIC MICROORGANISMS, Sevilla, Espanha, 23-27 September 2001. Invited Lecture.

56. NOVEL COMPATIBLE SOLUTES FROM HYPERTHERMOPHILES: APPLICATION FOR STABILIZATION OF ENZYMES
SECOND INTERNATIONAL CONFERENCE ON PROTEIN STABILIZATION, "Biomolecule Stabilization: From Molecular Interpretation to Bio-Industrial Applications", Lisboa, Portugal, 9-12 April, 2000. Invited Lecture.

55. KINETICS OF INTRACELLULAR METABOLITE POOLS IN *Lactococcus lactis* MONITORED BY *IN VIVO* NMR
XIX INTERNATIONAL CONFERENCE ON MAGNETIC RESONANCE IN BIOLOGICAL SYSTEMS, Florence, Italy, 20-25 August, 2000. Invited Lecture.

54. THERMO-OSMOADAPTATION IN THERMOPHILES AND HYPER-THERMOPHILES: BIOSYNTHESIS OF COMPATIBLE SOLUTES AND APPLICATION AS PROTEIN STABILIZERS
THE 3RD INTERNATIONAL CONGRESS ON EXTREMOPHILES, Hamburg, Germany, 3-7 September, 2000. Invited Lecture.

53. ON LINE MONITORING OF METABOLISM IN LIVING CELLS BY NMR
IV CONGRESO IBEROAMERICANO DE BIOFÍSICA, Alicante, Spain, 11-14 October 2000. Invited Lecture.

52. COMPATIBLE SOLUTES FROM HYPERTHERMOPHILES: APPLICATIONS FOR STABILIZATION OF ENZYMES
INTERNATIONAL BUSINESS COMMUNICATIONS'S WORLD CONGRESS on "Enzyme Technologies", San Francisco, USA, 10-12 March 1999. Invited Lecture.

51. COMPARATIVE STUDY OF THE PERFORMANCE OF MANNOSYLGLYCERATE AND OTHER ORGANIC SOLUTES IN THE THERMOPROTECTION OF MODEL ENZYMES
THIRD MEETING ON EXTREMOPHILES AS CELL FACTORIES, Graz, Austria, 3-6 June, 1999.

50. SOLUTES FROM HYPERTHERMOPHILES: MANNOSYLGLYCERATE AND DI-GLYCEROL-PHOSPHATE AS ENZYME STABILIZERS
Scientific Meeting on "PRODUCTION & APPLICATION OF COMPATIBLE SOLUTES", Witten, Germany, 17 September 1999. Invited Lecture.

49. NEW COMPATIBLE SOLUTES FROM HYPERTHERMOPHILES
CHINA-EU WORKSHOP ON EXTREMOPHILES, Xinjiang, China, 18-27 August 1998. Invited Member of the European Delegation.

48. NOVEL ORGANIC SOLUTES FROM HYPERTHERMOPHILES
International Conference "THERMOPHILES 98", Brest, France, 6-11 September 1998. Plenary Conference.

47. BIOCHEMICAL STRATEGIES FOR ADAPTATION TO EXTREME ENVIRONMENTS
XI CONGRESSO NACIONAL DE BIOQUÍMICA, Tomar, Portugal, 28-30 November 1998. Plenary Lecture.

46. ORGANIC SOLUTES FROM HYPERTHERMOPHILES: STABILIZING EFFECTS ON ENZYMES
BIOCHEMISTRY AT 100°C: HOW ARE ENZYMES AND THEIR SUBSTRATES STABILIZED? Cold Spring Harbor Laboratory, NY, USA, 6-9 December 1998. Invited Lecture.

45. COMPATIBLE SOLUTES FROM HYPERTHERMOPHILIC ORGANISMS: ROLE AS ENZYME STABILIZERS
Departament of Microbiology, University of Groningen, The Netherlands. Host: Prof. W. Konings. February 7, 1997.

44. RESPONSES TO TEMPERATURE AND SALT STRESS IN HYPERTHERMOPHILIC ORGANISMS
EUROCONFERÊNCIA DA EUROPEAN FEDERATION OF BIOTECHNOLOGY - Microbial Responses to Stress: what's new and how can it be applied?, Sesimbra, Portugal, 15-18 March 1997. Invited Lecture.

43. NMR TECHNIQUES USED TO DETERMINE THE PATHWAYS INVOLVED IN BIOLOGICAL PHOSPHORUS REMOVAL
COST MEETING ON BIOLOGICAL PHOSPHORUS REMOVAL, Gent, Belgium, 10-12 April 1997.

42. CARBON METABOLISM IN BIOLOGICAL PHOSPHORUS REMOVAL AS STUDIED BY NMR *IN VIVO*
Symposium on "NMR IN ENVIRONMENTAL SCIENCES", Wageningen NMR Centre, Wageningen, The Netherlands, 24 October 1997. Invited Lecture.

41. APPLICATION OF NUCLEAR MAGNETIC RESONANCE TO STUDY MICROBIAL PHYSIOLOGY
Chemistry Department, Université Blaise-Pascal, Clermont-Férrand, France, 28 October 1997.

40. VIVER EM AMBIENTES INÓSPITOS
Colóquio "DA QUÍMICA À BIOLOGIA E À SOCIEDADE", Academia das Ciências de Lisboa, Portugal, 24 November 1997.

39. APPLICATIONS OF *IN VIVO* NMR TO MICROBIAL PHYSIOLOGY
WORKSHOP ON STRUCTURAL BIOLOGY, Advances in X-Ray Analysis, NMR, Modeling and Design, Cambridge, United Kingdom, 12-13 January 1997. Invited Lecture.

38. NOVEL COMPATIBLE SOLUTES IN HYPERTHERMOPHILIC ORGANISMS
Departament of Microbiology, University of Groningen, The Netherlands, 26 January 1996.

37. BRAIN CELL IMMOBILIZATION FOR *IN VIVO* NMR MONITORING OF BIOCHEMICAL PROCESSES
14TH MEETING ON THE EUROPEAN SOCIETY FOR ANIMAL CELL TECHNOLOGY, Vilamoura, Portugal, 20-24 May 1996. Invited Lecture.

36. NOVEL COMPATIBLE SOLUTES IN THERMOPHILIC OR HYPER-THERMOPHILIC *BACTERIA* AND *ARCHAEA*
FIRST INTERNATIONAL CONGRESS ON EXTREMOPHILES, Estoril, Portugal, 2-6 June 1996.

35. APPLICATIONS OF NUCLEAR MAGNETIC RESONANCE TO STUDY MICROBIAL METABOLISM
7TH EUROPEAN CONGRESS ON BIOTECHNOLOGY, Nice, France, 19-23 February 1995.

34. APPLICATIONS OF NUCLEAR MAGNETIC RESONANCE TO STUDY BACTERIAL METABOLISM
Departament of Microbiology, Georg-August-Universität Göttingen, Germany, 25 April 1995. By invitation of Prof. G. Gottschalk.

33. ACCUMULATION OF INTRACELLULAR SOLUTES IN HYPERTHERMOPHILES IN RESPONSE TO TEMPERATURE AND SALINITY. CARBOHYDRATE METABOLISM
THIRD MEETING ON BIOTECHNOLOGY OF EXTREMOPHILES, Sevilla, Spain, 14-17 May 1995.

32. APPLICATIONS OF *IN VIVO* NUCLEAR MAGNETIC RESONANCE TO MONITOR INTRACELLULAR POOLS DURING FERMENTATION
BIOCHEMICAL ENGINEERING IX: Interdisciplinary Foundations for Creating New Biotechnology, Davos, Switzerland, 21-26 May 1995.

31. THE USE OF NUCLEAR MAGNETIC RESONANCE TO STUDY TRANSPORT AND METABOLISM IN MICROORGANISMS
INTERNATIONAL CONFERENCE TRANSPORT, SIGNALLING AND ITS METABOLIC CONSEQUENCES IN MICRO-ORGANISMS, Leuven, Belgium, 2-5 September 1995. Invited Lecture.

30. APPLICATIONS OF NMR TO INVESTIGATE CARBON AND PHOSPHORUS METABOLISM IN WHOLE CELLS
FIRST PORTUGUESE-SPANISH BIOPHYSICS CONGRESS, Lisboa, Portugal, 4-7 December 1995. Invited Lecture.

29. *IN VIVO* NMR STUDIES OF THE AEROBIC METABOLISM OF INTERNAL RESERVES BY THE "STRICT ANAEROBE" *Desulfovibrio gigas*
XVITH INTERNATIONAL CONFERENCE ON MAGNETIC RESONANCE IN BIOLOGICAL SYSTEMS, Veldhoven, The Netherlands, 14-19 August 1994. Invited Lecture.

28. STRUCTURE AND DYNAMICS OF THE HAEM POCKET IN *Methylophilus methylotrophus* CYTOCHROME *c*', A HAEM PROTEIN COUPLING ELECTRON AND PROTON TRANSFER
EUROBIC II, Metal Ions in Biological Systems, Florence, Italy, 30 August 3rd September 1994. Invited Lecture.

27. NMR STUDIES ON METABOLISM OF LACTIC ACID BACTERIA INVOLVED IN WINE FERMENTATION

THE SECOND INTERNATIONAL CONFERENCE ON APPLICATIONS OF MAGNETIC RESONANCE IN FOOD SCIENCE, University of Aveiro, Aveiro, Portugal, 19-21 September 1994. Invited Lecture.

26. AEROBIC UTILIZATION OF CARBON RESERVES BY THE "OBLIGATE ANAEROBE" *Desulfovibrio gigas*
XIITH INTERNATIONAL SYMPOSIUM ON BIOELECTROCHEMISTRY AND BIOENERGETICS, Sevilla, Spain, 25-30 September 1994. Invited Lecture.

25. SUGAR METABOLISM AND REGULATION IN LACTIC ACID BACTERIA FROM WINE
II CONGRESSO IBÉRICO DE BIOTECNOLOGIA, VII CONGRESSO DA SOCIEDADE PORTUGUESA DE BIOTECNOLOGIA, V CONGRESSO DA SOCIEDADE ESPANHOLA DE BIOTECNOLOGIA, Vilamoura, Portugal, 1-4 October 1994. Invited Lecture.

24. ESTUDOS DE METABOLISMO BACTERIANO POR RMN *IN VIVO*: APLICAÇÕES A BACTÉRIAS PRODUTORAS DE ÁCIDO LÁCTICO
SIMPÓSIO NACIONAL DE MICROBIOLOGIA APLICADA E BIOTECNOLOGIA - 1as Jornadas de Biologia de Leveduras Prof. Nicolau van Uden, Luso, Portugal, 28 February to 3 March 1993. Invited Lecture.

23. APLICAÇÕES DE RESSONÂNCIA MAGNÉTICA NUCLEAR AO ESTUDO DO METABOLISMO MICROBIANO *IN VIVO*
ESTUDOS AVANÇADOS DA UNIVERSIDADE DE COIMBRA, Seminários Interdisciplinares Portugal, 28 May 1993.

22. APPLICATION OF NMR TO ELUCIDATE STRUCTURE/FUNCTION RELATIONSHIPS IN HAEM PROTEINS
EUROPEAN RESEARCH CONFERENCE ON CHEMISTRY OF METALS IN BIOLOGICAL SYSTEMS, Albufeira, Portugal, 4-9 June 1993.

21. PATHWAY AND REGULATION OF ERYTHRITOL PRODUCTION BY *Leuconostoc oenos*
Departament of Microbiology, University of Groningen, hosted by Prof. W. Konings, The Netherlands, 12 July 1993.

20. STRUCTURE/FUNCTION RELATIONSHIP IN *Methylophilus methylotrophus* CYTOCHROME *c*'
II ENCONTRO DA ASSOCIAÇÃO PORTUGUESA DE RESSONÂNCIA MAGNÉTICA, Curia, Portugal, 17-18 October 1993. Invited Lecture.

19. PATHWAY AND REGULATION OF ERYTHRITOL BIOSYNTHESIS BY *Leuconostoc oenos*: AN *IN VIVO* NMR STUDY
BIOTECHNOLOGY IN ANIMALS AND MICROORGANISMS, Conferência das Regiões do Sul da Europa Atlântica, Espinho, Portugal, 4-7 November 1993. Invited Lecture.

18. ESTUDOS DE FISIOLOGIA BACTERIANA POR NMR *IN VIVO*

9º CONGRESSO NACIONAL DE BIOQUÍMICA, Sociedade Portuguesa de Bioquímica, Albufeira, Portugal, 5-8 December 1993. Invited Lecture.

17. APPLICATIONS OF *IN VIVO* NMR TO INVESTIGATE METHANE BIOPRODUCTION
H. Santos
13º ENCONTRO DA SOCIEDADE PORTUGUESA DE QUÍMICA, Instituto Superior Técnico, Lisboa, Portugal, 29 January to 2 February 1992. Invited Lecture.

16. ESTUDOS DE METABOLISMO EM SISTEMAS VIVOS POR RESSONÂNCIA MAGNÉTICA NUCLEAR
H. Santos
ESTUDOS AVANÇADOS DA UNIVERSIDADE DE COIMBRA, Seminários Interdisciplinares, Portugal, 20 de Março, 1992.

15. NUCLEAR MAGNETIC RESONANCE STUDIES OF METABOLISM IN LACTIC ACID BACTERIA
H. Santos
SECOND MEETING OF CONTRACTORS OF THE BRIDGE T-PROJECT ON LACTIC ACID BACTERIA, Cork, Ireland, 23-27 May 1992.

14. STRUCTURE/FUNCTION RELATIONSHIP IN CYTOCHROME *c*" FROM *Methylophilus methylotrophus*
H. Santos, H. Costa, D. L. Turner & A. V. Xavier
EENC 92 - 11th European Experimental NMR Conference, Lisboa, Portugal, 14-19 June, 1992. Invited Lecture.

13. *IN VIVO* NMR METABOLIC STUDIES OF *Propionibacterium acidi-propionici*
H. Santos
XV INTERNATIONAL CONFERENCE ON MAGNETIC RESONANCE IN BIOLOGICAL SYSTEMS, Jerusalém, Israel, 16-21 August, 1992. Invited Lecture.

12. INTRODUCTION TO NMR SPECTROSCOPY
H. Santos
FEBS ADVANCED COURSE, Oeiras, Portugal, 6-18 September, 1992.

11. BIOLOGICAL PHOSPHORUS REMOVAL FROM WASTE WATER; STUDIES ON BACTERIAL METABOLISM BY *IN VIVO* NMR
H. Santos
EUROPEAN RESEARCH CONFERENCE ON NATURAL WATERS AND WATER TECHNOLOGY: Organic Matter in Natural Waters and Water Technology; Espinho, Portugal, 4-8 October, 1992. Invited Lecture.

10. *IN VIVO* NUCLEAR MAGNETIC RESONANCE (NMR) STUDIES OF THE METABOLISM OF METHANOGENS
H. Santos
IV PORTUGUESE-SPANISH BIOCHEMISTRY CONGRESS, Póvoa de Varzim, Portugal, 29 September to 2 October, 1991. Invited Lecture.

9. KINETICS OF ^{15}N ASSIMILATION BY ROOTS OF MAIZE (*Zea mays* L.) SEEDLINGS AS INVESTIGATED BY *IN VIVO* ^{15}N-NMR
S. Amâncio & **H. Santos**
IV PORTUGUESE-SPANISH BIOCHEMISTRY CONGRESS, Póvoa de Varzim, Portugal, 29 de Setembro - 2 de Outubro de 1991.

8. ESTUDOS *IN VIVO* DE METABOLISMO DE PLANTAS E OUTROS ORGANISMOS ATRAVÉS DE RESSONÂNCIA MAGNÉTICA NUCLEAR
H. Santos
Facultad de Ciências, Universidade de Badajoz, Spain, 22 November,1991.

7. APPLICATION OF NUCLEAR MAGNETIC RESONANCE TECHNIQUES TO STUDY THE METABOLISM OF MICROORGANISMS AND PLANTS
H. Santos
Department of Microbiology, Agricultural University Wageningen, The Netherlands, 23 February 1989.

6. *IN VIVO* NUCLEAR MAGNETIC RESONANCE STUDIES OF THE METABOLISM OF METHANOGENIC BACTERIA
H. Santos, P. Fareleira, R. Toci, Y. Berlier, J. LeGall & A. V. Xavier
SIXTH INTERNATIONAL SYMPOSIUM ON MICROBIAL GROWTH ON C1 COMPOUNDS, Gottingen, Germany, 20-25 August 1989. Invited Lecture.

5. *IN VIVO* NMR STUDIES OF THE METABOLISM AND BIOENERGETICS OF *Methanosarcina barkeri*
H. Santos
FEMS SYMPOSIUM 1988 on Microbiology of Extreme Environments and its Potential for Biotechnology, Tróia, Portugal, 18-23 September 1988. Invited Lecture.

4. STUDIES OF LIVING SYSTEMS USING NUCLEAR MAGNETIC RESONANCE - APPLICATIONS TO PLANTS
H. Santos
8º CONGRESSO NACIONAL DE BIOQUÍMICA, Póvoa de Varzim, 29 November to 2 December 1987. Invited Lecture.

3. NMR STUDIES OF ELECTRON TRANSFER MECHANISMS IN CYTOCHROME c_3
H. Santos
Seminário proferido no Departmento de Química da Universidade de Leicester, Reino Unido, Junho, 1985.

2. *IN VIVO* NMR STUDIES ON THE METABOLISM OF BACTERIA
H. Santos
Seminário proferido no Centre d'Études Nucléaires de Cadarache, França, Novembro, 1985.

1. MECHANISMS OF ELECTRON TRANSFER IN CYTOCHROMES
H. Santos
JORNADAS DE BIOQUÍMICA, Complexo Interdisciplinar, Lisboa, Portugal, 14-15 de Dezembro, 1981.