

B. Project leader

B1. Scientific visibility and prestige (maximum 2 pages)

B.1.1. Main research results.

Most of my research projects focused on, the study of extremophiles metabolism, the evolution and structural and functional molecular adaptation mechanisms to extreme conditions. The main results encompass:

1. Cloning and characterization of carbamoylphosphate synthetases (CPS) from the human gut archaeon *Methanobrevibacter smithii*
2. Cloning and structural characterization of the first archaeal aspartate transcarbamoylase (ATC) from the deep-sea hyperthermophilic archaeon *Pyrococcus abyssi*.
3. Discovery and characterization of a novel CPS type from *P. abyssi* related to carbamate kinases.
4. Identification and characterization of the channeling mechanism for protecting thermolabile intermediates in hyperthermophilic microorganisms.
5. Isolation and characterization of ATC from hyperthermophilic bacterium *Aquifex aeolicus*.
6. Identification, cloning and characterization of the ancestral type CPS from *A. aeolicus*.
7. Study of CPS reaction mechanism using *A. aeolicus* CPS subunits.
8. Cloning and characterization of the *A. aeolicus* dihydroorotase (DHO).
9. Crystallization and structure determination of first DHO (class I) from *A. aeolicus*
10. Reconstitution of a mammalian type of multifunctional protein from bacterial enzymes.
11. Study of Ser/Thr protein kinase from *A. aeolicus*: identification of one of the most primitive metabolic regulatory system.
12. Archaeal identification in ecosystems from Movile cave (Romania).

B.1.2. The visibility of the scientific contributions.

AWARDS

1. *Valedictorium, Faculty of Biochemistry, Polytechnic Institute of Bucharest, 1988*
2. Doctorate in Enzymology, Highest distinction « *Très honorable avec félicitations du jury* », University Paris XI, France 1995.
3. *First prize - poster at XI Anniversary Scientific Conference “Biology-Traditions and Challenges”, Molecular Biology Session, Sofia – Bulgaria, 2009.*

GUEST SPEAKER Rutgers University, Cook College, New Brunswick, USA. March 9, 2001

CONFERENCES: participation at 30 scientific conferences (26 international and 4 national) with 17 oral presentations and 22 posters

REVIEWER for the International Peer Review journals: Journal of Biological Chemistry, Biochemistry, Protein Science and Archaea

SCIENTIFIC PROOFREADER *Introduction a l'analyse genetique*, by Griffiths, Miller, Suzuki, Lewontin and Gelbert. Bruxelles, DeBoeck Universite, 1997 - XVIII-918 p.

DOCTORATE COMMITTEE MEMBER: Vrije University, Brussels, Belgium, January 2002; Institute of Biochemistry Bucharest, Romania, June 2010 and November 2010.

DOCTORATE ADVISOR: Biology specialty, Romanian Academy Doctoral School, since 2010

DATA BASE: determination of 6 gene sequences and crystallographic coordinates

GRANTS AND FELLOWSHIPS

Project leader

1. National Exploratory program « Ideas », Contract nr. 1023/2008 (2009-2011)
2. Exploratory workshop grant (September 18-19, 2008)
3. National program CEEEX. Contract nr. 1491/2006 (2006-2008)
4. European project EUREKA. Avidis S.A. Clermont-Ferrand, France. (2002-2003)

Collaborations

1. Grant CNMP of Romanian MEC, contract nr. 32-142/2008 (2008-2010)
2. Grant PNCDI2 of Romanian MEC. Contract nr. 2497. 2008-2010.
3. Grant CEEEX of Romanian MEC. Contract nr 2999/2006. 2006-2008.
4. National Science Foundation U.S.A. (grant MCB-9810325) Wayne State University, Detroit, USA, 1998-2004 (participant).
5. Grant G.0040.96, Flanders Nationaal Fonds voor Wetenschappelijk Onderzoek, Belgium, 1995-1996.
6. Grant 1-96-3-21-145-0 Onderzoeksraad (OZR), Belgium, 1995-1996.

Research fellowships

1. French Government Fellowship for *Diplome d'Etudes Approfondies* (1990-1991) and *Doctorate* (1991-1994), University Paris XI, France.
2. Federation of European Biochemical Societies (FEBS) grant, Vrije University Brussels, Belgium (1995)
3. International Human Frontiers Science Program (HFSP) grant SF-339/94, University Vrije, Brussels, Belgium (1995)

Affiliation

- Member of CNATDCU, Biology and Biochemistry Commission, 2011-2014
- Federation of European Microbiology Society (FEMS), 2009
- American Society for Microbiology (ASM), U.S.A. 1993-1996
- Société Française de Biochimie et Biologie Moléculaire (SFBBM), France 1992-1996
- Groupe de Recherche BACTOCEAN, France 1991-1993

B2. Curriculum vitae (max. 4 pages)

EDUCATION

- 1991-1995 Doctorate in Enzymology, University Paris XI, Paris, France
1990-1991 Diplôme d'Etude Approfondie in Enzymology, University Paris XI, Paris, France
1983-1988 Bachelors in Biology, specialty Biochemistry, Politechnical Institute of Bucharest,
Faculty of Biochemistry, Bucharest, Romania

PROFESSIONAL POSITIONS

- 2007- present Senior research scientist CSI, Institute of Biology Bucharest of Romanian
Academy, Romania
2005-2007 Senior research scientist CSIII, Institute of Cellular Biology and
Pathology "N. Simionescu", Bucharest, Romania
2001-2002 Researcher, Project manager, Product Manager, Avidis S.A., Clermont-
Ferrand, France
1997-2001, 2003-2005 Research Associate, Wayne State University School of Medicine, Detroit,
MI, USA
1995-1996 Postdoctoral Fellow, Vrije University, Brussels, Belgium
1990-1993 Research Scientist, Institute of Biochemistry, Bucharest, Romania
1988-1990 Biologist, Petrochemical plant Brazi, Romania

PUBLICATIONS

Book chapters

1. Purcarea C (2009) Adaptari moleculare la temperaturi inalte. Vol. Adaptarea la stres: conditie de supravietuire si/sau factor de biodiversitate. Ed. Acad. Romane. p 43-50
2. Purcarea C (2001) *Aspartate transcarbamoylase from Pyrococcus abyssi*, vol. Hyperthermophilic Enzymes in *Methods in Enzymology* (Ed. M.W.W. Adams and R.M. Kelly), Acad. Press, San Diego, CA, U.S.A., vol 331, p 248-270

Articles

1. Popa E, Rusu A, Zamfir M, Dumitru L, Purcarea C (2009) An ammonia-metabolizing enzyme from the human archaeon *Methanobrevibacter smithii* might represent a missing link in the evolution of carbamoyl phosphate synthetases. *Biotechnology and Biotechnological Equipment*, 23(2): 533-537.

2. Zhang P, Martin PD, Purcarea C, Vaishnav A, Brunzelle JS, Fernando R, Guy-Evans HI, Evans DR, Edwards BF (2009) Dihydroorotase from the hyperthermophile *Aquifex aeolicus* is activated by stoichiometric association with aspartate transcarbamoylase and forms a one-pot reactor for pyrimidine biosynthesis. *Biochemistry*. 48: 766-78
3. Purcarea, C. Roshini, F., Guy, HI, Evans DR. The Sole Serine/threonine Protein Kinase and its Cognate Phosphatase from *Aquifex aeolicus* Targets Pyrimidine Biosynthesis. (2008) *Mol Cell Biochem*. 311:199-213
4. Martin P, Purcarea C, Vickrey JF, Evans DR, Guy HI, Edwards BFP (2005) The crystal structure of a novel, one-zinc dihydroorotase from *Aquifex aeolicus*. *J Mol Biol*. 348:535-47.
5. Kothe M, Purcarea C, Guy H, Evans DR, Powers-Lee S (2005) Direct Demonstration of Carbamoyl Phosphate Formation on the C-terminal Domain of Carbamoyl Phosphate Synthetase. *Protein Sci*. 14, 37-44
6. Ahuja A, Purcarea C, Ebert R, Guy HI, Evans DR (2004) *Aquifex aeolicus* dihydroorotase: association with aspartate transcarbamoylase switches on catalytic activity. *J Biol Chem*. 279, 53136-53144
7. Purcarea C, Lu T, Ahuja A, Kovari L, Evans DR (2003) *Aquifex aeolicus* aspartate transcarbamoylase: an enzyme specialized for the efficient utilization of unstable carbamoyl phosphate at elevated temperature. *J. Biol. Chem*. 27, 52924-52934.
8. Purcarea C, Martin P, Vickrey JF, Guy HI, Edwards BFP, Evans DR (2002) Cloning, Expression and Preliminary X-ray Analysis of the Dihydroorotase from the Hyperthermophilic Eubacterium *Aquifex aeolicus*. *Acta Crystallographica Section D Biological Crystallography* 58, 154-156
9. Ahuja A, Purcarea C, Guy HI, Evans DR (2001) A novel carbamoyl phosphate synthetase from *Aquifex aeolicus*. *J. Biol. Chem*. 276:45694-45703.
10. Purcarea C, Herve G, Cunin R, Evans DR (2001) Cloning, expression and structure analysis of carbamate kinase-like carbamoyl phosphate synthetase from *Pyrococcus abyssi*. *Extremophiles*. 5:229-239.
11. Simon V, Purcarea C, Sun K, Joseph J, Frebourg G, Lechaire J-P, Gaill F, Herve G (2000) The enzymes involved in synthesis and utilization of carbamylphosphate in the deep-sea tube worm *Riftia pachyptila*. *Marine Biology*, 136:115-127.
12. Watrin L, Lucas S, Purcarea C, Legrain C, Cunin R, Prieur D (1999) Isolation and characterization of pyrimidine auxotrophs and molecular cloning of the *pyrE* gene from the hyperthermophilic archaeon *Pyrococcus abyssi*. *Mol. Gen. Genet*. 262:378-381.

13. Purcarea C, Evans DR, Herve G (1999) Channeling of carbamoyl phosphate to the pyrimidine and arginine biosynthetic pathways in the deep-sea hyperthermophilic archaeon *Pyrococcus abyssi*. *J. Biol. Chem.* 274: 6122-6129.
14. Labedan B, Boyen A, Baetens M, Charlier D, Chen P, Cunin R, Durbecq V, Glansdorff N, Herve G, Legrain C, Liang Z, Purcarea C, Roovers M, Sanchez R, Toong TL, Van de Castele M, Van Vliet F, Xu Y, Zhang Y-F (1999) The evolutionary history of carbamoyltransferases: a complex set of paralogous genes was already present in the last universal common ancestor. *J. Mol. Evol.*, 49: 461-473.
15. Purcarea C, Herve G, Ladjimi MM, Cunin R (1997) Aspartate transcarbamylase from the deep-sea hyperthermophilic archaeum *Pyrococcus abyssi*; genetic organization, structure and expression in *Escherichia coli*. *J. Bacteriol.* 179:4143-4157.
16. Purcarea C, Herve G, Ladjimi MM, Cunin R (1997) Aspartate transcarbamylase from the hyperthermophilic deep-sea archaeum *Pyrococcus abyssi* I. Cloning, functional and structural analysis. *Arch Physiol Biochim*, 104:B58
17. Purcarea C, Herve G, Cunin R (1997) Aspartate transcarbamylase from the hyperthermophilic deep-sea archaeum *Pyrococcus abyssi* II. Expression in the mesophilic eubacterial host *Escherichia coli*. *Arch Physiol Biochim*, 104:B59
18. Purcarea C, Simon V, Prieur D, Herve G (1996) Purification and characterization of carbamylphosphate synthetase from the deep-sea hyperthermophilic archaeobacterium *Pyrococcus abyssi*. *Eur. J. Biochem.* 236:189-199.
19. Purcarea C, Herve G, Cunin R (1996) Aspartate transcarbamylase from a deep sea hyperthermophilic archaea (*Pyrococcus abyssi*). *FASEB J*, 10:A123.
20. Purcarea C, Erauso G, Prieur D, Herve G (1994) The catalytic and regulatory properties of aspartate transcarbamoylase from *Pyrococcus abyssi*, a new deep-sea hyperthermophilic archaeobacterium. *Microbiology.* 140:1967-1975.
21. Sahini VE, Pop C, (1989) A molecular orbital approach to some radiogenetic mechanisms. *Revue Roumaine de Chimie.* 34(1): 253-257.

Hirsch Index: Web of Science - 8, Google Scholar - 9

Citations: Web of Science - 195 , Google Scholar - 232

B3. Scientific contributions from the period 2001-2011

1. Purcarea C, Roshini F, Guy HI, Evans DR. The Sole Serine/threonine Protein Kinase and its Cognate Phosphatase from *Aquifex aeolicus* Targets Pyrimidine Biosynthesis. *Mol Cell Biochem.* 311:199-213 (2008) **citations 1**
2. Martin P, Purcarea C, Vickrey JF, Evans DR, Guy HI, Edwards BFP. The crystal structure of a novel, one-zinc dihydroorotase from *Aquifex aeolicus*. *J Mol Biol.* 348:535-47 (2005) **citations 11**
3. Kothe M, Purcarea C, Guy H, Evans DR, Powers-Lee S. (2005) Direct Demonstration of Carbamoyl Phosphate Formation on the C-terminal Domain of Carbamoyl Phosphate Synthetase. *Protein Sci.* 14, 37-44 **citations 9**
4. Ahuja A, Purcarea C, Ebert R, Guy HI, Evans DR. *Aquifex aeolicus* dihydroorotase: association with aspartate transcarbamoylase switches on catalytic activity. *J Biol Chem.* 279, 53136-53144 (2004) **citations 6**
5. Purcarea C, Lu T, Ahuja A, Kovari L, Evans DR. *Aquifex aeolicus* aspartate transcarbamoylase: an enzyme specialized for the efficient utilization of unstable carbamoyl phosphate at elevated temperature. *J. Biol. Chem.* 27, 52924-52934 (2003) **citations 1**
6. Purcarea C, Martin P, Vickrey JF, Guy HI, Edwards BFP, Evans DR. Cloning, Expression and Preliminary X-ray Analysis of the Dihydroorotase from the Hyperthermophilic Eubacterium *Aquifex aeolicus*. *Acta Crystallographica Section D Biological Crystallography* 58, 154-156 (2002) **citations 4**
7. Ahuja A, Purcarea C, Guy HI, Evans DR. A novel carbamoyl phosphate synthetase from *Aquifex aeolicus*. *J. Biol. Chem.* 276:45694-45703 (2001) **citations 4**
8. Purcarea C, Herve G, Cunin R, Evans DR. Cloning, expression and structure analysis of carbamate kinase-like carbamoyl phosphate synthetase from *Pyrococcus abyssi*. *Extremophiles.* 5:229-239 (2001) **citations 12**
9. Purcarea C, *Aspartate transcarbamoylase from Pyrococcus abyssi*, vol. Hyperthermophilic Enzymes in *Methods in Enzymology* (Ed. M.W.W. Adams and R.M. Kelly), Acad. Press, San Diego, CA, U.S.A., vol 331, p 248-270 (2001) **citations 2**