



Prof. Rafael Vicuña Professor



Most important awards, prizes and academies

Honours: Fulbright Foundation, travel fellowship (1974, 1978); Albert Einstein College of Medicine, NY, fellowship for Ph.D. studies (1974-78); International Union of Biochemistry, travel fellowship (1979); John Simon Guggenheim Memorial Foundation fellowship (1986); officially invited by the Chinese Government (mainland) to visit academic institutions (1989) and by the DFG to visit academic institutions in Germany (1998). *Academies:* Chilean Society of Biology (1973); Chilean Society of Biochemistry and Molecular Biology (1973, President 1997-99); American Society for Microbiology (1974); Association for Politics and the Life Sciences, USA (1987); Technical Association of the Pulp and Paper Industry, TAPPI, USA (1988-2000); Third World Academy of Sciences (1993); Chilean Society of Microbiology (1996); International Academy of Wood Science (1996); Latin American Academy of Sciences (1999); Chilean Academy of Sciences (1999, Vice-President 2001-03); Pontifical Academy of Sciences (2000).

Summary of scientific research

Major accomplishments in the field of biochemistry of nucleic acids: the identification and characterization of two protein factors that selectively inhibit viral DNA from fX174 phage from using the replication machinery of other single stranded DNA phages; the isolation and thorough characterization of plasmids and the restriction-modification system of the extremely thermophilic

bacterium *Thermus thermophilus*; the purification and characterization of DNA polymerase from *T. thermophilus*, an enzyme that is widely used today in PCR experiments. On the other hand, some achievements in the field of microbial degradation of lignin are: the isolation, identification and characterization of natural bacterial strains able to metabolize lignin model compounds; the elucidation of metabolic pathways involving novel catabolic intermediates; the discovery of the new enzyme benzaldehyde lyase, a proposition for its reaction mechanism and cloning and sequencing of the corresponding gene; finding that the ligninolytic system of the basidiomycete *Ceriporiopsis subvermispora* is composed of a manganese-dependent peroxidase and the copper containing phenol oxidase called laccase. Discovery of a new family of multicopper oxidases in the fungus *Phanerochaete chrysosporium*. Discovery of a transcription factor responding to copper in the same fungus. Proposition of a novel mechanism for the production of the extracellular hydrogen peroxide required as a substrate by MnP in cultures of *C. subvermispora*. Co-director of the genome project of the same fungus. Current work deals with microbial life in extremely arid environments.

Main publications

R. Vicuña, J. Hurwitz, S. Wallace, M. Girard. Selective inhibition of in vitro DNA synthesis dependent on Φ X174 compared with fd DNA. I. Protein requirements for selective inhibition. *J. Biol. Chem.* 252, 2524-33, 1977; A. Venegas, M. Motles, C. Vásquez, R. Vicuña. Conditions affecting DNA cleavage by TthI at a TthI endonuclease-dam methylase overlapping sequence. *FEBS Lett.* 130, 272-4, 1981; C. Rüttimann, M. Cotorás, J. Zaldívar, R. Vicuña. DNA polymerases from the extremely thermophilic bacterium *Thermus thermophilus* HB-8. *Eur. J. Biochem.* 149, 41-6, 1985; B. González, R. Vicuña. Benzaldehyde lyase from *Pseudomonas fluorescens* biovar I: a novel thiamine pyrophosphate-requiring enzyme. *J. Bacteriol.* 171, 2401-5, 1989; U. Urzúa, P. Kersten, R. Vicuña. Kinetics of Mn³⁺-oxalate in reactions catalyzed by manganese peroxidase of *Ceriporiopsis subvermispora*. *Arch. Biochem. Biophys.* 360, 215-22, 1998; L. Larrondo, S. Lobos, P. Stewart, D. Cullen, R. Vicuña. Isoenzyme multiplicity and characterization of recombinant manganese peroxidases (rMnPs) from *Ceriporiopsis subvermispora* and *Phanerochaete chrysosporium*. *Appl. Environ. Microbiol.* 67, 2070-5, 2001; A. Manubens, M. Avila, P. Canessa, R. Vicuña. Differential regulation of genes encoding manganese peroxidase (MnP) in the basidiomycete *Ceriporiopsis subvermispora*. *Current Genetics* 43, 433-8, 2003; L. Larrondo, B. González, D. Cullen R. Vicuña. Characterization of a multicopper oxidase gene cluster in *Phanerochaete chrysosporium* and evidence of altered splicing of the *mco* transcripts. *Microbiology* 150, 2775-83, 2004; P. Canessa, J.M. Álvarez, R. Polanco, P. Bull, R. Vicuña. The copper-dependent ACE1 transcription factor activates the transcription of the *mco1* gene from the basidiomycete *Phanerochaete chrysosporium*. *Microbiology* 154, 491-9, 2008; A. Azúa-Bustos, C. González-Silva, R. Mancilla, L. Salas, B. Gómez-Silva, C.P. McKay, R. Vicuña. Hypolithic cyanobacteria supported only by fog in the Coastal Range of the Atacama Desert. *Microbial Ecol.* 61, 568-81, 2011; C. Urrejola, J. Alcorta, L. Salas, M. Vásquez, MF Polz, R. Vicuña, B. Díez. Genomic features for desiccation tolerance and sugar biosynthesis in the

extremophile *Gloeocapsopsis* sp. UTEX B3054. *Frontiers in Microbiol* 07 May 2019. <https://doi.org/10.3389/fmicb.2019.00950>