

BIOGRAPHICAL SKETCH OF PROF. SINERIK N. AYRAPETYAN



Date of Birth: **May 28, 1941**

Marital Status: **Married, has a son and a daughter**

Place of Birth: **Armenia**

Nationality: **Armenian**

Business address: **UNESCO Chair in Life Sciences, Life Sciences International Postgraduate Educational Centre (LSIPEC), Avan – 31 Acharian St., Yerevan 0040, Armenia**

Position Held: **Head of Research Council of LSIPEC and Coordinator of UNESCO Chair**

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Education

Degrees	Dates	University
Master of Sciences	1960 -1966	Yerevan State University
PhD	1966 – 1969	Bogomolets Inst. Physiology, Acad. Sci. Ukraine.
Doctor of Sciences	1970 – 1980	Bogomolets Inst. Physiology, Acad. Sci. Ukraine.

Career/Employment

Employers	Position	Dates
UNESCO/UNITWIN Interregional Network on PhD Education and Research in Biophysics, Biotechnology and Environmental Health	Coordinator	present
Life Sciences International Postgraduate Educational Center	Chairholder of UNESCO Chair in Life Sciences	1997-present
Life Sciences International Postgraduate Educational Center	Head of Research Council	2010-present
Life Sciences International Postgraduate Educational Center	President	1997 - 2010
Armenian National Academy of Sciences	Head of the Biophysics Center	1989 - 1997
Institute of Experimental Biology, Arm. NAS	Head of Membranology Laboratory	1973 - 1989
Department of Physiology, Yerevan State University	Associate Professor	1971 - 1973

The Institute of Physiology of the Armenian Academy of Sciences	Senior Researcher	1969 - 1971
Visiting Researcher		
Department of Pharmacology and Physiology, Southampton University	Visiting Professor	1996 (a month)
Department of Life Science, Nottingham University, UK	Visiting Professor	1995 (3 months)
SUNY at Albany, New York	Visiting Professor	1989- 1992
National Institute of Physiological Sciences, Okazaki, Japan	Visiting Researcher	1981 (6 months)
Physiological Dept. of King's Collage, London, UK	Visiting Researcher	1980 (3 months)
Physiological Department of Belgrade University, Yugoslavia	Visiting Researcher	1980 (3 months)
Institute of Biology, Hungarian Academy of Sciences, Tihany	Visiting Researcher	1975 (3 months)

Specialization

- ✓ **main field: biophysics, neuroscience**
- ✓ **other fields: ionizing and non-ionizing radiobiology**
- ✓ **current research interest: intracellular signaling system in norm and pathology**

Membership of Professional Societies

Member of: International Society of Invertebrate Neurobiology (ISIN)
European Society for Neurochemistry (ESN)
International Society for Neurochemistry (ISN)
International Brain Research Organization (IBRO)
International Union of Pure and Applied Biophysics (IUPAB)
Bioelectromagnetics Society (BEMS)
WHO International Advisory Committee on Electromagnetobiology
President of: All Armenian Research Council

Editor in Chief of

Journal "Bioavailability and Bioequivalence"
"Biomedical Engineering Current Research"
"Basic, Applied Pharmacy and Pharmacology"
Journal of "Pharmacology & Pharmaceutical Research"

Member of Editorial Board of:

Journal of "Electromagnetic Biology and Medicine"
Journal of "ISRN Biophysics"
Journal of "European Journal of Biophysics"
Journal of "Advances in Life Sciences"
Journal of "Applied Pharmacy"
Journal of "BBA General Subjects"
Journal of "International Dental and Medical Research"
Journal of "International Journal of Basic and Applied Sciences"
Journal of "Insights of Medical Sciences"
Journal of "Chronicles of Pharmaceutical Science Journal"

Journal of “Clinical Investigation”
Journal of “Global Drugs and Therapeutics”
Journal of “Genetic Engineering and Biotechnology”
Journal of “Basic, Applied Pharmacy and Pharmacology”
Journal of “Targeted Drug Delivery”
Journal of “Frontiers of Mechatronical Engineering”
Journal of “Progress in Applied Microbiology”

Summary of Investigations:

2013 - present - “Bioremediation as a modern and efficient method for water pollution management”.

Conclusion: H₂O₂-induced bactericide properties elevated by non-critical concentration of CO₂.

2013 - present – “Agrobiotechnology and food safety”

Conclusion 1: Extremely low frequency of electromagnetic field (ELF EMF)-treated water as a tool for the increase of the growth and development of microbes and plants.

Conclusion 2: ELF EMF treatment as a novel method for the activation of bull sperm motility.

Conclusion 3: Double frequency of impedancemetric characteristics of meat as a novel method for determining its quality.

2010 - present - “Study of determination mechanism of age-dependent magneto- and microwave sensitivity of rat brain and heart muscles in norm and pathology”.

Conclusion: Age-dependent dysfunction of α_3 Na⁺/K⁺ pump isoform-dependent signaling system controlling cell hydration for the decrease of magneto sensitivity of heart muscle and brain tissue hydration.

2009 - present - “The study of functional role of different Na⁺/K⁺ pump isoforms in regulation of cell hydration in norm and pathology”.

Conclusion: α_3 isoform-dependent signaling system serves as a universal sensor through which the biological effect of weak environmental signals on cells and organisms are realized.

2008 - present - “Cellular and molecular mechanism of biological effect of background ionizing radiation, electromagnetic fields and infrasound frequency of mechanical vibration on plants, microbes, invertebrate and vertebrate organisms”.

Conclusion: Cell bathing aqua medium serves as one of the essential primary targets for biological effects of ionizing and non-ionizing radiation.

2007 - present - “The role of the dysfunction of Na⁺/K⁺ pump in age-dependent medical disorders”.

Conclusion: Age-dependent dysfunction of α_3 isoform-dependent signaling system controlling cell hydration serves as a primary mechanism for generation of age-related medical disorders.

2007 - present - “The correlation between brain cell hydration and pain sensation in mammals”.

Conclusion: Cell over-hydration promotes the nociceptive signals generation, while dehydration relieves pain and has anesthetic effects on mammals.

2007 - present - “The study of cell hydration as a marker for biological effect of environmental factors”.

Conclusion: Cell hydration serves as a universal and extra-sensitive sensor for environmental factors in plants, microbes and mammals.

2001 - present – “The study of the effect of cell bathing aqua structure on cell metabolic activity”.

Conclusion: - The environmental factor-induced changes in both water molecules' disassociation and peroxide formation in cell bathing medium serve as messengers through which cell bathing medium could modulate its metabolic activity.

1998 - 2009 – “The study of low frequency of EMF and infrasound on physicochemical properties of water and peroxide formation”.

Conclusion: EMF and infrasound have 4 and 8Hz frequency “windows” at which they have more pronounced effects on water molecules dissociation, heat fusion, electrical conductivity, gas solubility and hydrogen peroxide formation in water.

1997 - 2005 – “The nature of metabolic mechanism through which extremely weak chemical and physical factors could modulate the membrane conductive function (excitability and chemo sensitivity)”.

Conclusion: cGMP/cAMP-dependent $\text{Na}^+/\text{Ca}^{2+}$ exchanger serve as a universal and extra-sensitive membrane sensor for extremely low concentrations of biologically active substances and weak physical factors.

1994 - 2009 – “The role of the structural changes of cell bathing aqua medium in realization of biological effects of non-ionizing radiation (Electromagnetic fields and infrasound) on cells and organisms”.

Conclusion: EMF-induced changes of physicochemical properties and formation of ROS serve as main mechanisms through which non-thermal biological effects of magnetic and electrical fields on cells and organisms are realized.

1994 – 1997 - “The metabolic mechanism of the effect of NO on heart muscle contractility” (In collaboration with Prof. Robert Walker, UK).

Conclusion: The NO-induced heart muscle relaxation is due to the activation of cGMP-dependent Ca^{2+} efflux and $\text{Na}^+/\text{Ca}^{2+}$ exchange in forward mode from the cells.

1994 - 1997 - “The correlation between $\text{Na}^+/\text{Ca}^{2+}$ exchange and intracellular cAMP/cGMP”

Conclusion: The intracellular cGMP plays a key role in activation of Ca^{2+} efflux through $\text{Na}^+/\text{Ca}^{2+}$ exchange in forward mode and Ca^{2+} pump mechanisms, while intracellular cAMP activates Ca^{2+} influx by $\text{Na}^+/\text{Ca}^{2+}$ exchange in reverse mode.

1990 - 1998 - “Biological effect of extremely low concentration of transmitters on membrane functional activity” (In collaboration with David Carpenter, USA, Robert Walker, UK, Peter Usherwood, UK, Yanosh Salanki, Hungary).

Conclusion: Low concentrations, having no effect on membrane conductive properties, regulate the conductive function of membrane through the modulation of intracellular signaling system.

1989 - 1990 - “Metabolic regulation of N-cholinoreceptor affinity”

Conclusion: The Na^+ -pump inactivation leads to the increase of the number of functionally active chemoreceptors in membrane and the decrease of their affinity to ligands.

1988 - 1989 - “Correlation between Na^+/K^+ pump activity and intracellular concentration of cAMP”.

Conclusion: Pump inactivation leads to the increase of intracellular cAMP contents, while its activation has opposite effect.

1987 – 1991 - “The study of the functional role of Na^+/K^+ pump in regulation of cell sensitivity to ionizing radiation” (in collaboration with Dvoretzky A.I., Shainskaya A.M., Ukraine).

Conclusion: Ionic radiation-induced Na^+/K^+ pump inhibition leads to the increase of the number of pump units in the membrane. High affinity ouabain receptors are more sensitive to ionizing radiation than low affinity receptors.

1986 - 1988 – “Correlation between Na^+/K^+ pump activity and $\text{Na}^+/\text{Ca}^{2+}$ exchange”.

Conclusion: There is a negative correlation between Na^+/K^+ pump and $\text{Na}^+/\text{Ca}^{2+}$ exchange activity that is realized by intracellular level of cyclic AMP.

1984 - 1992 - “The study of the role of lipid composition in regulation of membrane protein function” (In collaboration with Prof. Toshifumi Takenaka, Japan)

Conclusion: Short-chain fatty acids can be effective modulators of both ouabain-sensitive and ouabain-insensitive fractions of Na efflux from the cells, membrane excitability and chemosensitivity.

1984 - 1991 - “The ionic membrane mechanism of ionizing radiation on neuromembrane function”

Conclusion: Ca^{2+} -dependent activation of Lipase A₂ activity is the gate for ionizing radiation-induced membrane damage (In collaboration with Prof. Konstantin Karageuzyan, Armenia).

1980 – 1988 - “The role of lipid surrounding of membrane proteins in regulation of their functional activity”.

Conclusion: The negative correlation between Na^+/K^+ and $\text{Na}^+/\text{Ca}^{2+}$ exchange depends on membrane lipids' fluidity. The increase of the latter makes the mentioned correlation disappear. Decanoic acid-induced membrane fluidity leads to the activation of the agonist-induced K currents.

1980 - 1988 - “The effect of water fluxes through the membrane on membrane excitability” (In collaboration with Prof. Kiozo Koketsu, Japan)

Conclusion: Transmembrane water fluxes having activation effect on membrane current have the same direction and inactivation effect on current having opposite direction.

1977 - 1984 - “The study of the functional role of electrogenic Na^+/K^+ pump in regulation of cell volume”

Conclusion: Na^+/K^+ pump has a cell volume regulation function: its activation leads to cell shrinkage, while inactivation to cell swelling.

1980 - 1990 - “The study of functional role of pump-induced cell volume changes in regulation of membrane chemosensitivity and excitability”

Conclusion: Number of functionally active protein molecules having enzymatic chemoreceptive and ion channel forming properties depend on cell surface: surface increasing leads to elevation of the number of functionally active proteins, while shrinkage has opposite effect.

1969 - 1976 - “Regulation mechanism of pacemaker activity of Helix neurons” (In collaboration with Prof. Howard Wachtel, USA)

Conclusion: The electrogenic sodium pump-dependent cell volume changes are responsible for membrane potential's oscillation of pacemaker neurons.

1965 - 1969 - “The study of the role of cell metabolic processes in generation of membrane potential of snail neuron” (postgraduate thesis, advisor- Prof. Platon Kostyuk, Ukraine)

Conclusion: The resting potential of snail neurons consists of two components of different nature: first is purely diffused, and is due to the presence of ionic gradient on the membrane, second is generated by electrogenic sodium pump.

Selective Publications:

Books

1. "Bioelectromagnetics: Current Concepts" 2006 (Eds. S. Ayrapetyan (Armenia) & M. Markov (USA) NATO Science Series, Springer Press. 480 pages.
2. "Agricultural Biotechnology and Biosafety for Food Security in the Caucasus Region and Moldova" 2004 (Eds. K. Nichterlein (FAO, Italy) & S.N. Ayrapetyan (Armenia) Noyan Tapan Press, 175 pages.
3. "Modern Problems of Cellular and Molecular Biophysics" 2001 (Eds. Ayrapetyan S. N. (Armenia) & North A.C. T. (IUPAB, UK), 360 pages.
4. "Pain Mechanisms and Management" 1998 (Eds. Ayrapetyan S.N. (Armenia) & Apkarian A.V. (USA), IOS press, Netherlands, 390 pages.
5. "Biological Effects of Electric and Magnetic Fields – Sources and Mechanisms" volume 1, 1994 (Eds. D. O. Carpenter (USA) & S.N. Ayrapetyan (Armenia), Academic press, New York.
6. "Biological Effects of Electric and Magnetic Fields – Beneficial and Harmful Effects" volume 2, 1994 (Eds. D. O. Carpenter (USA) & S.N. Ayrapetyan (Armenia), Academic press, New York.
7. "Metabolic Regulation of Membrane Function" 1990 (Eds. Ayrapetyan S. N Arvanov V. L, Arutchyan N, I, Kalantaryan L.B., Suleymanyan M.A), Armenian Academy of Sciences Publishers, Yerevan.
8. "The Membrane Ionic Transport upon the Effect of Ionic Radiation" 1990, Dvoretzky, A. I, Ayrapetyan, S. N., Shainskaya, A. M.,Chebotarev, Y. Y., Naukovo Dumka, Kiev.