

# Николай Владимирович Автандилян

## Научно-исследовательский институт биологии

Հիմնարար և ախտաբանական կենսաքիմիայի լաբորատորիա  
Заведующий лабораторией

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## Образование

Учреждение	Ереванский Государственный Университет
Факультет	Факультет Биологии/кафедра Биохимии
Дата	2008 - 2010
Степень / Звание	Магистр

Учреждение	Ереванский Государственный Университет
Факультет	Факультет Биологии/кафедра Биохимии
Дата	2004 - 2008
Степень / Звание	Бакалавр

## Ученое звание/Ученая степень

Учреждение	Ереванский Государственный Университет
Дата	2013
Степень / Звание	Кандидат наук
Специальность	Биологические науки
Научный руководитель	Դավթյան Միսակ Արշամի
Научная тема	Ուրեոթելիկ և ոչ ուրեոթելիկ արգինազների դերը պոլիամինների կենսասինթեզում

## Знание языков

English Русский

## Опыт работы

Учреждение	Ереванский Государственный Университет
Период времени	2022 до настоящего времени
Звание/степень	Заведующий лаборатории фундаментальной и патологической биохимии

## Научные интересы

- Биохимия, Медицинская биохимия, модель животных, экспериментальная биология, молекулярная биология, патологическая биология

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## Членство

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Учреждение	Европейская ассоциация исследований рака
Период времени	2021 до настоящего времени

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Учреждение	Федерация европейских биохимических обществ (FEBS)
Период времени	2010 до настоящего времени

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## Публикации

Статья

**Characterization and antibacterial/cytotoxic activity of silver nanoparticles synthesized from *Dicranum scoparium* moss extracts growing in Armenia**

Gayane Semerjyan, Inesa Semerjyan, Mikayel Ginovyan, Nikolay Avtandilyan

AIMS Biophysics 2025 29–42

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Статья

**Tissue remodeling during high-altitude pulmonary edema in rats: Biochemical and histomorphological analysis**

Ruzanna A. Shushanyan, Hasmik M. Karapetyan, Edita E. Nadiryan, Nikolay V. Avtandilyan,

Anna V. Grigoryan, Anna F. Karapetyan

Tissue and Cell 2025 102727

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Статья

**Elucidating the impact of *Hypericum alpestre* extract and L-NAME on the PI3K/Akt signaling pathway in A549 lung adenocarcinoma and MDA-MB-231 triple-negative breast cancer cells**

Hayarpi Javrushyan, Mikayel Ginovyan, Tigran Harutyunyan, Smbat Gevorgyan, Zaruhi Karabekian,

Alina Maloyan, Nikolay Avtandilyan

PLOS ONE 2025 e0303736

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Статья

**Silver nanoparticles fabricated using phycocyanin from *Arthrospira platensis*: green synthesis, physicochemical characterization, and biological activities**

Ani Harutyunyan, Astghik Hambardzumyan, Liana Gabrielyan, Anush Aghajanyan, Meri Kocharyan,

Nikolay Avtandilyan, Alina Zurnachyan, Inga Bazukyan, Wojciech Kujawski, Lilit Gabrielyan

Microbial Cell Factories 2025 1-23

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Статья

***Hypericum alpestre* extract exhibits in vitro and in vivo anticancer properties by regulating the cellular antioxidant system and metabolic pathway of L-arginine**

Mikayel Ginovyan, Hayarpi Javrushyan, Hasmik Karapetyan, Izabela Koss-Mikołajczyk,

Barbara Kusznierevicz, Anna Grigoryan, Alina Maloyan, Agnieszka Bartoszek, Nikolay Avtandilyan

Cell Biochemistry and Function 2024 1-21

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Статья

**The role of oxidative stress and neuroinflammatory mediators in the pathogenesis of high-altitude cerebral edema in rats**

Ruzanna A. Shushanyan, Nikolay V. Avtandilyan, Anna V. Grigoryan, Anna F. Karapetyan

Respiratory Physiology and Neurobiology 2024 104286

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Статья

**5-fluorouracil and Rumex obtusifolius extract combination trigger A549 cancer cell apoptosis: uncovering PI3K/Akt inhibition by in vitro and in silico approaches**

Mikayel Ginovyan, Hayarpi Javrushyan, Svetlana Hovhannisyanyan, Edita Nadiryan, Gohar Sevoyan,

Tigran Harutyunyan, Smbat Gevorgyan, Zaruhi Karabekian, Alina Maloyan, Nikolay Avtandilyan

Scientific Reports 2024 1-16

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Статья

**THE REGULATION OF DEAMINATION OF ADENINE COMPOUNDS IN BREAST AND LIVER IN DMBA-INDUCED BREAST CANCER RATS TREATED BY HYPERICUM ALPESTRE**

G. H. PETROSYAN, S. V. MARUTYAN, N. V. AVTANDILYAN

Proceedings of the YSU B: Chemical and Biological Sciences 2024 17-26

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Статья

**RABBITS ARGINASE I AND II: ACTIVITY AND pH SENSITIVITY OF SELF-FORMATION POLYPEPTIDES**

S. M. HOVHANNISYAN, E. K. BARSEGHYAN, N. V. AVTANDILYAN

Proceedings of the YSU B: Chemical and Biological Sciences 2024 35-43

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Статья

**Royal Jelly-Mediated Silver Nanoparticles Show Promising Anticancer Effect on HeLa and A549 Cells Through Modulation of the VEGF $\alpha$ /PI3K/Akt/MMP-2 Pathway**

Meri Kocharyan, Syuzan Marutyan, Edita Nadiryan, Mikayel Ginovyan, Hayarpi Javrushyan,

Seda Marutyan, Nikolay Avtandilyan

Applied Organometallic Chemistry 2024 1-11

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Статья

**Anti-cancer effect of in vivo inhibition of nitric oxide synthase in a rat model of breast cancer**

Nikolay Avtandilyan, Hayarpi Javrushyan, Mikayel Ginovyan, Anna Karapetyan, Armen Trchounian

Molecular and Cellular Biochemistry 2023 261-275

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Статья

**Anti-cancer effect of Rumex obtusifolius in combination with arginase/nitric oxide synthase inhibitors via downregulation of oxidative stress, inflammation, and polyamine synthesis**

Mikayel Ginovyan, Hayarpi Javrushyan, Gayane Petrosyan, Barbara Kusznierevicz,

Izabela Koss-Mikołajczyk, Zuzanna Koziara, Monika Kuczyńska, Patrycja Jakubek, Anna Karapetyan,

Naira Sahakyan, Alina Maloyan, Agnieszka Bartoszek, Nikolay Avtandilyan

International Journal of Biochemistry & Cell Biology 2023 106396

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Статья

**Screening revealed the strong cytotoxic activity of Alchemilla smirnovii and Hypericum alpestre ethanol extracts on different cancer cell lines**

Mikayel Ginovyan, Svetlana Hovhannisyanyan, Hayarpi Javrushyan, Gohar Sevoyan, Zaruhi Karabekyan,

Narine Zakaryan, Naira Sahakyan, Nikolay Avtandilyan

AIMS Biophysics 2023 12-22

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*Статья*

**The Action Mechanisms, Anti-Cancer and Antibiotic-Modulation Potential of Vaccinium myrtillus L. Extract**

Mikayel Ginovyan, Anush Babayan, Anahit Shirvanyan, Alvard Minasyan, Meri Qocharyan,

Barbara Kusznierevich, Izabela Koss-Mikołajczyk, Nikolay Avtandilyan, Anne Vejux, Agnieszka Bartoszek,

Naira Sahakyan

Discovery Medicine 2023 590-611

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*Статья*

**The possible anti-inflammatory properties of hydro-ethanolic extract of Oregano**

Armenuhi Moghrovyan, Mikayel Ginovyan, Nikolay Avtandilyan, Lilya Parseghyan, Armen Voskanyan,

Naira Sahakyan, Anna Darbinyan

Functional Foods in Health and Disease 2023 476-486

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*Статья*

**THE CYTOTOXIC PROPERTIES OF ALCHEMILLA SMIRNOVII EXTRACT ON THE HELA CANCER CELLS VIA DOWNREGULATION OF ARGINASE ACTIVITY**

S.M. Hovhannisyan, E.E. Nadiryan, M.V. Qocharyan, G.H. Petrosyan, G.P. Sevoyan, Z.I. Karabekyan,

H.G. Javrushyan, M.M. Ginovyan, N.V. Avtandilyan

ԵՊՀ գիտական տեղեկագիր. Քիմիա և կենսաբանություն: 2023 238-247

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*Статья*

**REGULATORY EFFECTS OF RUMEX OBTUSIFOLIUS AND HYPERICUM ALPESTRE EXTRACTS ON THE QUANTITY OF IL-2 IN IN VITRO AND IN VIVO CANCER MODELS**

E.E. Nadiryan, S.M. Hovhannisyan, M. V. Qocharyan, G.H. Petrosyan, H.G. Javrushyan, M.M. Ginovyan,

N.V. Avtandilyan

ԵՊՀ գիտական տեղեկագիր. Քիմիա և կենսաբանություն: 2023 248-257

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*Статья*

**ALTERATION OF TOTAL AND MITOCHONDRIAL ATPASE ACTIVITY IN THE BREAST AND LIVER IN BREAST CANCER-INDUCED RATS**

Seda V. Marutyan, Gayane A. Petrosyan, Anna R. Muradyan, Lilit A. Marutyan, Syuzan A. Marutyan,

Nikolay V. Avtandilyan

Proceedings of the YSU B: Chemical and Biological Sciences 2022 151-160

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*Статья*

**Antihyperglycemic activity of L-norvaline and L-arginine in high-fat diet and streptozotocin-treated male rats**

Hayarpi Javrushyan, Edita Nadiryan, Anna Grigoryan, Nikolay Avtandilyan, Alina Maloyan

Experimental and Molecular Pathology 2022 104763

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*Статья*

**EVALUATION OF THE ANTIOXIDANT ACTIVITY AND THE ANTI-CANCER PROPERTIES OF ALCHEMILLA SMIRNOVII JUZ. EXTRACT ON THE HELA CANCER CELL LINE**

S. Hovhannisyan, E. Nadiryan, M. Qocharyan, G. Sevoyan, M. Ginovyan, N. Avtandilyan

Статья

**The effects of NO on the urea cycle pathway in short-term intermittent hypobaric hypoxia in rats**

Hayarpi Javrushyan, Nikolay Avtandilyan, Armen Trchounian

Respiratory Physiology and Neurobiology 2021 103598

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Статья

**NEW THERAPEUTIC APPROACHES IN BREAST ANTICANCER TREATMENT USING ARMENIAN HERBAL EXTRACTS**

H.G. JAVRUSHYAN, N.V. AVTANDILYAN, M.M. GINOVYAN, A.H. TRCHOUNIAN

Biological Journal of Armenia 2021 32-38

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Статья

**The potential therapeutic effect of NG-hydroxy-nor-L-arginine in 7,12-dimethylbenz(a)anthracene-induced breast cancer in rats**

Nikolay Avtandilyan, Hayarpi Javrushyan, Anahit Mamikonyan, Anna Grigoryan, Armen Trchounian

Experimental and Molecular Pathology 2019 1-10

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Статья

**The Involvement of Arginase and Nitric Oxide Synthase in Breast Cancer Development: Arginase and NO Synthase as Therapeutic Targets in Cancer**

Nikolay Avtandilyan, Hayarpi Javrushyan, Gayane Petrosyan, Armen Trchounian

BioMed Research International 2018 8696923,9

<https://www.hindawi.com/journals/bmri/2018/8696923/>

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Статья

**THE CHANGE OF POLYAMINES AND NITRIC OXIDE QUANTITIES IN HUMAN BLOOD SERUM OF PROSTATE AND BLADDER CANCER**

H. Javrushyan, N. Avtandilyan, A. Mamikonyan, A. Trchounian

Biological Journal of Armenia 2017 125-132

<http://biology.asj-oa.am/view/year/2017.html>

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Статья

**CHANGES OF ARGINASE ACTIVITY AND ARGINASE ISOENZYME SPECTRUM IN HUMAN SERUM DURING DIFFERENT STAGES OF BREAST CANCER BEFORE SURGERY AND AFTER CHEMOTHERAPY**

Mariam Sargsyan, Hermine Gevorgyan, Nikolay Avtandilyan, Susanna Karapetyan

ԵՊՀ ՌԻԳԸ գիտական հոդվածների ժողովածու 2017 176-183

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Статья

**The change of arginase activity in blood serum during breast and prostate cancers**

Avtandilyan N.V., Karapetyan S.A., Alexanyan K. A.

Electronic Journal of Natural Sciences of NAS RA 2016 12-14

<http://ejns.sci.am>

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Статья

**The relationship between arginase activity and change of polyamines quantity in human**

**blood serum during breast cancer.**

Avtandilyan N. V., Karapetyan S. A., Aleksanyan K. A.

Biological Journal of Armenia 2016 92-99

<http://www.flib.sci.am/eng/Biology/>

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*Статья*

**Relationship between liver polyamines quantity and arginase isoenzymes activity after arginase inhibition by NG-hydroxy-L-arginine**

Avtandilyan N.V., Karapetyan S.A.

Electronic Journal of Natural Sciences of NAS RA 2015 3-6

<http://ejns.sci.am>

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*Статья*

**Պոլիամինների քանակության փոփոխության ուսումնասիրումը լյարդի արգինազի իզոֆերմենտների արգելակման ժամանակ**

Մարիամ Սարգսյան, Նիկոլայ Ավթառդիյան, Սուսաննա Կարապետյան

ԵՊՀ ՈԻԳԸ գիտական հոդվածների ժողովածու 2015 75 - 81

<http://www.ysu.am/sss/hy>

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*Статья*

**The relationship of blood serum arginase activity and polyamines quantity during human breast cancer**

Avtandilyan N.V., Karapetyan S.A., Aleksanyan K.A.

New Armenian Medical journal 2015 10 - 10

[http://www.ysmu.am/index.php?option=com\\_content&view=article&id=111&Itemid=638&...](http://www.ysmu.am/index.php?option=com_content&view=article&id=111&Itemid=638&...)

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*Статья*

**Polyamines quantity change after inhibition of rats kidney and brain arginase isoenzymes by NG-hydroxy-L-arginine.**

Karapetyan S. A., Avtandilyan N. V.

Issues in theoretical and clinikal medicine 2014 20-24

<http://pananarm.info/>

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*Статья*

**The change of the activity of arginase isoenzymes after the intravenous injection of polyamines**

Avtandilyan N.V., Karapetyan S.A., Davtyan M.A.

Electronic Journal of Natural Sciences of NAS RA 2014 9-12

<http://ejns.sci.am>

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*Статья*

**The research of the role of nonureotelic arginases in polyamines biosynthesis in brain and kidney in vitro**

Avtandilyan N.V.

Biological Journal of Armenia 2013 26-32

<http://www.flib.sci.am/eng/Biology/>

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*Статья*

**Polyamines are noncompetitive inhibitors for nonureotelic arginases in the different tissues of rats**

Avtandilyan N.V., Karapetyan S.A., Davtyan M.A.

Electronic Journal of Natural Sciences of NAS RA 2013 7-10

<http://ejns.sci.am>

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*Статья*

**The change of kinetics of nonureotelic arginase under influence of exogenous polyamines in rat brain and kidney**

Avtandilyan N.V., Karapetyan S.A., Davtyan M.A.

Perspectives for development of molecular and cellular biology - 3. International young scientists conference  
2012 48-52

<http://www.molbiol.sci.am>

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*Конференция*

**Serum arginase activity during women breast and men prostate cancers.**

Nikolay V. Avtandilyan, Susanna A. Karapetyan, Knarik A. Alexanyan

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*Конференция*

**The change of arginase activity in the serum of patients diagnosed with breast cancer.**

Sargsyan M.S., Avtandilyan N.V., Karapetyan S.A.

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*Конференция*

**Изменение аргиназной активности и количества полиаминов в сыворотке крови при злокачественных опухолях предстательной железы**

Геворгян Э.Р., Автандилян Н.В., Карапетян С.А.

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*Конференция*

**Arginase and NO-synthase are target enzymes in breast anticancer therapy**

N. Avtandilyan, A. Trchounian

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*Конференция*

**INHIBITION OF NOS ACTIVITY AS AN EFFECTIVE ANTICANCER THERAPY AGAINST 7,12-DMBA RAT MODEL OF BREAST CANCER**

Mamikonyan A., Avtandilyan N., Javrushyan H., Trchounian A.

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*Конференция*

**Arginase is an enzyme with real tricks in antitumor treatment of 7,12-dimethylbenz(a) anthracene induced breast cancer in rats**

G.Petrosyan, N. Avtandilyan, H. Javrushyan, A. Trchounian

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*Конференция*

**The potential therapeutic effect of nor-NOHA and L-NAME in breast cancer treatment**

N. Avtandilyan, A. Trchounian

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*Конференция*

**Oxidative stress in the 7,12-dimethylbenz[a] anthracene rat model of breast cancer: suppression by a NO-synthase inhibitor NG- nitro-L-arginine methyl ester**

N.Avtandilyan, G.Petrosyan, A.Trchounian

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*Конференция*

**Effect of L-arginine catabolic enzymes inhibitors on 7,12-dimethylbenz(a)anthracene-induced mammary tumors in rats**

NIKOLAY AVTANDILYAN, HAYARPI JAVRUSHYAN, ANAHIT MAMIKONYAN, ARMEN TRCHOUNIAN

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*Конференция*

**Suppression of tumor progression by arginase and NO-synthase combined inhibition in 7,12-dimethylbenz(a)anthracene-induced breast cancer in rats**

A. Mamikonyan, H. Javrushyan, N. Avtandilyan, A. Trchounian

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*Конференция*

**Antioxidant properties of some herbal extracts from Armenian flora, evaluation of their cytotoxicity and genotoxicity on HT29 cell line**

Mikayel Ginovyan, Zuzanna Koziara, Monika Baranowska, Klaudia Suliborska, Patrycja Jakubek, Barbara Kusznierevicz, Nikolay Avtandilyan, Naira Sahakyan, Agnieszka Bartoszek

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*Конференция*

**High antioxidant and cytotoxic activity of Rumex obtusifolius seed extract and metabolomic characterization of its bioactive phytochemicals.**

M. Ginovyan, Z. Koziara, M. Baranowska, I. Koss-Mikolajczyk, K. Suliborska, P. Jakubek, B. Kusznierevicz, N. Avtandilyan, N. Sahakyan, A. Bartoszek

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*Конференция*

**Deamination of adenine compounds in different organs of rats with DMBA-induced cancer**

G. Petrosyan, N. Avtandilyan, S. Marutyan

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*Конференция*

**Upregulation of nitric oxide quantity by L-norvaline and L-arginine in high-fat diet and Streptozotocin-treated male rats**

E. Nadiryan, H. Javrushyan, N. Avtandilyan, A. Maloyan

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*Конференция*

**Hypericum alpestre combined with arginase and NOS inhibitors shows antiproliferative activity in the rat breast cancer model**

H. Javrushyan, N. Avtandilyan, S. Hovhannsiyan, M. Qocharyan, M. Ginovyan, A. Maloyan

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*Конференция*

**Anti-inflammatory and immunostimulatory effect of Hypericum alpestre combined with arginase and NOS inhibitors in the rat breast cancer model**

H. Javrushyan, E. Nadiryan, G. Petrosyan, M. Ginovyan, A. Maloyan, N. Avtandilyan

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*Конференция*

**New therapeutic approach in breast anti-cancer treatment using a combination of Rumex obtusifolius extract and L-arginine pathway inhibitors**

N. Avtandilyan, H. Javrushyan, A. Karapetyan, M. Ginovyan

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*Конференция*

**Evaluation of immunostimulatory effect of combination of herbal extracts and chemotherapeutic drugs by quantitative alteration of interleukin-2**

H. Javrushyan, G. Sevoyan, M. Ginovyan, Z. Karabekian, N. Avtandilyan

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*Конференция*

**BIOLOGICAL ACTIVITY OF ARMENIAN HONEY BEES' VENOM AND LACTIC ACID BACTERIA ISOLATED FROM HONEYBEES' GUT**

Anahit Sahakyan, Nelli Vardazaryan, Mery Qocharyan, Nikolay Avtandilyan, Inessa Semerjyan,

Inga Bazukyan

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*Конференция*

**The combination of herbs and chemotherapeutic agents inhibits tumor progression via down-regulation of the TNF $\alpha$ -VEGF $\alpha$ /PI3K/Akt/NOS/COX-2-MMP-2 pathway in DMBA-induced breast cancer in rats**

N. Avtandilyan, M. Kocharyan, S. Hovhannisyanyan, S. Gevorgyan, H. Javrushyan, M. Ginovyan, A. Maloyan

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*Конференция*

**From metabolomics to medicine: exploiting the functional potential of plant extracts in human health, with emphasis on Ribes nigrum, Ficus carica and Vitis vinifera**

S. Tadevosyan, M. Ginovyan, N. Avtandilyan, A. Shirvanyan, A. Bartoszek, N. Sahakyan

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*Конференция*

**From agro-bio-waste to application: the power of bilberry aerial part extract as anti-cancer and antibiotic-modulating agent**

N. Sahakyan, M. Ginovyan, A. Babayan, A. Shirvanyan, A. Minasyan, B. Kusznierevich,

I. Koss-Mikołajczyk, N. Avtandilyan, A. Bartoszek

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*Конференция*

**Harnessing plant extracts to overcome antibiotic resistance: leaf extracts of Ribes nigrum, Ficus carica, and Vitis vinifera as resistance modifiers of E. coli strains**

M. Ginovyan, A. Shirvanyan, S. Tadevosyan, A. Babayan, B. Kusznierevich, N. Avtandilyan, A. Bartoszek,

N. Sahakyan

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*Конференция*

**The morphofunctional changes in rat's liver under conditions of 7, 12-DMBA-induced breast cancer after NG-Nitro-L-arginine methyl ester treatment**

A. Grigoryan, R. Shushanyan, N. Avtandilyan, A. Karapetyan

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*Конференция*

**Antibacterial, hemolytic and anticancer activities of silver nanoparticles biosynthesized by phycocyanin extracted from Spirulina**

L. Gabrielyan, A. Harutyunyan, A. Hambardzumyan, A. Aghajanyan, N. Avtandilyan, L. Gabrielyan

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*Конференция*

**ANTI-CANCER PROPERTIES AND POTENTIAL MOLECULAR MECHANISMS OF COMBINATIONS OF HERBAL EXTRACTS AND CHEMOTHERAPEUTIC AGENTS**

N. Avtandilyan, H. Javrushyan, H. Karapetyan, A. Grigoryan, E. Nadiryan, G. Sevoyan, M. Ginovyan,

A. Maloyan

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*Конференция*

**Enhanced anti-inflammatory and antiproliferative effects of Inula helenium herbal extract and arginase inhibitor in breast cancer in vivo study**

E. Nadiryan, H. Javrushyan, N. Avtandilyan

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Конференция

**Investigating the anticancer advantages of pairing Rumex obtusifolius herb extract with 5-fluorouracil against breast cancer in vivo**

S. Hovhannisyan, M. Ginovyan, N. Avtandilyan

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Конференция

**Cytotoxic and prooxidant properties of ethanolic extract from Hypericum alpestre and metabolomic profiling of its bioactive phytochemicals**

M. Ginovyan, I. Koss-Mikołajczyk, B. Kusznerewicz, N. Avtandilyan, A. Bartoszek

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Конференция

**Interconnection between hyperglycemia, cancer, and arginine metabolism: a unified therapeutic approach**

E.Nadiryany, H.Javrushyan, N.Avtandilyan

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Конференция

**Bee Venom as a Source of Novel Antimicrobial Agents: A Regional Study from Armenia**

Inesa Semerjyan, Melanya Grigoryan, Svetlana Hovhannisyan, Nikolay Avtandilyan, Peter Vandamme,

Inga Bazukyan

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Конференция

**Emodin inhibits HIF-1 $\alpha$  expression in MDA-MB- 231 cells via suppression of the PI3K/Akt/mTOR pathway**

S. Hovhannisyan, M. Ginovyan, N. Avtandilyan

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Конференция

**Hypericum alpestre Inhibits PI3K/Akt/mTOR and HIF-1 $\alpha$  Signaling While Activating Caspase-3 in MDA-MB-231 Cells: A Comparative Study with Dactolisib and Doxorubicin**

H. Javrushyan, N. Avtandilyan, A. Maloyan

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Конференция

**Synergistic Inhibition of HIF1 $\alpha$  and PI3K/Akt Signaling and Activation of Caspase3 by Emodin and Metformin Combination in MDAMB231 Cells**

M. Kocharyan, H. Javrushyan, N. Avtandilyan

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Конференция

**Phytochemicals and Chemotherapy: Present and Future Strategy**

Hayarpi Javrushyan, Edita Nadiryany, Nikolay Avtandilyan, Alina Maloyan

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**Modulating Bone Marrow Microenvironment in Breast Cancer: Impact of Combined Chemotherapy and Herbal Extracts**

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**Hypericum alpestre Extract and L-NAME Suppress PI3K/Akt Pathway and Enhance Apoptosis in Lung and Breast Cancer Cells**

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**The Impact of *Hypericum alpestre* and *Rumex obtusifolius* on Proline Metabolism in Breast Cancer Model Animals**

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**Hypoxia-Linked Alterations in Arginine Metabolism and Oxidative Stress in the Bone Marrow during Breast Cancer Progression and Treatment**

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