Red blood cell (RBC) arteriovenous gap as a marker of hemotransfusion in massive and fulminant hemorrhage with the formation of Multiple Organ Dysfunction Syndrome (MODS). Case report

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Keywords: Biomarker; Arteriovenous AV Gap blood RBC - marker; venous (V) blood RBC; arterial (A) blood RBC; Multiple organ dysfunction syndrome; Acute Respiratory Distress Syndrome; Microcirculatory Mitochondrial Distress Syndrome; pO2 (AV gap); Electro-Ion Membrane Distress Syndrome; Recruitment of microcirculatory – mitochondrial control strategy.

Goal of the study: Arteriovenous Gap (AV Gap) as a universal test of specific prognostic markers of the development of MODS in extremely in massive, fulminant hemorrhage, hemorrhagic shock caused by polytrauma and of volume of blood loss more than 3 liters. To prove the medico-legal indication of blood transfusion and the cause of the difference in arteriovenous erythrocyte (Hb (RBC AV gap) with RBC venous blood (V), first analysis (VHct 36%; VtHb 12.3 g/dL), which does not suggest blood transfusion, however, arterial blood (A) third analysis, data (AHct < 12%; AtHb reduced g/dL) justify red blood cell transfusion. Thus, the hypothesis of successful resuscitation of cardiac arrest by Academician V. Negovschi by intra-arterial administration under pressure of RBC, here we have proven it as an axiom.

Summary: The intensive care unit (ICU) needs fast and effective methods of diagnosis, resuscitation and restoration of lost functions or maintenance of dying functions, tenatogenesis in clinical death and Multiple organ dysfunction syndrome (MODS) [1,2]. Contemporary assessment of the molecular pathological physiology of the critically ill patient with MODS requires urgent determination of the level of disorders of the

respiratory and cardiovascular systems. In this direction, the determination of blood gases and acid-base homeostasis will be of significant importance. In scientific practical medical literature, disorders of the respiratory and cardiovascular systems are designated Acute Respiratory Distress Syndrome (ARDS) and Microcirculatory Mitochondrial Distress Syndrome (MMDS) [3]. Confirmation of these serious conditions requires targeted treatment [4].

Introduction: The critical - terminal states install the centralization of the macro - circulation and trigger MODS, blocking the microcirculation at the level of the cellular capillary metabolic space. With MODS, with an increase in ↑ pCO2, caused by pulmonary / extrapulmonary ARDS and confirmed by the fall in the oxygenation index ↓ PaO_2 / FiO_2 ↓ 300 in the context of the Berlin 2012 classification, violations of pathologies of gas exchange are also taken into account: 1) Lung gas exchange: a) acute respiratory failure - ↓end-tidal CO_2 fraction ($FetCO_2$ ↓), SaO_2 ↓, PaO_2 ↓, FiO_2 ↓; b) parenchymal (endothelial-epithelial disorder to alveolar and vascular tissue) - FetCO2 ↓/ or normal, SaO_2 ↓, PaO_2 ↓; 2) transportation of gas in the blood (minute volume) ↓, Hb ↓, SvO_2 ↓, PvO_2 ↓, $avSO_2$, $avPO_2$; 3) Gas exchange intissues - SvO_2 ↑, BE ↑, PvO_2 ↑, $avSO_2$ ↓, $avPO_2$ ↓; lactate / pyruvate ↑ [5,6]. Pyruvates (salts of pyruvic acid) are a product of the anaerobic metabolism of glucose, known as glycolysis. Pyruvic acid supplies energy to cells via the citric acid cycle (also known as the Krebs cycle) in the presence of oxygen (aerobic respiration), and in the absence of oxygen it is fermented by lactate dehydrogenase (LDH) to form lactate (lactic acid) [7]. With sufficient oxygen supply, pyruvate is further metabolised in the mitochondria to H_2O and CO_2. If the difference pCO2 (AV gap) > 6 mmHg., is of extrapulmonary origin, then this is considered as a marker of tissue hypoxia, allowing the development of MMDS to be assessed.

Material and methods:

We presented a described marker of tissue hypoxia, with a difference pCO2 (AV gap) > 6 mmHg, at the International Conference on Biotechnology, Biomarkers, Systems Biology (2019). Amsterdam, Netherlands. The Republic of Moldova had a special honor, since the Session Chair of the Conference was Professor DR Ilie Vasiliev represented by the World Academy of Medical Sciences, Netherlands, in collaboration with Japan, where the Session Co-Chair was Brilliant Professor DR Hitoshi Sohma (Sapporo Medical University Center for Medical Education, Japan) [8]. CO2 is formed in mitochondria, and in cases of undamaged lungs and when there is an arterio-venous difference pCO2 AV gap pCO2> 6 mm Hg, MMDS is established. The difference in pCO2 between arterial pACO2 and venous pVCO2 indicates the balance between CO2 elimination through the lungs and its production by tissues. This arteriovenous difference PCO2 (PaCO2 − PvCO2) is determined by the difference PCO2 gap or ΔPCO2 and is considered a marker of tissue hypoxia, if difference pCO2 (AV gap) > 6 mmHg. Using the ratio of pCO2 (AV gap) to pO2 (AV gap) according to the formula [pCO2 (AV gap) / pO2 (AV gap)] more informatively reflects the ejection cardiac fraction of output between Oxygen delivery (DO2) and VO2 (VO_2 max is the maximum (max) velocity, V of oxygen, O_2) consumption, which is important for adequate O2 extraction by cells, which mechanism is seriously disrupted in critical conditions. The [pCO2 (AV gap) / pO2 (AV gap)] ratio can replace the respiratory quotient (RQ), which is the ratio of VCO 2 /VO 2 (carbon dioxide production/oxygen consumption).

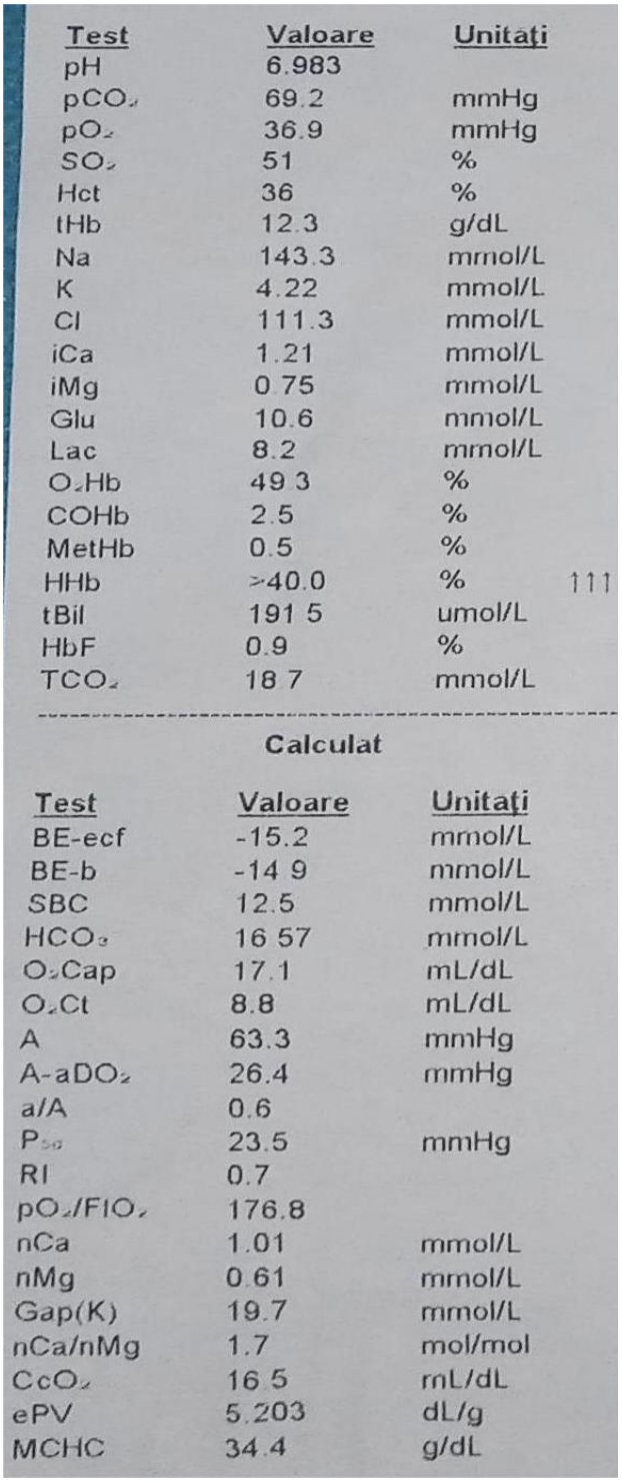
The [pCO2 (AV gap) / pO2 (AV gap)] ratio has been identified as a mortality biomarker for patients with severe ARDS.

Possible calculations of RBC, pCO2 (AV gap) / pO2 (AV gap) which are tangential with the Oxygen transport and gas exchange parameters described below.

Volumetric concentration of oxygen in arterial blood (CaO2) = (0.0139 x SaO2, % x Hb, g%) + (0.0031 x PaO2, mm Hg) Norm 18-21 vol%
Volume concentration of oxygen in mixed venous blood (CvO2) = (0.0139 x SvO2, % x Hb, g%) + (0.0031 x PvO2, mmHg) Norm 14.5 - 15.5 vol%
Volumetric concentration of oxygen in capillary blood (Ccap O2) = (1.39 x Hb, g%) x (0.0031 x PaO2 mmHg) (sO2 in capillary blood is taken to be 100%)
Arteriovenous difference in volume concentration of oxygen (Ca-vO2) Norm 3.5-5.5 vol%
Oxygen consumption = (cardiac output, ml/min) x Ca-vO2, vol%/100. Norm 200 - 250 ml/min
Oxygen delivery to tissues = (cardiac output, ml/min) x CaO2, vol%/100. Norm 1100-1300 ml/min
Oxygen extraction = (oxygen consumption) / (oxygen delivery to tissues). Norm 0.22 - 0.32
Fick equation: (cardiac output) = (oxygen consumption, ml/min) / [hemoglobin, g% x 0,00139 x (Sa-vO2, vol%)] Normal 3-7 l/min
Respiratory quotient = (CO2 release) / (O2 consumption) Norm 0.7 - 1.0
Shunt fraction (QS/QT - the ratio of shunt blood flow to total pulmonary blood flow) = CcapO2 / (CcapO2 - CvO2), sO2 in capillary blood is taken equal to 100% Norm < 5%

Results: We have covered the successful treatment of ARDS and MMDS in different countries [3-5, 9-14]. The result was due to decentralization, anti-shock therapy, detoxification and analgesia in the Recruitment of microcirculatory – mitochondrial control strategy, supplemented by Multiple Organ Support Therapy - Extracorporeal Life Support Organization (MOST-ELSO) (Extracorporeal membrane oxygenation (ECMO) and Extracorporeal carbon dioxide removal (ECCO2R), etc.) and in combination with antibacterial / antifungal [15]/ antiviral treatment and surgical correction [16], counteracts the MMDS mitochondrial collapse, and regression of MODS [5,17]. Respiratory, cardiac and cerebral support, has justified itself not only in critical-terminal obstetrics, but also in oncological MODS, with massive injuries and bleeding [2,18,19] and even with infection coronavirus SARS-Cov2 / COVID19 and other viral infections [20-22], where Maria and Irina Vasilieva syndrome (Electro-Ion Membrane Distress Syndrome induces Chronic Fatigue Syndrome/Myalgic Encephalomyelitis, CFS/ME) is significant [23]. The absence of a continuous decrease in the pCO2 marker of tissue hypoxia AV gap <5 mmHg proves the suspension of the continuation of cell necrosis/apoptosis, hypo- (a) energy and confirms mitochondrial euenergetic metabolic remodeling with the elimination of mitochondrial hypo (an) energy, active lysosomal clearance (mitophagy), thus supporting the presence of euenergetic mitochondria with the normalization of mitochondrial Ca ++ - channel uniporter and cyclosporine-sensitive mitochondrial pore (mitochondrial permeability pore transition), with beneficially productively inactivate Reactive oxygen species (ROS) and Reactive nitrogen species (RNS) [24-28].

1. Venous blood acid-base balance (first analysis)



Test	Valoare	Unitaţi	
pH	6.983		
pCO_2	69.2	mmHg	
pO_2	36.9	mmHg	
SO_2	51	%	
Hct	36	%	
tHb	12.3	g/dL	
Na	143.3	mmol/L	
K	4.22	mmol/L	
Cl	111.3	mmol/L	
iCa	1.21	mmol/L	
iMg	0.75	mmol/L	
Glu	10.6	mmol/L	
Lac	8.2	mmol/L	
O_2Hb	49.3	%	
COHb	2.5	%	
MetHb	0.5	%	
HHb	>40.0	%	↑↑↑
tBil	191.5	umol/L	
HbF	0.9	%	
TCO_2	18.7	mmol/L	

Calculat

Test	Valoare	Unitaţi
BE-ecf	-15.2	mmol/L
BE-b	-14.9	mmol/L
SBC	12.5	mmol/L
HCO_3	16.57	mmol/L
O_2Cap	17.1	mL/dL
O_2Ct	8.8	mL/dL
A	63.3	mmHg
$A\text{-}aDO_2$	26.4	mmHg
a/A	0.6	
P_{50}	23.5	mmHg
RI	0.7	
pO_2/FIO_2	176.8	
nCa	1.01	mmol/L
nMg	0.61	mmol/L
Gap(K)	19.7	mmol/L
nCa/nMg	1.7	mol/mol
CcO_2	16.5	mL/dL
ePV	5.203	dL/g
MCHC	34.4	g/dL

2. Venous blood acid-base balance (second analysis)

Test	Valoare	Unitaţi
pH	7.131	
pCO_2	66.6	mmHg
pO_2	31.4	mmHg
SO_2	41	%
Hct	34	%
tHb	11.5	g/dL
Na	141.3	mmol/L
K	4.80	mmol/L
Cl	111.5	mmol/L
iCa	1.22	mmol/L
iMg	0.64	mmol/L
Glu	7.8	mmol/L
Lac	6.2	mmol/L
O_2Hb	40.2	%
COHb	1.8	%
MetHb	0.3	%
HHb	>40.0	%
tBil	186.6	umol/L
HbF	0.5	%
TCO_2	24.4	mmol/L

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Calculat

Test	Valoare	Unitaţi
BE-ecf	-7.0	mmol/L
BE-b	-6.8	mmol/L
SBC	17.9	mmol/L
HCO_3	22.39	mmol/L
O_2Cap	16.0	mL/dL
O_2Ct	6.7	mL/dL
A	66.2	mmHg
$A\text{-}aDO_2$	34.8	mmHg
a/A	0.5	
P_{50}	26.8	mmHg
RI	1.1	
pO_2/FIO_2	150.2	
nCa	1.07	mmol/L
nMg	0.54	mmol/L
Gap(K)	12.3	mmol/L
nCa/nMg	2.0	mol/mol
CcO_2	15.6	mL/dL
CaO_2	6.5	mL/dL
ePV	5.739	dL/g
ΔPV	10.3	%
MCHC	34.2	g/dL

3. Arterial blood acid-base balance (third analysis)

Test	Valoare	Unitaţi
pH	7.432	
pCO_2	19.5	mmHg
pO_2	187.5	mmHg
SO_2	Suspect	%
Hct	<12	%
tHb	Scăzut	g/dL
Na	129.2	mmol/L
K	3.43	mmol/L
Cl	121.3	mmol/L
iCa	0.28	mmol/L
iMg	0.17	mmol/L
Glu	6.4	mmol/L
Lac	2.2	mmol/L
O_2Hb	Suspect	%
COHb	Suspect	%
MetHb	Suspect	%
HHb	Suspect	%
tBil	Suspect	umol/L
HbF	Suspect	%
TCO_2	13.7	mmol/L

Calculat

Test	Valoare	Unitaţi
BE-ecf	-11.4	mmol/L
BE-b	-8.0	mmol/L
SBC	18.1	mmol/L
HCO_3	13.11	mmol/L
A	122.7	mmHg
a/A	1.5	
pO_2/FIO_2	897.3	
nCa	0.29	mmol/L
nMg	0.17	mmol/L
nCa/nMg	1.7	mol/mol
SO_2	100	%

4. Venous blood acid-base balance (fourth analysis)

Test	Valoare	Unitati
pH	7.464	
pCO_2	29.7	mmHg
pO_2	73 6	mmHg
SO_2	98	%
Hct	24	%
tHb	9.2	g/dL
Na	138 3	mmol/L
K	4.57	mmol/L
Cl	112 9	mmol/L
iCa	1.10	mmol/L
iMg	0 52	mmol/L
Glu	7 5	mmol/L
Lac	1.8	mmol/L
O_2Hb	94 8	%
COHb	2.7	%
MetHb	0 3	%
HHb	2.2	%
tBil	101.3	umol/L
HbF	0.1	%
TCO_2	22 4	mmol/L

Calculat

Test	Valoare	Unitati
BE-ecf	-2 4	mmol/L
BE-b	-1 0	mmol/L
SBC	23 6	mmol/L
HCO_3	21 53	mmol/L
O_2Cap	12 4	mL/dL
O_2Ct	12 7	mL/dL
A	110 1	mmHg
A-aDO_2	36.5	mmHg
a/A	0.7	
RI	0.5	
pO_2/FIO_2	352.3	
nCa	1.14	mmol/L
nMg	0.55	mmol/L
Gap(K)	8.5	mmol/L
nCa/nMg	2.1	mol/mol
CcO_2	12.5	mL/dL
ePV	8.261	dL/g
MCHC	38.5	g/dL

Translation from romanian to english: scazut → reduced; calculat → calculating; valoare → value; unitați → unity; suspect → suspect

Case report. In the context of arteriovenous differences, we will present a clinical case where you can properly familiarize yourself with the pCO2 difference (AV gap), as a marker, which confirms MMDS. According to the attached acid-base homeostasis and blood gases. The use of Recruitment of microcirculatory – mitochondrial control strategy reduced pCO2 (AV gap) 49.7 (mmHg)→ 10.2 mmHg, and therefore, fatal acidosis (pH 6.9 → 7.4; pCO2 69→ 29 (mmHg); pO2 36→73 (mmHg); SO2 51→ 98 (%); BE-ecf - 15.2 → - 2.4 (mmol/l); BE-b (-14,9) → (- 1) mmoli/l; AV(K) 19.7 → 8.5 (mmol/l). Oxygenation index from 176.8 → 352.3. MMDS, according to arteriovenous difference PCO2 (AV gap) or ΔPCO2 = PaCO2 − PvCO2 = 69.2 -19.5 = 49.7 (mmHg) confirmed, since pCO2 (AV gap) > 49.7 (mmHg), and after Recruitment of microcirculatory – mitochondrial control strategy it decreased to 10.2 mmHg. PCO2 (AV gap), since, ΔPCO2 = PaCO2 − PvCO2 = 29.7 - 19.5 = 10.2 mmHg. In this pathological biochemical context, we were able to reduce lactate from (V) 8,2 mmol/l → (V) 6,2 mmol/l → (A) 2,2 mmol/l → (V) 1,8 mmol/l by Recruitment of microcirculatory – mitochondrial control strategy. It should be noted that elevated lactate levels are a marker of cerebral hypoxia, confirming decreased cerebral blood flow or ischemia and the above-described MMDS or decreased metabolism with a concomitant decrease in brain pyruvate levels. Lactic acid levels are considered high if they range from 2 to 4 mmol/l and pH is below 7.25, and are regarded as hyperlactatemia or lactic acidosis. An increase in lactate to a concentration exceeding 5 mmol/l and a decrease in pH below 7.25 can confidently indicate lactic acidosis.
However, and other a difficult situation arose when the visual blood loss of more than 3 liters did not correspond to the data of venous red blood (venous VHct 36%; VtHb 12.3 g/dL). For the protocol implementation of red blood cell transfusion, the basis was the arteriovenous difference in red blood (arterial blood AHct < 12%; AtHb low g/dL) against (VHct 36%; VtHb 12.3 g/dL). After the red blood cell transfusion → VHct 24%; VtHb 9.2 g/dL. Thus, it was possible to prove the indications for blood transfusion, based on the Arteriovenous Gap of Red Blood Cell (RBC) marker. Have not encountered such a method in the medical literature as an indication for hemotransfusion in difficult situations. But we decided it exclusively in the interests of the patient.

Conclusion:

Detectable Systemic Perfusion Pressure (SPP) in capillary resistance pressure (CPR) in ICU is the gold standard not limited in time compared to the definition of the Hemodynamic Support Algorithm used by the ARDS Network in the “Prospective, Randomized, Multi-Center Trial of (Fluid Conservative” vs. (Fluid Liberal) Management of Acute Lung Injury and ARDS to determine, Pulmonary artery wedge pressure, Cardiac index, Pulmonary diastolic pressure. Volemic resuscitation, where instead of permissive hypoperfusion provided by protocols, was guided by permissive SPP, with prevention of dilutional coagulopathy with limitation of fluid use. Of the fluids, intravenous Ringer was preferred. We draw attention to the fact that the permissive SPP solved disputes about large or low liquid volume Eliminating, thus, the problems of hyper or hypo hydration. Using arteriovenous gap markers pCO2, K+, pO2, Lactate, pRBC, confirming MMDS, blocking microcirculation with sequestration of its

contents, and the transition of metabolism to anaerobic glycolysis with an increase in lactate accelerating brain death and tenatogenesis. Using Recruitment of microcirculatory – mitochondrial control strategy suspended the development of MMDS, evidenced improved by acid-base homeostasis, after recruitment of microcirculation. Also, in 2007, we noted the successful stabilization of the "metabolic stage" of Coagulation Resuscitation, while we are still far from the methods of "no fluid resuscitation" or "low-volume resuscitation" [2]. The decisive one in the dispute, in this case, was SPP [2,5,12,29] based on AV gap markers: pCO2, pK+, pO2, pLactate, pRBC.

The microcirculatory-mitochondrial recruitment contributes to the reduction of the tissue hypoxia marker pCO2 at the A-V difference, rejects necrosis / apoptosis, cellular hypo- (an) energetic and allows mitochondrial eu-energetic metabolic remodeling by eliminating hypo - (an)- energetic mitochondria carried out by lysosomal clearance (mitophagy), thus demonstrating eu-energetic mitochondria with the normalization of the uniporter-Ca ++ mitochondrial pore transition and mitochondrial permeability, which productively inactivates toxic forms of oxygen and nitrogen.

With some elementary technologies and simple maneuvers to balance multiple changes, without the need for sophisticated technologies, it is possible to reduce Thus the mortality of the critically - patient [4-6, 30-33]. With the simultaneous rapid development of technocratization and robotization of medicine, mathematical-geometric models of research in medicine and artificial intelligence , where throughout the main thing will remain private intellectual property, as Saint Exupery spoke about [34-49].

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References:

1.Cojocaru Victor, Ceban Emil, Vasilieva Irina, Vasilieva Maria, Groppa Stanislav, Vasiliev Ilie, et al. (2020). Tödliche β-SARS - Cov-2 COVID 19 ist nochkein Satz. Published on LinkedIn. WAMS.
https://www.researchgate.net/publication/349506716_Todliche_b-SARS_-_Cov-2_COVID_19_ist_noch_kein_Satz
2. Vasiliev I. Calalb I. Bujujan A. et al. (2007). Successful treatment of disseminated intravascular coagulation syndrome in obstetrics. Collection of Papers and Theses. Actual Problems Anaesthesiology and Intensive Therapy. 2nd White Sea Symposium. Arkhangelsk, 106-108.
https://www.researchgate.net/publication/348369589_Successful_Treatment_of_Disseminated_Intravascular_Cagulation_Syndrome_in_Obstetrics_2nd_White_Sea_Symposium_of_the_All-Russian_Conference_with_International_Participation_Actual_problems_of_Anesthesi
3. Vasiliev I., Vasilieva Irina, Vasilieva Maria.(2019). Prevention of the Development of Multi Organ Dysfunction Syndrome-is Achieved by Complex Methods of Recruiting

Microcirculatory-mitochondrial Distress Syndrome, in which the pCO2 (AV gap) Increases. Austria.
https://www.researchgate.net/publication/348370862_Prevention_of_the_Development_of_Multi_Organ_Dysfunction_Syndrome-is_Achieved_by_Complex_Methods_of_Recruiting_Microcirculatory-mitochondrial_Distress_Syndrome_in_which_the_pCO2_AV_gap_Increases_Austr/citations
4. Vasiliev I., Vasilieva M., Vasilieva I., Litarczek G., et al. (2018). Poster. Suspendarea sindromului Detresei Microcirculator – Mitocondriale prin recrutarea microcirculator - mitocondrială a situațiilor critice obstetricale. PROGRAM Al 17-lea Congres al Societății de Obstetrică și Ginecologie din România 20-22 septembrie 2018 Iași, România., 104:41.
https://www.researchgate.net/publication/354511943_PROGRAM_Al_17-lea_Congres_al_Societatii_de_Obstetrica_si_Ginecologie_din_Romania_20-22_septembrie_2018_Iasi_Romania_pg_41
5. Vasiliev I., Vasilieva Maria, Vasilieva Irina. (2021). E-Book. Forty Years Success of No Maternal Mortality in Critical Obstetrics on the Operating Table. A Decrease in The Increased Marker of Tissue Hypoxia PCO2> (Av-Gap) in Microcirculatory-Mitochondrial Distress Syndrome in Critical Obstetrics is Achieved by Complex Methods of Recruiting Microcirculatory-Mitochondrial Distress Syndrome. Biomedical Research and Clinical Reviews. 4(1); DOI:10.31579/2692-9406/06
https://www.researchgate.net/profile/Ilie-Vasiliev/publication/351945001_A_masterpiece_of_the_gold_international_treasury_Forty_Years_Success_of_No_Maternal_Mortality_in_Critical_Obstetrics_on_the_Operating_Table_A_Decrease_in_The_Increased_Marker_of_Tissue_Hypoxia_PCO2_Av/links/60b1280745851557baa6b6ad/A-masterpiece-of-the-gold-international-treasury-Forty-Years-Success-of-No-Maternal-Mortality-in-Critical-Obstetrics-on-the-Operating-Table-A-Decrease-in-The-Increased-Marker-of-Tissue-Hypoxia-PCO2-Av.pdf
6.Vasiliev Ilie. (2009). Respiratory Suport with Alveolar Recruitment for Complex Treatment of Acute Lung Injury and Acute Respiratory Distress Syndrome. Krasnoyarsk: International Congress for Respiratory Support. Book of Abtracts III International Congress for Respiratory Suport Krasnoyarsk. 2-7.
https://www.researchgate.net/publication/353182325_Respiratory_Support_with_Alviolar_Recruitment_for_Complex_Treatment_of_Acute_Lung_Injure_and_Acute_Respiratory_Distress_Syndrome_Krasnoiarsk
7.Ophardt, Charles E. (2018). "Pyruvic Acid - Cross Roads Compound". Virtual Chembook. Elmhurst College. Archived from the original on July 31, 2018. Retrieved April 7, 2017.
8. Vasiliev I., Vasilieva Maria, Vasilieva Irina, et al. (2019). The recruitment of microcirculatory-mitochondrial of critical obstetric situations in the complex multi-organ support therapy reduces pCO2 (AV gap) and the development of the syndromeof acute multi-organ dysfunction. Biochem Mol biol,5:22. DOI: 10.21767/2471-8084-C1-022
https://www.researchgate.net/profile/Ilie-Vasiliev/publication/348076731_Amsterdam_2019_EuroSciCon/links/5fee415fa6fdccdcb81e97cd/Amsterdam-2019-EuroSciCon.pdf
https://www.imedpub.com/conference-abstracts-files/biotechnology-biomarkers-systems-biology-2019-keynote.digital/files/assets/common/downloads/biotechnology-biomarkers-systems-biology-2019-keynote.pdf

9. Vasiliev I., Vasilieva Maria, Vasilieva Irina., Litarczek Gheorghe., Friptu V., Gladun S., Diug V., et al. (2018). 241. Suspendarea sindromului Detresei Microcirculator - Mitocondriale prin recrutarea microcirculator - mitocondrială a situațiilr critie obstetricale. Congresul Național al Societății de Obstetrică și Ginecologie din România 20-22.09.2018 Coordonator Științific Profesor Dr Mircea Onofriescu. 241:167
https://www.researchgate.net/publication/353164296_National_Congress_of_the_Society_of_Obstetrics_and_Gynecology_from_Romania_20092018_Volume_of_Abstracts_Co-ordinator_Professor_Dr_Mircea_Onofriescu
10. Vasiliev I., Vasilieva Maria, Vasilieva Irina. (2018). Recruitment of Microcirculatory-mitochondrial of Critical Obstetric Situations in the Complex of MOST. The VI National Congress with International Participation. 13-15 September. 2018. Chișinău. Republic of Moldova
https://www.researchgate.net/publication/354372196_National_Congress_With_International_participation
11. Vasiliev I., Vasilieva Maria, Vasilieva Irina. (2018). Recruitment of microcirculatory mitochondrial of critical obstetric situations in the complex of multi organ support therapy stops the development of the sindrome of acute multi organ dysfunction. Conference: Global Summit on Medicine, Pharmacology&Cancer Research with of the World Academy of Medical Sciences (WAMS). Barcelona Spain Juli 19-20 2018
https://www.researchgate.net/publication/354376523_Recruitment_of_microcirculatory_mitochondrial_of_critical_obstetric_situations_in_the_complex_of_multi_organ_support_therapy_stops_the_development_of_the_sindrome_of_acute_multi_organ_dysfunction
12.Vasilieva Irina, Vasilieva Maria, & Vasiliev I. (2023). Recruitment Microcirculatory - Mitochondrial through a permissive systemic perfusion pressure combats microcirculatory - mitochondrial distress syndrome. Cases report. Special Journal of the Medical Academy and Other Life Sciences., 1(4). https://doi.org/10.58676/sjmas.v1i4.24
13. Saicharan G Bodi M.V. Raghavendra Rao, Vijaykumar Chennamchetty, M M Karindas, Ilie Vasiliev, et al. (2022). Breathing Lung Transplantation - A ROAD TO RELIEF NEW LUNGS WITH OLD VESSELS. Journal International Education & Research Journal., 8:7:36-39
https://www.researchgate.net/publication/362348460_International_Education_Research_Journal_BREATHING_LUNG_TRANSPLANTATION_-_A_ROAD_TO_RELIEF_NEW_LUNGS_WITH_OLD_VESSELS
14. Vasiliev I., Vasilieva M., Vasilieva I., Catereniuc I., Globa T., Nacu V. et al. (2016). Aggressiveness syndrome hyperantiinflammatory immune CHAOS dissonance and extracorporeal myelotimospleen perfusia. Togliatti Medical Council, 3-4:64-69.
https://www.researchgate.net/publication/348281194_AGGRESSIVENESS_SYNDROME_HYPERANTIINFLAMMATORY_IMMUNE_CHAOS_DISSONANCE_AND_EXTRACORPOREAL_MYELOTIMOSPLEEN_PERFUSIA
https://elibrary.ru/item.asp?id=27208738
15. Mirta D' Ambra. (2019). CDC alert for hospital infections due to Candida auris multiresistant. American Journal of Biomedical Science & Research., 2:3:13-14
DOI: 10.34297/AJBSR.2019.03.000625
https://www.researchgate.net/publication/333397204_CDC_Alert_for_Hospital_Infections_due_to_Candida_Auris_Multiresistant
16. Ignatenco S ., Vasilieva Irina, Crăciun I. (2020). Închiderea temporară a cavității abdominale la pacienții operați de ischemie mezenterică acută. Temporary closure of

the abdominal cavity in patients operated with mesenteric ischemia. Congresul consacrat aniversării a 75-a de la fondarea Universităţii de Stat de Medicină şi Farmacie „Nicolae Testemiţanu" din Republica Moldova. 21-23 octombrie 2020: Abstract book. https://repository.usmf.md/handle/20.500.12710/14572
https://repository.usmf.md/handle/20.500.12710/12697
https://repository.usmf.md/bitstream/20.500.12710/12697/1/INCHIDEREA_TEMPORARA_A_CAVITATII_ABDOMINALE_LA_PACIENTII_OPERATI.pdf
17. Vasiliev I., Vasilieva Maria., Vasilieva Irina., Litarczek G., Friptu V., Gladun S., Diug Valentina, et al. (2018). De-instalation of the MODS by Associating the Microcirculatory-mitochondrial Recruitment with MOST in ELSO. Perinatology Bulletin. Journal of Research Practice Suppliment., 3:6.
https://repository.usmf.md/handle/20.500.12710/17378
https://www.researchgate.net/publication/348298191_DE-INSTALLATION_OF_THE_MULTI-ORGANIC_DYSFUNCTION_SYNDROME_BY_ASSOCIATING_THE_MITOCHONDRIAL_MICROCIRCULATORY_RECRUITMENT_WITH_MULTIPLE_ORGAN_SUPPORT_THERAPY_IN_EXTRACORPOREAL_LIFE_SUPPORT_ORGANIZATION
18. Diug Valentina, Vasiliev I. (2018). Definitive Haemostasis in Hematoma Postpartum Massive Hemorrhage. Sum of Summaries. Iasi: National Conference., 44-46
https://www.researchgate.net/publication/364669546_Romania_Definitive_hemostasis_in_postpartum_hematoma_with_hemorrhage_massive_Clinical_case_Valentina_Diug_Ilie_Vasiliev_Iasi_April_19-21_2018_pg_44
19. D' Ambra Mirta. Ilie Vasiliev. Valeri Shevchenko. (2019). When the Trauma is Serious. American Journal of Biomedical Science & Research, 2:6:241 - 244.
https://paper.researchbib.com/view/paper/213167
20. Ilie Vasiliev, Maria Vasilieva, Irina Vasilieva. (2024). Neuro SARS-CoV-2 (COVID-19). Book. LAP. Germany (Berlin).
https://www.researchgate.net/publication/381201875_Neuro_SARS-CoV-2_COVID-19_Ilie_Vasiliev_Maria_Vasilieva_Irina_Vasilieva_Book_Germany_httpswwwhugendubeldedetaschenbuchilie_vasiliev_maria_vasilieva_irina_vasilieva-neuro_sars_cov_2_covid_19_-48341418-
21. Ilie Vasiliev. Maria Vasilieva. Irina Vasilieva. (2023). Molecular pathological biology of Coronavirus infection SARS-CoV-2. Book. LAP. United Kingdom. London.
https://www.researchgate.net/publication/376886306_Ilie_Vasiliev_Maria_Vasilieva_Irina_Vasilieva_Molecular_pathological_biology_of_Coronavirus_infection_SARS-CoV-2/citations
https://www.researchgate.net/publication/383231717_EuroBuch_Vasiliev_Ilie_Vasilieva_Maria_Vasilieva_Irina_Molekularpathologische_Biologie_der_Coronavirus-Infektion_SARS-CoV-2
22. Raghavendra Rao, MM Karindas, Ilie Vasiliev, Hitesh Lakshmi Billa et al. (2022). Monkey Pox: A Novel Unravelling of Intercontinental Health Emergency. International Journal of Current Advanced Research, 11:06(B):1081-1086
https://www.researchgate.net/publication/361664203_MONKEY_POX_A_NOVEL_UNRAVELLING_OF_INTERCONTINENTAL
23. Vasilieva Maria, Vasilieva Irina , Vasiliev I., Malakhova M., Groppa S. et al. (2019). Electro - Ion Membrane Distress Syndrome induces Chronic Fatigue Syndrome/Myalgic Encephalomyelitis (CFS/ME). Journal of Clinical Research in Anesthesiology, 2: 2

https://www.researchgate.net/publication/351887239_Electro_-_Ion_Membrane_Distress_Syndrome_induces_Chronic_Fatigue_SyndromeMyalgic_Encephalomyelitis_CFSME_
24. Vasilieva Maria, Vasilieva Irina, Vasiliev I*., Groppa Stanislav, Ghidirim Gheorghe et al., (2020). Intralipid in the Target Treatment of Lipid Peroxidation Disorder Caused by Oxidative and Nitro- Galogenic Stress in Patients with SARS-Cov2/ COVID / 19. Journal of Advances in Medical and Pharmaceutical Sciences, 22:11:20
https://www.researchgate.net/publication/370400568_Intralipid_in_the_Target_Treatment_of_Lipid_Peroxidation_Disorder_Caused_by_Oxidative_and_Nitro-_Galogenic_Stress_in_Patients_with_SARS-Cov2_COVID_19
https://dspace.onua.edu.ua/items/437aa21f-a5ca-42e5-bb6a-0bc31c0f5a00
25. Vasilieva I., Vasilieva M., & Vasiliev I. (2023). Lipid Therapy for Dyslipidemic Disorders Activates 21st Century Nano Antioxidant Hydrogen as a Potential Anti-COVID-19 Agent: Review . Special Journal of the Medical Academy and Other Life Sciences., 1(7). https://doi.org/10.58676/sjmas.v1i7.41
https://www.researchgate.net/publication/373790803_Lipid_Therapy_for_Dyslipidemic_Disorders_Activates_21st_Century_Nano_Antioxidant_Hydrogen_as_a_Potential_Anti-COVID-19_Agent_Review
26. Vasilieva Irina, Vasilieva Maria, Vasiliev I. et al. (2025). Endothelial dilatation. Special Journal of the Medical Academy and Other Life Sciences., 3(1). https://doi.org/10.58676/sjmas.v3i1.105
https://sjmas.com/index.php/sjmas/article/view/105/95
27. Vasilieva Irina, Vasilieva Maria, & Vasiliev I. (2024). Role Of Acute Vascular Distress Syndrome In The Development Of Multisystem Inflammatory Syndrome In Sars-Cov-2 And Modern Views On The Research And Treatment Of Critical Coronavirus. Special Journal of the Medical Academy and Other Life Sciences., 2(4). https://doi.org/10.58676/sjmas.v2i4.70
https://www.researchgate.net/publication/380835765_Role_Of_Acute_Vascular_Distress_Syndrome_In_The_Development_Of_Multisystem_Inflammatory_Syndrome_In_Sars-Cov-2_And_Modern_Views_On_The_Research_And_Treatment_Of_Critical_Coronavirus
28. Vasilieva Irina, Vasilieva Maria, & Vasiliev I. (2023). A Intralipid blocks the entry of the SARS. Special Journal of the Medical Academy and Other Life Sciences., 1(3). https://doi.org/10.58676/sjmas.v1i3.1
https://www.researchgate.net/publication/369010544_London_UK_Intralipid_blocks_the_entry_of_the_SARS-Cov2COVID19_virus_into_cells_by_maintaining_receptor_a_leucine-rich_repeat_containing_15_LRRC15_an_angiotensin-converting_enzyme_2_receptor_competitor
29. Vasilieva Irina, Vasilieva Maria, Vasiliev I., Groppa S, et al. (2019). Role of pCO2 (AV gap) of Multi Organ Dysfunction Syndrome. J Biomed Pharm Sci, 2:2
https://www.researchgate.net/profile/Ilie-Vasiliev/publication/370410995_Role_of_pCO2_AV_gap_of_Multi_Organ_Dysfunction_Syndrome/links/644e723997449a0e1a6b0696/Role-of-pCO2-AV-gap-of-Multi-Organ-Dysfunction-Syndrome.pdf
30. Vasiliev I. Creciun A. (1986). Cases of anaphylactic shock and tactics emergency therapy. Courr Med., 5:51-53.

https://www.researchgate.net/publication/353018042_Vasiliev_I_Creciun_A_198_Cases_of_anaphylactic_shock_and_tactics_emergy_therapy_Cour_Med_1986
31. Vasilieva Maria, Vasilieva Irina, Vasiliev I. Groppa S. et al. (2018). Neurovegetative correction of diencephalic-hyperkinetic, catabolic adrenergic syndrome. Journal of Clinical Research in Anesthesiology, 1 : 2
https://www.researchgate.net/publication/348198142_Neurovegetative_Correction_of_Diencephalic_-Hyperkinetic_Catabolic_Adrenergic_Syndrome_under_a_Creative_Commons_Attribution_CC-BY_40_license
https://asclepiusopen.com/journal-of-clinical-research-in-anesthesiology/volume-1-issue-2/5.pdf
https://www.researchgate.net/profile/Ilie-Vasiliev/publication/348198142_Neurovegetative_Correction_of_Diencephalic_-Hyperkinetic_Catabolic_Adrenergic_Syndrome_under_a_Creative_Commons_Attribution_CC-BY_40_license/links/5ff3647192851c13feeb28cc/Neurovegetative-Correction-of-Diencephalic-Hyperkinetic-Catabolic-Adrenergic-Syndrome-under-a-Creative-Commons-Attribution-CC-BY-40-license.pdf
32. Vasilieva Irina, Vasilieva Maria, Vasiliev I., Ghicavii V. et al. (2019). Triphosphoric acid, donated, restores heart rhythm disturbances caused by energetically deficient, mitochondrial hypercalcaemia to Ca++ mpt pore lesion. J Clin Res Anesthesiol., 1:1-3. f
https://asclepiusopen.com/journal-of-clinical-research-in-anesthesiology/volume-1-issue-2/6.pdf
33. Vasiliev I. Ceban N et al. (1989). The lymphotropic therapy with lymph stimulation in complex treatment of exotoxin shock. Health Care, 2:52-53.
https://www.researchgate.net/publication/354533684_The_lymphotropic_therapy_with_lymph_stimulation_in_complex_treatment_of_exotoxin_shock
34. Vasilieva Irina, Vișnevschi Anatolie, Vasilieva Maria, & Vasiliev I. (2023). Total Quality Management as Predictor of Artificial Intelligence Ensures Competitive Marketing. Special Journal of the Medical Academy and Other Life Sciences., 1(8). https://doi.org/10.58676/sjmas.v1i8.47
https://www.researchgate.net/publication/375496954_London_Irina_Vasilieva_A_Visnevschi_Maria_Vasilieva_I_Vasiliev_Total_Quality_Management_as_Predictor_of_Artificial_Intelligence_Ensures_Competitive_Marketing_Special_journal_of_the_Medical_Academy_and/citations
Translated into Chinese
https://www.researchgate.net/publication/382823509_Irina_Vasilieva_Anatolie_Visnevchi_Maria_Vasilieva_Ilie_Vasiliev_quanmianzhiliangguanlizuoweirengongzhinengdeyuceqiquebaoshichangjingzheng_Total_Quality_Management_as_Predictor_of_Artificial_Intellige
35. Santo Banerjee, A. Gowrisankar. (2023). Fractal Signatures in the Dynamics of an Epidemiology. An Analysis of COVID-19 Transmission. Gowrisankar, D. Easwaramoorthy, ∗R. Valarmathi, P.S. Eliahim Jeevaraj,Christo Ananth and Ilie Vasiliev. Chapter 7An Integrated Perspective of Fractal Time SeriesAnalysis for Infected Cases of COVID-19A
https://www.routledge.com/Fractal-Signatures-in-the-Dynamics-of-an-Epidemiology-An-Analysis-of-COVID-19/Banerjee-Gowrisankar/p/book/9781032327693
36. Gowrisankar A., Easwaramoorthy D., Valarmathi R., Eliahim Jeevaraj PS., Christo Ananth, Ilie Vasiliev. (2023). An Integrated Perspective of Fractal Time Series Analysis for Infected Cases of COVID-19.In Book: Santo Banerjee, A. Gowrisankar.

(2023). Fractal Signatures in the Dynamics of an Epidemiology. An Analysis of COVID-19 Transmission.In Book: Santo Banerjee, A. Gowrisankar. (2023). Fractal Signatures in the Dynamics of an Epidemiology. An Analysis of COVID-19 Transmission
https://www.taylorfrancis.com/chapters/edit/10.1201/9781003316640-7/integrated-perspective-fractal-time-series-analysis-infected-cases-covid-19-gowrisankar-easwaramoorthy-valarmathi-eliahim-jeevaraj-christo-ananth-ilie-vasiliev
37. Raghavendra Rao M V., Anantha Lakshmi G., Karindas M.M., Ille Vasiliev, et al. (2023). RESPECTING OUR MEDICAL HISTORY, DREAMING OUR FUTURE. International Journal of Curent Medical and Pharmaceutical Research., 9:4:352-358.
DOI: http://dx.doi.org/10.24327/ 23956429.ijcmpr20230100
https://www.researchgate.net/publication/371638585_INTERNATIONAL_JOURNAL_OF_CURRENT_MEDICAL_AND_PHARMACEUTICAL_RESEARCH_RESPECTING_OUR_MEDICAL_HISTORY_DREAMING_OUR_FUTURE
38. Vasiliev I, Vasilieva M, Vasilieva I, et al. (2015) The Extracorporeal Bio-Xeno Perfusion (myelo-timo-spleen) in Multi-organ Supportive Therapy (MOST) as a Modulator of Energy, for Immuno Correction Compensatory Anti-Inflammatory Response Syndromes, and Persistent Inflammation, Immuno suppression, Catabolism, and Multi-organ Dysfunction. J Anesth Pati Care 1(1): 104.
doi: 10.15744/2456-5490.1.104
https://www.researchgate.net/profile/Ilie-Vasiliev/publication/349301780_The_Extracorporeal_Bio-Xeno_Perfusion_myelo-timo-spleen_in_Multi-organ_Supportive_Therapy_MOST_as_a_Modulator_of_Energy_for_Immuno_Correction_Compensatory_Anti-Inflammatory_Response_Syndromes_and_Pers/links/60291da592851c4ed56e503a/The-Extracorporeal-Bio-Xeno-Perfusion-myelo-timo-spleen-in-Multi-organ-Supportive-Therapy-MOST-as-a-Modulator-of-Energy-for-Immuno-Correction-Compensatory-Anti-Inflammatory-Response-Syndromes-and-Pe.pdf
39. Vasiliev I., Nistor V., Bogdan V., et al. (1993). The extracorporeal bio-xeno perfusion as a complex therapeutic component of the treatment of septicemia on the background of associated injury. Courr Med., 2:56-59.
https://www.researchgate.net/publication/348369818_The_extracorporeal_bio-xeno_perfusion_as_a_complex_therapeutic_component_of_the_treatment_of_septicemia_on_the_background_of_associated_injury
40. Vasiliev I , Vasilieva Maria, Vasilieva Irina. (2016). The Medico Legal Indications and Contraindications to the use ECMO and ECCO2R at ALI/ARDS. United States: Project Proposed for Discussion and Study WAMS. 6-9
41. Dra Mirta D'Ambra, Ilie Vasiliev and Mark Karindas. (2019). Small Brain Vessels Disease. Biomed J Sci & Tech Res 19(5). BJSTR. MS.ID.003355.
DOI: 10.26717/BJSTR.2019.19.003355
https://www.researchgate.net/profile/Ilie-Vasiliev/publication/348281165_Small_Brain_Vessels_Disease/links/5ff64205a6fdccdcb83725ca/Small-Brain-Vessels-Disease.pdf
42. Vasilieva I., Vasilieva M., & Vasiliev, I. (2024). Role of glucose in regulating menstrual cycle . Special Journal of the Medical Academy and Other Life Sciences., 2(8). https://doi.org/10.58676/sjmas.v2i8.90
https://sjmas.com/index.php/sjmas/article/view/90/80

43. Vasilieva I., Vasilieva M., & Vasiliev I. (2024). Amnesia and homework. Special Journal of the Medical Academy and Other Life Sciences., 2(8). https://doi.org/10.58676/sjmas.v2i8.89
https://sjmas.com/index.php/sjmas/article/view/89/79
44. Vasilieva I., Vasilieva M., & Vasiliev I. (2025). Allopregnanolone, Gap Difference Blood Plasma (Pl) > Cerebrospinal Fluid (CSF) (Allopregnanolone Gap Pl > CFS) - biomarker of Status Epilepticus (SE). Special Journal of the Medical Academy and Other Life Sciences., 3(1). https://doi.org/10.58676/sjmas.v3i1.106
https://sjmas.com/index.php/sjmas/article/view/106/96
45. Vasilieva I., Vasilieva M., & Vasiliev I. (2024). Settings Type 2 diabetes mellitus develops after menarche, a disorder diagnosed by the Leptin biomarker. Special Journal of the Medical Academy and Other Life Sciences., 2(10). https://doi.org/10.58676/sjmas.v2i10.100
https://sjmas.com/index.php/sjmas/article/view/100/90
46. Vasilieva I., Vasilieva M., & Vasiliev,I. (2024). Poor social relationships and apathy. Special Journal of the Medical Academy and Other Life Sciences., 2(10). https://doi.org/10.58676/sjmas.v2i10.99
https://sjmas.com/index.php/sjmas/article/view/99/89
47. Vasilieva I., Vasilieva M., Vasiliev I., et al. (2024). Illnesses and sleep deprivation. Special Journal of the Medical Academy and Other Life Sciences., 2(9). https://doi.org/10.58676/sjmas.v2i9.94
https://sjmas.com/index.php/sjmas/article/view/94/86
48. Vasilieva I., Vasilieva I., Vasilieva M., et al. (2024). Exhaustion of neurotransmitters storage. Special Journal of the Medical Academy and Other Life Sciences., 2(9). https://doi.org/10.58676/sjmas.v2i9.95
https://sjmas.com/index.php/sjmas/article/view/95