WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.453
Volume 15, Issue 3, 51-70. Review Article ISSN 2277–7105

THE CONCEPT OF PATHOLOGICAL PATTERNS OF THE BODY IN CONTACTS WITH THE EXTERNAL ENVIRONMENT: PRINCIPLES OF ANALYSIS OF EARLY AND LATER SKIN AND MUCOSAL LESIONS IN CONNECTION WITH COVID-19 AND CO-INFECTIONS

Lakhtin V. M.*, Lakhtin M. V., Aleshkin V. A., Vorobev A. M.

G.N. Gabrichievsky Institute for Epidemiology & Microbiology, Moscow 125212, Russia.

Article Received on 31 Dec. 2025,
Article Revised on 21 Jan. 2026,
Article Published on 01 Feb. 2026,
https://doi.org/10.5281/zenodo.18426840

***Corresponding Author**
Lakhtin V. M.
G.N. Gabrichievsky Institute for Epidemiology & Microbiology, Moscow 125212, Russia.

How to cite this Article: Lakhtin V. M.*, Lakhtin M. V., Aleshkin V. A., Vorobev A. M. (2026). The Concept Of Pathological Patterns Of The Body In Contacts With The External Environment: Principles Of Analysis Of Early And Later Skin And Mucosal Lesions In Connection With Covid-19 And Co-Infections. "World Journal of Pharmaceutical Research, 15(3), 51–70.

ABSTRACT

The goal is to develop a conceptual understanding of pathological patterns (PPs) in relation to the COVID-19 pandemic, waves, and outbreaks. The concept of PPs is based on observations of PPs in elderly patients aged 65+ (2020-November 2025) in relation to COVID-19, acute respiratory viral infections, and acute respiratory infections. It is supported by our own publications on PPs in macro-systems of the body that are in contact with the external environment (using the examples of the skin and mucosal envelopes). The main provisions of the concept, and the principles of PP analysis are outlined. A personalized analysis of PP patients with signs of COVID-19 (lung damage, erythema and skin rashes, mucosal disorders in the absence or low titers of anti-COVID-19 antibodies), including those vaccinated and revaccinated against COVID-19, was conducted in connection with the pandemic and subsequent waves and outbreaks of COVID-19. The results indicate the high sensitivity of the body's macro-systems. Early and later short-term manifestations on the skin and mucosa of PP erythemas, rashes, and other types of lesions in connection with the COVID-19 pandemic and further seasonal manifestations of post-COVID syndrome and long COVID-19 have been established. Cascade chains have been identified that combine primary and secondary PPs in connection with the seasonality of COVID-19, including those that reflect changes in the

circulatory system. Against the background of the similarity of the primary PPs in patients, the secondary PPs were characterized by an increase in the diversity of differences between patients, which could be represented as a personalized unique tree of the patient's pathologies. The contribution of the patient's existing pathologies (including chronic ones) to the formation of such a tree was noted. The branching of the tree during periods of long COVID-19 reflected the combined nature of the resulting PPs under the influence of acute respiratory viral infections and acute respiratory diseases. Based on a generalized analysis of the PPs of patients' macro-systems in contact with the external environment during periods of pandemic and later outbreaks of COVID-19, a concept of PPs has been proposed. The key terms of the concept have been described. The diagnostic and prognostic significance of the concept, as well as its connection to infection, have been assessed. The prognostic value of the concept lies in its ability to predict the development of characteristic early and later personalized PPs in relation to post-COVID-19. A classification of the PP topography has been provided. The concept allows for the development of therapeutic vectors in PPs and strategies for accelerated elimination of PPs. The data and approaches presented in this article will help in the diagnosis, prognosis, prevention, and treatment of post-viral syndrome in connection with viral infections.

KEYWORDS: COVID-19, post-COVID-19 syndrome, long COVID-19, skin and mucosa, pathological patterns, erythema, rashes, cornea, vitreous body, pathological and therapeutic vectors, pathological tree, rheumatic syndrome, rehabilitation.

ABBREVIATIONS

LC long COVID-19

PPs pathological pattern(s)

PS post-COVID-19 syndrome

ARVI acute respiratory viral infections

ARI acute respiratory infections (bacterial)

CNS central nervous system

1. INTRODUCTION

During periods of pandemics, waves and outbreaks of COVID-19, elder patients are particularly susceptible to viral infection. They are more likely to experience COVID-19, post-COVID-19 syndrome (PS), and long COVID-19 (LC). Early significant signs (precursors of diseases, components of PS, and LC) of COVID-19 include temporary (rapidly

resolving within up to 10-14 days) pathological images/patterns (PPs) on the skin and mucosa.

The aim is to summarize, supplement and develop previously published materials.[1-11,43-45] in the form of a concept of PPs in connection with the pandemic, waves and outbreaks of COVID-19.

2. MATERIALS AND METHODS

Observations on patient pathologies (November 2019-November 2025) in connection with the COVID-19 pandemic and its outbreaks; own publications on the PPs of the body's macro-systems contacting the external environment during PS and LC were used.

3. MAIN CONTENT

3.1. Provisions of the PP concept in connection with COVID-19 [1-11] (see also the dictionary of terms)

* Waves of the COVID-19 pandemic caused by the *Omicron* strain and other similar aggressive COVID-19 strains (as well as seasonal outbreaks of COVID-19 caused by moderate exposure to other later strains of COVID-19) contribute to the appearance/ manifestation of specific characteristic PPs on the skin and mucosal envelopes in patients.

* There is a visually detectable effect of macro-systems of the body in contact with the external environment at the PP level, due to the high sensitivity of macro-systems in connection with COVID-19.

* Personalized PPs are characteristic of the patient and reflect the patient's pathology history (pathology tree) against the background of the COVID-19 waves.

* PPs are unique. This means the uniqueness of PPs in terms of their present or next location, mosaic, type of asymmetry, current time.

* The observed dynamics of PPs allows to reveal both chains of PPs over time and cascades of PPs that can be branched.

* There is a continuity of PPs, which assumes partial similarity of the resulting/ final PPs at the moment with the previous ones.

* PPs during outbreaks of COVID-19 are expected in places of preserved earlier pathologies, reflecting their possible further development in breadth (for example, rashes of densely located pimples on the skin above the injured shin bone, under the eyes above the right side of the cheekbones) and in depth (overlapping erythema circles with a diameter of 1.5–2.5 cm on top of each other on the skin above injured knee).

* Memory can be expressed in understanding the history of PPs as a process of developing PP properties, taking into account the stages of PPs in the chain.
* Resonance characterizes a sharply marked (in time and amplitude) sensitized preferential choice of the asymmetric arrangement of PPs in response to factors caused by COVID-19 (similarity to allergic reactions).
* PP hypersensitivity characterizes a large-scale (not strictly localized, with a relatively wide coverage of the territory) response of the body during the waves of COVID-19.
* The asymmetry (external and internal) of PPs is a key criterion for the status of a mosaic pattern as pathological and in a functionally active aggressive state. It is opposed to the symmetry of PPs as a state of achieved calm, "rest", a stationary phase of PP functioning.
* PPs are characterized by an architecture that includes the entire territory, a mosaic of elements (their variation) with the dynamics of their interrelationships in shapes and vectors.
* PP vectors (vectors in/within PPs) can help in early diagnosis, prognostication, prevention and therapy of PS and LC of the patient.
* Pathology tree is personalized, reflects the history and cascade branching of PPs, the contribution of concomitant PS and LC pathologies. It is an effective tool for developing an optimized algorithm when considering personalized prevention and therapy of a patient.
* There is an acceleration of the progress of existing personalized comorbidities corresponding to the patient's personal pathology tree in the conditions of PS and LC.
* There is a partial (with the exception of the vascular systems of the body) uncertainty of the exact programmed response to the localization of PPs induced by viral (COVID-19, combinations of COVID-19 with acute respiratory viral infections (ARVI) and the bacterial acute respiratory infections (ARI)) infection.

3.2. The PP concept makes it possible

- To explain and monitor the history of personalized PPs against the background of outbreaks of infection.
- To establish the history/ chronology of the patient's PPs.
- To order the patient's characteristic PPs, including within the framework of a personalized pathological tree.
- To analyze the diagnostic value of PPs (in relation to early and rapidly passing/ reversible/ rapidly rehabilitating skin and mucosal PPs).

- To predict features of PPs (including forecasting/anticipating possible early and rapid/reversible skin and mucosal PPs, including, for example, during epidemic outbreaks of COVID-19).
- To establish links between PPs and infections (for example, outbreaks of COVID-19).
- To classify of PPs in connection with COVID-19.[21-24]
- To describe the algorithms of possible ways of prevention and therapy of the patient in conditions of PS and LC.

3.3. Strategies to combat PP in connection with COVID-19, PS and LC

Based on the PP concept, we have proposed strategies to prevent the development of PP in connection with PS and LC.

Earlier, we proposed the PP concept, outlined its principles, described examples of PP, and gave a classification of PP skin, depending on the shapes of the constituent elements, location, and topography of their features. The precursors/predictors and related early and subsequent processes of combined pathologies of PS and LC in patients are characterized. Approaches to the creation of a prognostic model of the development of PS, including in the patient's LC, are formulated. An assessment of the influence of individual precursors on the formation of a personalized pathological tree of the patient is given.

Strategies to counter the development of PS variants in patients may include:

* Constructing vectors and gradients of and within dominant regions in PP (forecasting, modeling, and conducting optimized therapy).
* Simplification of the personalized pathology tree (cutting off branches in the tree and reducing PS factors) (regular medical check-ups in connection with LC and selective treatment of existing or identified new diseases, including chronic ones).
* Preventing the acceleration of the development of pathologies (recommendations of antiviral drugs).
* Strengthening of molecular and cellular defense systems (by supporting the protection systems of innate and antibody immunity).
* The use of cognitive mechanisms to support prevention and therapy.
* Other preventive actions as an additional resource for prevention and therapy (in addition to vaccination and revaccination; physiotherapy, others).

3.4. Further ways of development and application of the PP concept

- In ophthalmology (eyes, including the shell, cornea, lens, vitreous body and retina).[35,36,37]

- In rheumatology (arthritis, other joint lesions, fibrosis, autoimmune diseases of organs and tissues).[4,25,26,27]

- In oncology[46], including the connection with the metastasis of cancer cells with lymph through the thoracic lymph duct.

- In central nervous system (CNS) investigation, cognitive impairment[31]: viral (varying manifestations of COVID-19 strains, especially in conditions of PS and LC; the resulting effects of COVID-19 strains in combination with ARVI and the bacterial ARI), bacterial action (staphylococci, others), fungal action, mixed.

- Molecular and cellular macro-systems (innate immune systems [cytokine and lectin systems co-functioning with protective cells at the reception level], probiotic systems of mucosal immunity; co-functioning of innate, probiotic and adaptive immunity).[32,33,34,45]

- The circulatory system.[5,6,9,29,30] Thus, we found that the PP is closely located in accordance with the topography of the vascular system of the blood localized with the neurovascular nodes and plexuses (sinusitis cavities of the nose and forehead, a node under the knee joint, rashes on the cardiac side of the chest, blood vessels near the affected sweat glands, pulmonary embolism).

- Others (association of PP with existing pathologies of internal organs and tissues, for example, pulmonary fibrosis, cataracts and lesions of the vitreous body of the eyes; expanded ideas about PP include not only visible changes on the skin and mucosal envelopes; association with lesions of vascular systems [not only the circulatory, but also the lymphatic system, the system of glandular sweat ducts]).

4. CONCLUSION

The above strategies for countering the development of PS and LC in patients with PP in connection with COVID-19 will be useful for the prevention and treatment of PP observed in conditions of the spread of viral respiratory infections among the population.

5. DICTIONARY OF TERMS

A. *Patterns*. The patterns are characterized as localized on the skin. Patterns on the skin are classified as:

*homogeneous and heterogeneous (according to the composition of the constituent elements; homogeneous flat erythemas without protrusions; heterogeneous flat erythemas as a result of

inaccurate superposition of several circular erythemas; heterogeneous erythemas with independent pain and hour centers);
*asymmetrical and symmetrical: relative to body parts ("left-right"); taking into account the internal symmetry of the parts of the pattern (see also "PP architecture");
*erythematous (with the presence of flat spots: circular, ellipsoidal, complex, for example, with irregular/off-center overlapping of circles);
*in the form of rashes - combinations of numerous papules of slightly varying size (usually 1-4 mm in diameter, without suppuration);
* initiated, early, primary;
*late (secondary), functionally similar and time-linked to primary;
*signaling, significant for early diagnosis and prognostics;
*taking into account the contribution of existing chronic diseases (the influence of a personalized pathological tree, including according to medical examination data).

Patterns are characterized as pathological in violation of the rules described below.

B. *Seasonality of PPs* (association with seasonal infection - outbreaks/ waves of COVID-19, ARVI and/or bacterial ARI in combination with COVID-19; reflects the events of the COVID-19 pandemic.[12,13,15,16,17]

C. *Post-COVID-19 syndrome* (reflects the effects of COVID-19; secondary PP associated with primary PP; contribution and development of new and concomitant diseases corresponding to a personalized pathology tree; include representations of LC).[3,4]

D. *Long COVID-19* (reflects the appearance and manifestation of pathologies in the long-term periods after the detection of signs of COVID-19).[23,24,38,39,40,41] PPs in LC conditions are more complex and diverse in nature when compared with usual PS and include the influence of skin-related pathologies of other tissues and organs.

E. *Macro-systems* (organ-type; represent compact visual areas of the skin adequate to infectious effects, in contact with the external environment (accounting for events in the subcutaneous layer of connective tissue with a network of blood vessels) and mucosa (using the examples of eyes, lips, sweat glands and the mucosal envelopes of the urogenital system), manifested in the form of patterns; subcutaneous/mucous/ shell tissue and molecular cellular systems as factors of macro-systems in contact with the environment.[8,10,18,28]

- Sensory macro-systems which react as highly sensitive systems to infections.[7,14,19,24]

F. *Personalized PPs* (characterize the only selected patient; reflect the history of the patient's PP; in the case of COVID-19, they reflect the relationship with seasonality, region, infection features [including those combined with ARVI and/or ARI, characteristic lesions of the skin and mucosal envelopes, including in combination with lesions of other types of macro-systems].[8,18,28]

G. *The uniqueness of PPs* (reflects the uniqueness of the temporary location of PPs, including in a cascade of alternating PPs; it is manifested in the sequential time-separated appearance and localization of PPs in the next - already a new place, different from the previous one).[7,19,28] It is caused by the short-term memory of rapid defensive responses of the body, the central nervous system (CNS), including at the level of cognitive reactions.

H. *Cascades of PPs* (changes within the pattern; alternation and jumps in the localization of patterns over time; indicates the combined effect of infections, including ARVI and/or bacterial ARI, including the key/initiating role of primary patterns caused by COVID-19 pathogens); including reverse cascades as restorative and as completing patterns in the direction of symmetry, a state of "rest" and the absence of a vector for the development of pathology.[9,7,19,28]

I. *Continuity of PPs* in relation to previous PPs: by type of PPs (similar rashes in the size of inflammatory papules [usually, diameters in the range of 1-6 mm, mainly 2-4 mm]); by asymmetry (left-right parts of the body); by time (at the same time [for example, after a year]); overlap, repeatability of PPs [immediately, after a year], and development in a cascade are allowed:[7,19,28]

-partial reproducibility of the coverage of the territory by previous PPs (weakened, less pronounced response, due to asymmetry);

-overlap of the PP location area.

K. *Memory* (partial repetition of the constituent elements of PPs, including in the cascade of PPs; the absence of a complete repetition of the previous PPs).[7,19]

L. *Resonance* is expressed in the presence, for example, of pain centers or skin scratching points localized in PPs, in a specific place on the body, skin surface or mucosal envelopes; there is a connection with hypersensitivity, including the contribution of allergic reactions

and a pathological tree; it can also be expressed in the form of repeated (duplicated) rashes close in time.

M. *Hypersensitivity to PPs* (due to preliminary sensitization of the skin and mucosal surface as a result of previous PPs, increased response to external and internal stimuli, including the presence of infection; the presence of pain or scratching of the skin over a wide area of the skin).

N. *Asymmetry and symmetry of PPs.*

******Asymmetry* **is observed as a violation of symmetry**

a) In the left-right symmetrical halves of the body (variants: the appearance of PPs on the left or right; among early PPs: the initial predominance of PP severity on the left or right; later alignment of the severity of early PPs due to the strengthening of a weaker PPs on the left or right, respectively).

b) Within PPs against the background of cascading/ temporary changes (relocation of PP elements: strengthening of some against the background of weakening of others; transition to temporary and then stable mosaic gradients and vectors of elements).[7,19,28]

Personal examples of passing/ temporary PPs in LC (the first 2 years of the pandemic: 2020-2021) on the background of periodic pain in the left parietal part of the head (examples of features of *early* PPs: superiority of erythemic circular spots on the thigh in the area of the chronically damaged knee joint; overlapping two erythemic spots with pronounced pain centers and scratching at the junction of the shoulder and neck; recurrence of herpes on the lower lip; *later:* increased arthritis of the knee joint; changes in the skin of the sole of the foot); on the right (early: eye mucosa; cataract progress followed by surgical removal; temporary damage to the vitreous body of the eye; slight predominance of herpes at the junction of the lips; later (mainly in 2022 and beyond): predominant rashes on one of the sides and/ or one of the arms, left or right side of the chest). There was a *mega-switching of the patient's PP asymmetry over long periods* of time according to the principle: "All PPs earlier (mainly 2020-2021) – on the right"; "All PPs later (mainly 2022 and beyond)" - on the left." A mega-switch may indicate the person dominance of the left or right compartments of the CNS in process control.

***Symmetry of PPs*.**

- The external symmetry may reflect the "old" preserved patterns of the left-right half of the body type due to the location of the "left half of the body [left pattern] – right half of the body [right pattern]").
- Internal (inside the PP there is a symmetrical image/ architecture, for example, a pentagon in the ulnar fossa, made up of rash papules).

**PP architecture* (for example, due to both left-right asymmetry and vectors {for example, vectors in the left PP ulnar fossa are contrasted with the later “the same PP” internal symmetry – the architecture of a symmetrical image within the rash in the right ulnar fossa is a pentahedron measuring 3 cm in diameter [5 papules at 5 points of the faces] centered on the fold of the fossa – 2-3 less pronounced papules}). With the complete symmetry of the PPs, the architectural aspect of the unified picture of the left and right PPs can be considered within the framework of "left-right".

O. *Vectors in PPs* are integrative, reflecting the mosaic heterogeneity of types and sizes, for example, papules in rashes, and the internal and external asymmetry of their location. They are localized in the initial, developing and residual PPs. A set of mosaic vectors that change over time can be identified in the PPs. The final resulting vector of the pattern in time is characterized as pronounced, stable, and residual. The vector assumes the presence of gradients (mostly nonlinear), composed of the dominant areas of the pattern, its mosaic, single elements/ constituent units in PPs).[10,11,42]

- *Pathology vectors*, pathological vectors (coincide with the periods of waves and outbreaks of COVID-19; characterized by both asymmetry and a characteristic location on the patient's body).
- *Therapy vectors*, therapeutic vectors (as mostly meaning and perspective). They are constructed based on data on pathology vectors. They focus on the processes and directions opposite to the pathology vectors.

P. *The tree of PPs*. The patient's pathological tree includes the history of PPs (for example, since the appearance of COVID-19-initiated primary PPs on the skin) in connection with current pathologies of both PPs and concomitant chronic diseases of macrosystems in contact with the external environment, as well as internal tissues and organs.[28] It is built in terms of time counting, starting from the primary PPs and then capturing the PS and LC. It reflects the cascade and contribution of infections and previous diseases (including chronic ones) to the

overall picture of the patient's pathologies. Characterizes the co-functioning/ combination of pathologies and the divergence of the general status of the condition in patients due to the development and elimination of some of PPs. Demonstrates the diagnostic value of primary PPs, initiating further events.

- *Acceleration of the development/ progression of pathologies.*[20] Based on the carriage of COVID-19 strains, there may be an acceleration of concomitant pathologies, including chronic diseases, in accordance with the personal pathology tree.

- *Uncertainty factor* (due to the inability to predict the exact answer based on the location on the body, the architecture of the territory and the size of the PPs. It respects the personalized and tendentious nature of the asymmetry and symmetry of PPs.

Disclosure of conflict of interest

The authors declare no conflict of interest.

REFERENCES

1. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Melikhova Yu.V., Davydkin V.Yu. The concept of the effect of COVID-19 waves on the patterns of the skin and mucosal envelopes of patients 65+ // *11 Interregional Forum of Dermatovenerologists and Cosmetologists* (October 5-6, 2021, Moscow). Collection of abstracts, 55-6. https://kkkvd.ru/wp-content/uploads/doc04959420211019060304.pdf; https://ru24.net/smi/gosrf-ru/299246258/; https://mosderm.ru/news/616696580a5b/podvedeny-itogi-11-mejregionalnogo-foruma-dermatovenerologov-i-kosmetologov-nadk
2. Lakhtin V.M., Lakhtin M.V., Davydkin V.Yu., Melikhova Yu.V., Kombarova S.Yu. The concept of the directed effect of COVID-19 waves on the dominant macro-systems of patients 65+ // *Proceedings of the VIII All-Russian Interdisciplinary Scientific and Practical Conference with international participation "Socially significant and especially dangerous diseases"* / Ministry of Health of the Russian Federation, Federal Service for Supervision of Consumer Rights Protection and Human Welfare, International Association of Specialists in the Field of Infections, Federal Medical and Biological Agency, Ministry of Health of the Krasnodar Territory, Federal State Budgetary Educational Institution of Higher Education "Kuban State Medical University" of the Ministry of Health of the Russian Federation, Autonomous Non-profit Organization

"Commonwealth of Professional Assistance to Doctors of the North–West - Krasnodar: JSC Polygraph-YUG, 2021. – 53-4. ISBN 978-5-7992-0817-2 https://vk.com/wall593797833_204; https://vk.com/doc593797833_614950883?hash=3b13b9618d388fc551

3. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Melikhova A.V., Davydkin V.Yu. The concept of post–COVID-19 syndrome in elderly patients // *Proceedings of the XV Annual All-Russian Congress on Infectious Diseases named after Academician V.I. Pokrovsky* (March 27-29, 2023, Moscow), 127.
4. Lakhtin V.M., Melikhova A.V., Novikova L.I., Lakhtin M.V., Kombarova S.Yu. Autoimmune pathologies against the background of impaired functioning of organs and tissues of patients in connection with a new coronavirus infection: The concept of post–COVID-19 syndrome in elderly patients // *Proceedings of the XV Annual All-Russian Congress on Infectious Diseases named after Academician V.I. Pokrovsky* (March 27-29, 2023, Moscow), 127-8.
5. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Novikova L.I., Bayrakova A.L., Melikhova A.V., Davydkin V.Yu. The concept of system signaling in relation to COVID-19 accompanying pathologies based on damage to blood vessel patterns // *Topical issues of Infectious Pathology in Southern Russia : Proceedings of the XVI Scientific and Practical Conference* / Ministry of Health of the Russian Federation, Ministry of Health of the Krasnodar Territory, Kuban State Medical University of the Ministry of Health of the Russian Federation, GBUZ Specialized Clinical Infectious Diseases Hospital Ministry of Health of the Krasnodar Territory, NGO "Commonwealth of Professional Assistance to doctors of the North-West". Krasnodar: Novation Publ., 2023. 1 electron–optical disc, 72-4. ISBN 978-5-00179-328-1. (in Russian)
6. Lakhtin V.M., Lakhtin M.V., Novikova L.I., Bayrakova A.L., Melikhova A.V., Kombarova S.Y. The concept of organ and tissue signaling of pathologies associated with COVID-19 on the blood vessel damage platform // *II All-Russian Congress with international participation "Academy of Laboratory Medicine: the latest achievements – 2023"*. Materials of the Congress. Moscow, 2023; 16-7. ISBN 978-5-906484-72-7. (in Russian) https://www.mediexpo.ru/fileadmin/user_upload/content/pdf/thesis/lab2023-abstracts.pdf
7. Lakhtin M.V., Lakhtin V.M., Melikhova A.V., Kombarova S.Yu., Davydkin V.Yu. The concept of post-COVID-19 syndrome: pathologies of sensory macrosystems, clinical patterns, patterns and rules, diagnostic, prognostic and other perspectives //

Pridneprovsky Scientific Bulletin. - 2023. - Volume 4; No. 1 (elibrary: 2023-Volume 1; No. 4): 35-54. ISSN 1561-6940. (in Russian) https://www.elibrary.ru/title_about.asp?id=53818; https://elibrary.ru/contents.asp?id=50195461; https://www.elibrary.ru/item.asp?id=50156771

8. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Melikhova A.V., Davydkin V.Yu. The concept of personalized multisystem multi-chain post-COVID-2019 syndrome in elderly patients based on disorders of the blood vascular system // *Pridneprovsky Scientific Bulletin*. - 2023. – Volume 2; No. 3 (elibrary: 2023-Volume 2; No. 3): 71-83. (in Russian) https://elibrary.ru/title_about.asp?id=53818; https://elibrary.ru/contents.asp?id=50423242; https://elibrary.ru/item.asp?id=50423260
9. Lakhtin M.V., Lakhtin V.M., Melikhova A.V., Bayrakova A.L., Klimova E.V., Davydkin V.Yu., Kombarova S.Y. Post-COVID syndrome in elderly patients: a concept for the development of systemic chain pathologies accompanying COVID-19 on the platform of primary vascular disorders of the circulatory system // *Cardiovascular therapy and prevention*. 2023; 22(6S): 70. doi:10.15829/1728-8800-2023-6S [Collection of abstracts of the XXX Russian National Congress "Man and Medicine - 2023" (April 10-12, 2023, Moscow)]. (in Russian) https://chelovekilekarstvo.ru/wp-content/uploads/2023/03/ch23_tezisi.pdf
10. Lakhtin V.M. The concept of skin damage patterns in the context of pathologies related to COVID-19. (in Russian) *nmonews.ru (December 2024)*
11. Lakhtin V.M., Lakhtin M.V., Melikhova A.V., Davydkin V.Yu., Davydkin I.Yu., Novikova L.I., Kombarova S.Yu. New perspectives in cosmetology of elderly patients: ideas about pathological and therapeutic patterns // *XIII National Congress with international participation named after N.O. Milanov "Plastic surgery, aesthetic medicine and cosmetology"* (December 9-11, 2024, Moscow). Collection of abstracts. – Moscow, 2024: 102-3. (in Russian) https://plastsur.ru/event/xiii / (the electronic version of the abstracts is published in the archive of the conference series "Plastic Surgery, Aesthetic Medicine and Cosmetology"). (in Russian)
12. Lakhtin V.M., Lakhtin M.V., Kombarova S.Y. Seasonal changes in contact macrosystems of patient 65+ in connection with COVID-19 // *National priorities of Russia*, 2021; 3(42): 308-10. http://oniipi.org/материалы-всероссийской-научно-прак/
13. Lakhtin V.M., Lakhtin M.V., Melikhova Yu.V., Davydkin V.Yu., Kombarova S.Yu. The effect of COVID-19 waves on patients' systems in contact with the external environment

65+ // *Modern immunoprophylaxis: challenges, opportunities, prospects: Collection of abstracts of the All-Russian Scientific and Practical Conference with international participation (October 7-8, 2021)* / Edited by Academician of the Russian Academy of Sciences V.G. Akimkin. Moscow: Central Research Institute of Epidemiology of Rospotrebnadzor, 202; 42-3. ISBN 978-5-6045286-4-8. (in Russian) https://www.elibrary.ru/item.asp?id=46686519 =collection; https://www.elibrary.ru/item.asp?id=46686568&pff=1 =thesis (PDF is available); https://www.elibrary.ru/download/elibrary_46686568_85976998.pdf =PDF version; https://www.crie.ru/images/science/materials-immunoprof2021.pdf

14. Lakhtin V.M., Lakhtin M.V., Kombarova S.Y. Deterministic effect of COVID-19 waves on the sensory macro-systems of patients 65+ // *Proceedings of the II International Scientific and Practical Conference on Combating new coronavirus infection and other infectious diseases (December 9-10, 2021, St. Petersburg)* / edited by Dr. Medical Sciences, Professor A.Y. Popova, acad. RAS, Doctor of Medical Sciences, Professor V.V. Kutyrev. Saratov: Amirit Press, 2021; 80-3. ISBN 978-5-00140-907-6. (in Russian) https://vrachirf.ru/concilium/100255.html; https://pasteur.rbtour.ru/; https://pasteur.rbtour.ru/materialy-konferencii.html; https://pasteur.rbtour.ru/materialy-konferencii.html
15. Lakhtin V.M., Lakhtin M.V., Davydkin V.Yu., Kombarova S.Yu. Analysis of pathologies of patients 65+ in connection with the waves of COVID-19 over the past two years // *Infectious diseases in the modern world: evolution, current and future threats: proceedings of the XIV Annual All-Russian Congress on Infectious Diseases named after Academician V.I. Pokrovsky*, Moscow, March 28-30, 2022. Moscow: Medical Marketing Agency (MMA), 2022; 96-7. ISBN 978-5-9905908-9-2. (in Russian) www.congress-infection.ru
16. Lakhtin V.M., Lakhtin M.V., Davydkin V.Yu., Kombarova S., Yu. The dynamics of pathologies in asymptomatic patients 65+ in connection with the waves of COVID-19 // *All-Russian Therapeutic Congress with international participation: BOTKIN READINGS (April 22-23, 2022, Saint Petersburg).* Collection of abstracts: / Edited by: Academician of the Russian Academy of Sciences V.I. Mazurov, Associate Professor E.A. Trofimov - St. Petersburg: Publishing House "Man and his Health", 2022; 112-3. (in Russian) https://congress-ph.ru/event/botkin22/tezis
17. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Novikova L.I., Davydkin V.Yu., Melikhova A.V. A single married couple as one of the minimum epidemiologically

significant cells of COVID-19 outbreaks // *Socially significant and especially dangerous infectious diseases: Proceedings of the XI All-Russian Interdisciplinary Scientific and Practical Conference with international participation* / Ministry of Health of the Russian Federation, Federal State Budgetary Educational Institution of Higher Education "Kuban State Medical University" Ministry of Health of the Russian Federation, Ministry of Health Krasnodar Region, Autonomous non-profit organization "Commonwealth of Professional Assistance to doctors of the North-West". Krasnodar: Novation Publ., 2024. 1 electron–optical disc., 114-6. ISBN 978-5-00179-573-5. (in Russian)

18. Lakhtin V.M., Lakhtin M.V., Melikhova A.V., Davydkin V.Yu., Kombarova S.Yu. Personalized skin and mucosal disorders in 65+ patients with asymptomatic COVID-19 // *Materials of the XII Forum of Dermatovenerologists and Cosmetologists with international participation "Synthesis of Science and Practice"* (October 17-18, 2022, Moscow), 49. (in Russian)
19. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu. N. Patterns of dynamics of pathological disorders of the main sensory macro-systems of the body in contact with the external environment in patients 65+ with asymptomatic COVID-19 // *Proceedings of the III International Scientific and Practical Conference on countering the new coronavirus infection and other infectious diseases* (December 15-16, 2022)., St. Petersburg) / edited by Doctor of Medical Sciences, prof. N. A.Yu. Popova, Academician. RAS, Doctor of Medical Sciences, Professor V.V. Kutyrev. - Saratov: Amirit, 2022; 143-145. ISBN 978-5-00207-130-2. (in Russian)
20. Lakhtin V.M., Lakhtin M.V., Davydkin V.Yu., Kombarova S.Yu. Supervision of 65+ patients with asymptomatic COVID-19: Accelerated course of pathologies / / *Current issues of preventive medicine and sanitary and epidemiological welfare of the population: Factors, technologies, management and risk assessment.* Collection of scientific papers. Special issue: based on the materials of the interregional scientific and practical conference "Topical issues of epidemiology and hygiene: science and practice. Answers to global challenges" / I.A. Umnyagina, N.N. Zaitseva, N.S. Kucherenko, G.A. Chekhova, M.A. Pozdnyakova, S.O. Semisynov. - N. Novgorod: Medial Publishing House, 2022; 272-6. ISBN 978-5-6046124-7-7. (in Russian)
21. Lakhtin V.M., Lakhtin M.V., Melikhova A.V., Davydkin V.Yu., Kombarova S.Yu. Classification aspect of postcovoid syndromes in patients 65+ // In the book: *Proceedings of the II Internet conference on infectious diseases "Pokrovsky readings"*. Collection of conference abstracts. Moscow, 2022; 28. (in Russian) [II Annual Internet conference

"POKROVSKY READINGS", Moscow, November 1-3, 2022]. https://vip.congress-infection.ru/ru/tezis_2022

22. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Melikhova A.V., Davydkin V.Yu. Approaches to the classification of post–COVID-19 syndromes // *Problems of scientific thought*. 2022. Vol. 4; No. 12 (elibrary: Volume 12; No. 4): 39-46. ISSN 1561-6916 https://elibrary.ru/contents.asp?id=49852988; https://elibrary.ru/item.asp?id=49852998
23. Lakhtin V.M., Lakhtin M.V., Kombarova S.Y. Treatment of COVID-19 in patients 65+ with examples of skin and mucosal disorders and in connection with the classification of post-COVID-19 syndromes // *Proceedings of the III International Scientific and Practical Conference on countering the new coronavirus infection and other infectious diseases* (December 15-16, 2022, Saint Petersburg) / Edited by Dr. of Medical Sciences, professor A.Yu. Popova, acad. RAS, Doctor of Medical Sciences, Professor V.V. Kutyrev. Saratov: Amirit, 2022; 140-2. ISBN 978-5-00207-130-2 (in Russian)
24. Lakhtin V.M., Lakhtin M.V., Melikhova A.V., Davydkin V.Yu., Kombarova S.Y. Long COVID-19 syndrome in patients 65+ associated with changes in skin, mucosa and other sensory macrosystems as an additional approach to the classification of post–COVID-19 syndromes // *Proceedings of the XII Forum of Dermatovenerologists and cosmetologists with international participation "Synthesis of Science and practice"* (October 17-18, 2022, Moscow): 54-5.
25. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu. Autoimmune pathologies against the background of disorders of sensory macro-systems of 65+ patients in contact with the external environment in connection with COVID-19 // *Proceedings of the III International Scientific and Practical Conference on countering the new coronavirus infection and other infectious diseases (December 15-16, 2022, St. Petersburg-Petersburg)* / edited by Dr. of Medical Sciences, prof. A.Yu. Popova, academician of RAS, Doctor of Medical Sciences, Professor V.V. Kutyrev. Saratov: Amirit Press, 2022: 137-9. ISBN 978-5-00207-130-2 (in Russian)
26. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu. Rheumatic pathologies against the background of changes in the skin and mucosa of patients 65+ in connection with COVID-19 // *Proceedings of the XII Forum of dermatovenerologists and cosmetologists with international participation "Synthesis of science and practice"* (October 17-18, 2022, Moscow): 53-4. (in Russian)
27. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu. Rheumatic pathologies against the background of changes in sensory macro-systems of patients 65+ in connection with

COVID-19 // *Journal of Infectology*. 2022. Vol. 14; No. 4; Appendix 1, p. 52. (in Russian) [International Scientific and Practical Conference "Modern aspects of infectious diseases and Microbiology" (September 14-15, 2022, Gomel, Belarus)]. https://ipoeasid.ru/wp-content/uploads/2022/09/ZHurnal-infektologii-Prilozhenie1-tom-k-nomeru-4-2022.pdf

28. Lakhtin V.M., Melikhova A.V., Lakhtin M.V., Bayrakova A.L., Kombarova S.Yu. Personalized system analysis of pathological disorders of organs in contact with the external environment in patients 65+ in connection with COVID-19: patterns // *Materials of the Congress. RCMMI 2023*: collection of abstracts. Moscow : U Nikitskikh Vorot Publishing House, 2023; 93-4. ISBN 978-5-00170-772-1. (in Russian) [Collection of materials of the First Russian Congress on Medical Microbiology and Infectology (1st RCMMI, March 2-3, 2023)]. https://elibrary.ru/item.asp?id=50475495
29. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Novikova L.I. The role of blood vessel disorders in the initiation of post–COVID-19 syndrome pathologies in elderly patients // *Molecular diagnostics and safety-2023: proceedings of the Congress with international participation* (Moscow, April 27-28, 2023) / Edited by Academician of the Russian Academy of Sciences (RAS) V.G. Akimkin. Moscow: Central Research Institute of Epidemiology of Rospotrebnadzor, 2023; 220. ISBN 978-5-6045286-5- (in Russian) https://mdb2023.ru/; https://files.cmd.su/s/LKXnYNMTqE3qiyE
30. Lakhtin V.M., Lakhtin M.V., Melikhova A.V., Novikova L.I., Kombarova S.Y. Erythemic signals in conditions of SARS-CoV-2 infection: significance for cosmetology // *13th All-Russian Forum of the National Alliance of Dermatovenerologists and Cosmetologists "Dermatovenerology and cosmetology: synthesis of science and practice"* (October 17-18, 2023, Moscow). Collection of works, 44. (in Russian)
31. Lakhtin V.M., Lakhtin M.V., Ruzhentsova T.A., Kombarova S.Yu., Melikhova A.V., Davydkin V.Yu. Assessment of cognitive states as part of post-COVID-19 syndrome in elderly patients // *Collection of abstracts of the III Annual Conference on Infectious Diseases "Pokrovsky readings"*, October 30-31, 2023, Moscow. – Moscow : Medical Marketing Agency (MMA), 2023: 39. ISBN 978-5-6048391-1-9 (in Russian)
32. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu. Recognizing and binding glycans and glycoconjugates of the body's system against COVID-19 // *All-Russian Therapeutic Congress with international participation: BOTKIN READINGS (April 23-24, 2021, Saint Petersburg).* Collection of abstracts: / Edited by Academician of the Russian Academy of Sciences V.I. Mazurov, Associate Professor E.A. Trofimov. - St. Petersburg:

Publishing House "Man and his Health", 2021; 161. ISBN 978-5-6040648-4-9. (in Russian) https://congress-ph.ru/

33. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu. Megapatterns recognized by lectins of the body's defense systems: a new potential against pathologies of the skin and mucous membrane // *11th Interregional Forum of Dermatovenerologists and Cosmetologists* (October 5-6, 2021, Moscow). Collection of abstracts, 57. (in Russian) https://kkkvd.ru/wp-content/uploads/doc04959420211019060304.pdf; https://ru24.net/smi/gosrf-ru/299246258 /; https://mosderm.ru/news/616696580a5b/podvedeny-itogi-11-mejregionalnogo-foruma-dermatovenerologov-i-kosmetologov-nadk
34. Lakhtin V.M., Lakhtin M.V., Melikhova A.V., Davydkin I.Yu., Davydkin V.Yu. Preventive and therapeutic recognizing patterns of glycoconjugates of postbiotics supporting mucosal biotopes // *Modern immunoprophylaxis: challenges, opportunities, prospects: Collection of abstracts of the All-Russian Scientific and Practical Conference with international participation (October 7-8, 2021)* / ed. Academician of the Russian Academy of Sciences V.G. Akimkin. Moscow: Central Research Institute of Epidemiology of Rospotrebnadzor, 2021; 44-5. ISBN 978-5-6045286-4-8. (in Russian) https://www.elibrary.ru/item.asp?id=46686519; https://www.elibrary.ru/item.asp?id=46686569&pff=1; https://www.elibrary.ru/download/elibrary_46686569_42332436.pdf; https://www.crie.ru/images/science/materials-immunoprof2021.pdf
35. Lakhtin V.M., Melikhova A.V., M.V. Lakhtin, Davydkin V.Yu., Kombarova S.Yu. Long COVID-19 in patients 65+ on examples of pathologies of the skin and mucosal envelopes of the eyes and their rehabilitation // *Proceedings of the Congress. RCMMI 2023*: Collection of abstracts. Moscow : U Nikitsky Vorota Publishing House, 2023. pp. 92-3. ISBN 978-5-00170-772-1. (in Russian) [Collection of materials of the First Russian Congress on Medical Microbiology and Infectology (1st RCMMI, March 2-3, 2023)]. https://elibrary.ru/item.asp?id=50475495
36. Lakhtin V.M., Lakhtin M.V., Novikova L.I., Kombarova S.Yu., Melikhova A.V. Cases of rapid rehabilitation in conditions of COVID-19: primary and secondary lesions of the skin, mucosal envelopes and vitreous body of the eye // *VII National Congress on Rehabilitation* (September 24-25, 2024, St. Petersburg). (in Russian) https://reabin.congress-ph.online/

37. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Novikova L.I., Melikhova A.V. Short-term skin and eye lesions due to COVID-19 // Collection of abstracts of the *IV Annual Conference on Infectious Diseases "Pokrovsky readings"*, November 1-2, 2024, Moscow. Moscow: Medical Marketing Agency, 2024; 36-7. ISBN 978-5-6048391-1-9. (in Russian) https://vip.congress-infection.ru/; https://vip.congress-infection.ru/wp-content/uploads/2024/11/sbornik-tezisov.pdf
38. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Melikhova A.V., Novikova L.I., Bayrakova A.L. COVID-19 infection using examples of skin and mucosal pathologies and their rehabilitation in patients 65+ // *Topical issues of infectious pathology in the South of Russia : Proceedings of the XVI scientific and practical conference* [May 18-19 In 2023, Krasnodar] / The Ministry of Health of the Russian Federation, the Ministry of Health of the Krasnodar Territory, the Kuban State Medical University of the Ministry of Health of the Russian Federation, the Specialized Clinical Infectious Diseases Hospital of the Ministry of Health of the Krasnodar Territory, the NGO "Commonwealth of Professional Assistance to Doctors of the North-West". Krasnodar: Novation Publ., 2023. – 1 electronic-optical disc., 70-2. ISBN 978-5-00179-328-1. (in Russian)
39. Lakhtin V.M., Lakhtin M.V., Bayrakova A.L., Melikhova A.V., Klimova E.V., Kombarova S.Y. Long COVID-19 and rehabilitation of pathologies in elderly patients using examples of skin and mucosal envelopes // *II All-Russian Congress with international participation "Academy of Laboratory Medicine: the latest achievements – 2023"* (May 30-June 1, 2023, Moscow). Materials of the Congress. Moscow, 2023; 15-6. ISBN 978-5-906484-72-7. (in Russian) https://www.mediexpo.ru/fileadmin/user_upload/content/pdf/thesis/lab2023-abstracts.pdf
40. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Novikova L.I., Melikhova A.V., Davydkin V.Yu. Long COVID-19: Early and late rehabilitation of post-COVID-19 syndrome pathologies in elderly patients // *VI National Congress rehabilitation – XXI century: traditions and innovations.* Collection of abstracts. Electronic edition. St. Petersburg, 2023; 108-9. (in Russian) (September 18-19, 2023, St. Petersburg).
41. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Novikova L.I., Melikhova A.V., Davydkin V.Yu. Approaches to systemic rehabilitation of post–COVID-19 syndrome in elderly patients: assessment of concomitant pathologies of long COVID-19 in the planning and implementation of rehabilitation // *VI National Congress rehabilitation - XXI century: Traditions and innovations.* Collection of abstracts. Electronic edition. St. Petersburg, 2023; 110-1. (in Russian)

42. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Novikova L.I., Melikhova A.V. Pathological and therapeutic vectors in connection with COVID-19 // Collection of abstracts of *the IV Annual Conference on Infectious Diseases "Pokrovsky Readings"*, November 1-2, 2024, Moscow. – Moscow: Medical Marketing Agency, 2024; 37. ISBN 978-5-6048391-3-3 (in Russian) https://vip.congress-infection.ru/; https://vip.congress-infection.ru/wp-content/uploads/2024/11/sbornik-tezisov.pdf
43. Lakhtin V.M., Lakhtin M.V., Davydkin V.Yu., Mironov A.Yu., Alyoshkin V.A., Afanasyev S.S., Kombarova S.Yu. COVID-19 as a multipurpose infection: preventive management strategies // *Epidemiological surveillance of current infections: New threats and challenges.* Collection of scientific papers of the All-Russian Scientific and Practical conference with international participation dedicated to the 100th anniversary of Academician I. N. Blokhina (April 26-27, 2021, Nizhny Novgorod) / Edited by Dr. N.N. Zaitseva, M.D., Nizhny Novgorod: Medial Publishing House, 2021; 55-7. ISBN 978-5-6046124-2-2. (in Russian) https://www.elibrary.ru/item.asp?id=45847817
44. Lakhtin V.M., Lakhtin M.V., Kombarova S.Y. COVID-19: multi-target infection, protection strategies // *National Priorities of Russia*. 2021; 3(42). 310-3. (in Russian) http://oniipi.org/материалы-всероссийской-научно-прак
45. Lakhtin V.M., Lakhtin M.V., Kombarova S.Yu., Davydkin V.Yu. Lectin-Glycoconjugate strategies against diseases in connection with COVID-19 // *Problems of medical mycology (St Peterburg*, 2022; 24(2): 95. (in Russian)
46. Lakhtin M.V., Lakhtin V.M., Alyoshkin V.A., Afanasyev M.S., Afanasyev S.S. Lectins in anti-cancer strategies // *Acta biomedica scientifica (Irkutsk, Russia)*, 2018; 3(4): 69-77, DOI 10.29413/ABS.2018-3.4.11. (in Russian).