

LONG COVID seen from FRANCE

Report of the 2nd Long Covid day,
Nancy 8/12/2022



Marc Jamouille, MD, PhD, family doctor

18/12/2022 marc.jamouille@uliege.be

Published on <https://orbi.uliege.be/handle/2268/297474>



The Long Covid is not yet a really identified disease but it has its patients, already innumerable, its doctors surprised by the extent of their ignorance and its scientists who search the unknown of the great game of aggressions and defenses of life. The French of France

organized in Nancy their second meeting on this difficult subject. The French Society of Infectious Pathology (SPILF)¹ and several learned societies of different disciplines organized this day. There were very few foreigners, two Swiss and one Belgian. I produced a poster² that tries to relate the terrible experience of my patients and the small steps that my colleagues and I can do to help them.

The city of Nancy is beautiful, the cold sun in this early winter accompanied my train trip. I was able to visit the Ecole de Nancy museum, a glassmaker's paradise, and the Nancy Museum of Fine Arts with its wonderful collection. In between, I spent a whole day at the Jean Prouvé conference center, with 180 people from all over France and 500 online, scientists from all specialties, general pediatricians,



pulmonologists, cardiologists, gastroenterologists, psychiatrists, physiotherapists, rehabilitators, and many patients, some of whom are also doctors. With, of course, one or another sociologist to observe all this. No press, no politics, no pomp and circumstance, only people to exchange their powerlessness and work on their non-knowledge.

I will try to relate what I have learned. All the presentations will soon be available on the website of the SPILF. It is possible that

some interventions are missing. The unmentioned authors will forgive me. As it is not possible to

¹ SPILF <https://www.infectiologie.com/fr/spilf-presentation.html>

² Van Weyenbergh, J., Meyts, I., Kazeneza-Mugisha, G., & Jamouille, M. (08 December 2022). *Suivi d'une cohorte de patients Long Covid en médecine de famille*. Poster session presented at 2eme Journée Long Covid, Nancy, France. <https://hdl.handle.net/2268/296822>

relate the intense complexity of the subject, I have tried to find the publications cited by the authors. This text thus becomes a valuable bibliographic source of publications selected by experts.

At the end of the conference, Mrs Salmon-Ceron, specialist in infectious diseases, APHP, Paris, gave an overview of the known and still unknown world of Long Covid.

I relate here the contributions of the various speakers, several of whom were by video-conference, who followed one another at a steady pace, taking up too much of the lunch time and allowing little time to meet people. About twenty posters were also exposed. I was able to make contact with general practitioners, a neuropsychologist, a sociologist and various colleagues. It seems that the first day in 2021 had gathered few people. The subject is so complex and gives us a glimpse of the limits of all medicine. We can bet that in 2023 we will need two or even three days of exchanges, with, I hope, a European participation.

A message from the WHO

The session began with an online presentation by Ms. Victoria Diaz of WHO's Department of Emergency Situations, who in a fast-paced American style covered the key issues of the still-rough definition of disease, the critical issue of access to care for patients who don't know what they are sick with and doctors who know next to nothing, the thorny issue of the labor market, which is losing thousands of productive adults without politicians being overly concerned, the issue of Patient Reported Outcome (PRO) measures, which is very complicated since it is difficult to ask patients if they are getting better when we know almost nothing about the natural history of the disease. She also announced a working group on the definition of Long Covid in children and adolescents and made a plea to intensify research on the new pandemic that Long Covid represents.

Epidemiology of Long covid by François Goehringer



epidemiologist CHU Nancy

Very difficult to measure the extent of the problem due to the absence of a precise definition and a specific biomarker

Which population?

UK: 1.18 million people after one year 2.8%.

Fr: 1.5 million people after 1 year 4%.

NI: Restricting the definition of post-COVID-19 status to core symptoms, 381 (21.4%) of 1782 COVID-19-positive participants versus 361 (8.7%) of 4130 controls were found to have at least one symptom that had substantially increased in severity

WHO : At least 17 million people in the WHO European Region experienced prolonged IVOC during the first two years of the pandemic.

Global Burden of Disease; pooled data: Estimated prevalence of 6.2% of surviving Covids

What symptoms are attributable to Long covid?

Pinto et al: Documents a distinct and significant pattern of symptoms (symptom type and onset) in non-hospitalized persons with confirmed SARS-CoV-2 infection.

Sources quoted(partial)

- Office of National Statistics : <https://www.ons.gov.uk/>
- Santé publique France : <https://www.santepubliquefrance.fr/>
- Global burden of diseases: <https://www.healthdata.org/gbd/2019>
- Ballering, A. V., van Zon, S. K., Olde Hartman, T. C., Rosmalen, J. G., & Lifelines Corona Research Initiative. (2022). Persistence of somatic symptoms after COVID-19 in the Netherlands: an observational cohort study. *The Lancet*, 400(10350), 452-461. <https://pubmed.ncbi.nlm.nih.gov/35934007/>

- Hanson, S. W., Abbafati, C., Aerts, J. G., Al-Aly, Z., Ashbaugh, C., Ballouz, T., ... & Global Burden of Disease Long COVID Collaborators. (2022). Estimated global proportions of individuals with persistent fatigue, cognitive, and respiratory symptom clusters following symptomatic COVID-19 in 2020 and 2021. *JAMA*, 328(16), 1604-1615. <https://jamanetwork.com/journals/jama/article-abstract/2797443>
- Pinto, M. D., Downs, C. A., Huang, Y., El-Azab, S. A., Ramrakhiani, N. S., Barisano, A., ... & Lambert, N. (2022). A distinct symptom pattern emerges for COVID-19 long-haul: a nationwide study. *Scientific reports*, 12(1), 1-11. <https://www.nature.com/articles/s41598-022-20214-7>
- Blomberg, B., Mohn, K. G. I., Brokstad, K. A., Zhou, F., Linchusen, D. W., Hansen, B. A., ... & Langeland, N. (2021). Long COVID in a prospective cohort of home-isolated patients. *Nature medicine*, 27(9), 1607-1613. <https://www.nature.com/articles/s41591-021-01433-3>
- Robineau, O., Wiernik, E., Lemogne, C., de Lamballerie, X., Ninove, L., Blanché, H., ... & Carrat, F. (2022). Persistent symptoms after the first wave of COVID-19 in relation to SARS-CoV-2 serology and experience of acute symptoms: a nested survey in a population-based cohort. *The Lancet Regional Health-Europe*, 17, 100363. <https://hal-ephe.archives-ouvertes.fr/CONSTANCES/hal-03737925v1>
- Daitch, V., Yelin, D., Awwad, M., Guaraldi, G., Milić, J., Mussini, C., ... & Margalit, I. (2022). Characteristics of long COVID among older adults: a cross-sectional study. *International Journal of Infectious Diseases*. <https://www.sciencedirect.com/science/article/pii/S1201971222005355>

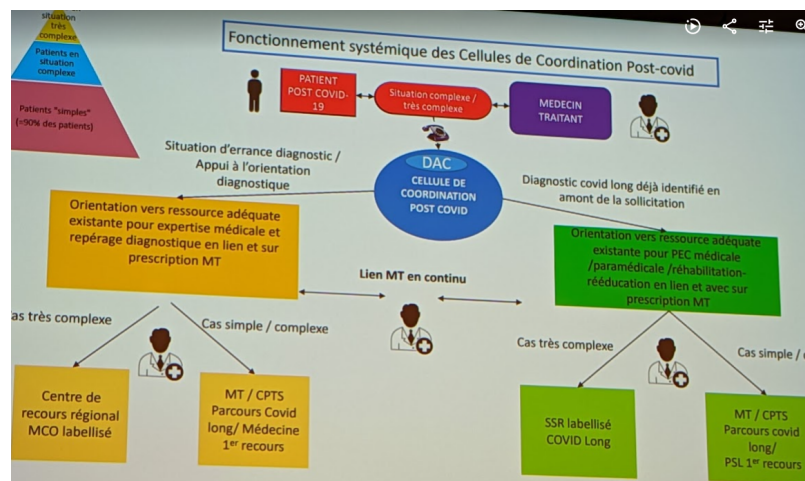
The Long Covid Care Pathway by Jérôme Larché



Internal Medicine, FACS & ARS Occitanie

Care pathways already exist

Assessing the right care by the right professionals at the right time



Statement on integrated care model

Development of a multi-professional care pathway. Inspired by Wolf et al. and clinical pathway UK using Simon Décarý's model for primary care (which in France includes some specialties) with a central coordination unit for Occitanie. Learning system concept.

Objectives: 1/ to put the actors in relation, 2/ day center 3/ 18 follow-up care centers 4/ regional observatory Long Covid. Learning system. In addition training, webinar and contacts with occupational medicine

Sources quoted

- Wolf, S., Zechmeister-Koss, I., & Erdős, J. (2022). Possible long COVID healthcare pathways: a scoping review. *BMC Health Services Research*, 22(1), 1-11 <https://pubmed.ncbi.nlm.nih.gov/35999605/>
- UL Long Covid pathway ; <https://clinical-pathways.org.uk/covid-19/long-covid-pathway>
- Décarý, S., Dugas, M., Stefan, T., Langlois, L., Skidmore, B., Bhéreur, A., ... & Saxinger, L. (2021). Care Models for Long COVID: A Rapid Systematic Review. *medRxiv*. <https://www.medrxiv.org/content/10.1101/2021.11.17.21266404v1.full>
- Greenhalgh, T., & Knight, M. (2020). Long COVID: a primer for family physicians. *American family physician*, 102(12), 716-717. <https://pubmed.ncbi.nlm.nih.gov/33320511/>

Posters

Commented poster : Coordinated pathway in RENNES



Covid Long Unit CHU Rennes

Pathway implemented since early 2021. Coordination center at the CHU that responds to requests (600 requests over 13 months) from referring physicians and incorporates patients into a multidisciplinary follow-up program after an orientation assessment.

Cognitive and psychic course and in parallel a physical course. The follow-up is carried out by the treating physicians or at the university hospital. An evaluation of the patients is organized after 6 months. A progressive decrease of the symptoms is noted without however it is specified to what is due to the improvement. Back to work; 61%



Poster; Care pathway in private practice, Charleroi, Belgium

64 patients (F:72%, mean age 42) were identified and followed since May 2021 and monitored in family medicine consultation with the means at hand (specific intervention of the national insurer only at the end of 2022) The only "treatments" were acetylsalicylic acid 80mg, clopidogrel 75mg and the physician as placebo. Clinical, DUSOI severity index and COOP functional status indicator had a statistically significant relationship with a very severe Long Covid of more than 18 months (P=0.001). At 18 months, out of 55 patients, three groups can be distinguished: 30% cured, 30% resumption of activity with sequelae, 40% unable to resume the normal course of life. See: <https://hdl.handle.net/2268/296822>

- Jamouille, M., Kazeneza-Mugisha, G., & Zayane, A. (2022). Follow-Up of a Cohort of Patients with Post-Acute COVID-19 Syndrome in a Belgian Family Practice. *Viruses*, 14(9), 2000. <https://www.mdpi.com/1999-4915/14/9/2000>

Commented poster; SYMPOCOV cohort



Nancy University Hospital. Patients treated for at least one year for post-covid disease by the infectious diseases department. descriptive analysis

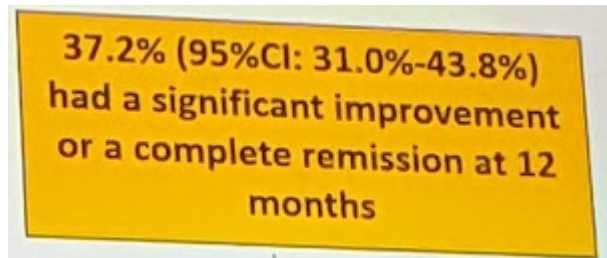
Out of 41 patients (F: 80%, mean age 45), after one year 50% were still off work, 20% on modified workstations and 30% on full-time work. No significant predictivity of the initial state. Frequent persistence of cognitive disorders, important socio-occupational impact at one year.

sources quoted

- Humphreys, H., Kilby, L., Kudiersky, N., & Copeland, R. (2021). Long COVID and the role of physical activity: a qualitative study. *BMJ open*, 11(3), e047632. <https://bmjopen.bmj.com/content/bmjopen/11/3/e047632.full.pdf>
- Delbressine, J. M., Machado, F. V., Goërtz, Y. M., Van Herck, M., Meys, R., Houben-Wilke, S., ... & Vaes, A. W. (2021). The impact of post-COVID-19 syndrome on self-reported physical activity. *International journal of environmental research and public health*, 18(11), 6017. <https://link.springer.com/article/10.1007/s10072-021-05786-y>
- APHP. ComPaRe Covid long : Combien de temps dure le Covid long ? Publié le 08/04/2022. <https://www.aphp.fr/>
- Tran, V. T., Riveros, C., Clepier, B., Desvarieux, M., Collet, C., Yordanov, Y., & Ravaud, P. (2022). Development and validation of the Long Coronavirus Disease (COVID) Symptom and Impact Tools: a set of patient-reported instruments constructed from patients' lived experience. *Clinical Infectious Diseases*, 74(2), 278-287. <https://academic.oup.com/cid/article/74/2/278/6252414>

- Han, Q., Zheng, B., Daines, L., & Sheikh, A. (2022). Long-Term sequelae of COVID-19: A systematic review and meta-analysis of one-year follow-up studies on post-COVID symptoms. *Pathogens*, 11(2), 269. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8875269/>

Commented poster: Predictive factors for improvement. Hotel Dieu, Paris



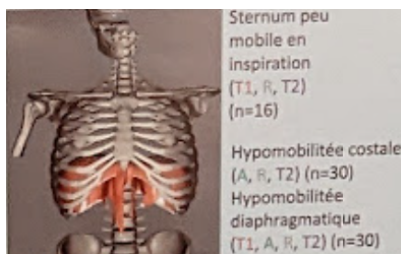
By an association of researchers, Paris. Study carried out on the PERSICOR database of 296 patients (F:77%, mean age 45) Long covid, Hotel Dieu, Paris on patients who had a confirmed Covid, excluding intensive care. Evaluation one year after the first consultation for LC, by standardized questionnaire (231 patients) (score 1-3 symptom persistence, score 10

complete remission). The authors present an interesting distribution of symptoms over time. Among the predictive factors of improvement, we noted in univariate analysis that the presence of anti SARS COV 2 antibodies was associated with a greater probability of improvement at one year (aPRR: 1.60, p=0.028) whereas the presence of neurocognitive disorders (in univariate), and ageusia (in univariate and multivariate) were associated with a less favorable evolution. These results are in favor of a role of immunity in the genesis of long COVID.

Sources quoted

- Augustin, M., Schommers, P., Stecher, M., Dewald, F., Gieselmann, L., Gruell, H., ... & Lehmann, C. (2021). Post-COVID syndrome in non-hospitalised patients with COVID-19: a longitudinal prospective cohort study. *The Lancet Regional Health-Europe*, 6, 100122. <https://pubmed.ncbi.nlm.nih.gov/34027514/>
- Mirfazeli, F. S., Sarabi-Jamab, A., Pereira-Sanchez, V., Kordi, A., Shariati, B., Shariat, S. V., ... & Faiz, S. H. R. (2022). Chronic fatigue syndrome and cognitive deficit are associated with acute-phase neuropsychiatric manifestations of COVID-19: A 9-month follow-up study. *Neurological Sciences*, 43(4), 231-2239. <https://link.springer.com/article/10.1007/s10072-021-05786-y>
- Evans, R. A., Leavy, O. C., Richardson, M., Elneima, O., McCauley, H. J. C., Shikotra, A., ... & Berridge, A. (2022). Clinical characteristics with inflammation profiling of long COVID and association with 1-year recovery following hospitalisation in the UK: a prospective observational study. *The Lancet Respiratory Medicine*. <https://pubmed.ncbi.nlm.nih.gov/35472304/>

Poster; Osteopathy and respiratory symptoms of Long covid, the COVOSTEO study



A small therapeutic trial has been presented during congresses. It was a small cohort of 30 patients with respiratory disorders treated with osteopathy sessions, associated with their background treatment. Interestingly, it showed a significant improvement of the Nijmegen score in patients who had received at least 5 sessions. This unpretentious study encourages the undertaking of a

randomized study to validate or not this approach which could be complementary to classical approaches.

A patient's intervention

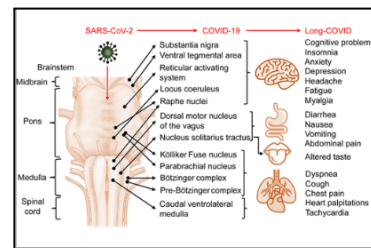
A woman from the audience spoke up and introduced herself as suffering from Long Covid. She mentions an invisible handicap, which is felt and not seen. Her attending physician, who is very kind, knows nothing. He was clearly failing. She is very concerned about the fact that there is a lot of talk about Long Covid patients and not about Long Covid disease. She pleads for the state to recognize this disease, which would allow the social and professional difficulties that this condition causes to be recognized.



The person is also concerned about the state of research on biomarkers and in particular on coagulation (assuming she is referring to the work of Pretorius and micro clots). She ended her presentation, expressed in emotion, on the state of degradation in which some patients are and thanked the researchers present for their efforts

Covid Long and psycho-cognitive disorders by Lucie Hope

Long covid is a multisystemic condition
 Available tools: MOCA, Cognitive Complaint Questionnaire,
 Also assess Anxiety, Depression, Fatigue, Sleepiness, Pain
 PTSD: PCL-5 (Brunet)



MONTREAL COGNITIVE ASSESSMENT (MOCA) NOM : _____ Date de naissance : _____
 Version 7.1 FRANÇAIS Score total : _____ Sexe : _____

VISSUOSPATIAL / EXÉCUTIF Copier le cube (11 h 10 min) _____
 (Lignes)

DÉNOMINATION _____
 (Lignes)

MÉMOIRE Lire la liste de mots, le patient doit répéter le mot et dessiner un objet correspondant. _____
 (Lignes)

ATTENTION Lire la série de chiffres (1) différer (2)3. Le patient doit la répéter. _____
 (Lignes)

LANGAGE Répéter la couleur à disposition sur le sable. _____
 (Lignes)

ABSTRACTION Similitude entre orange - fruit / train - bicyclette / menthe - règle. _____
 (Lignes)

RAPPEL Dire un souvenir des mots. _____
 (Lignes)

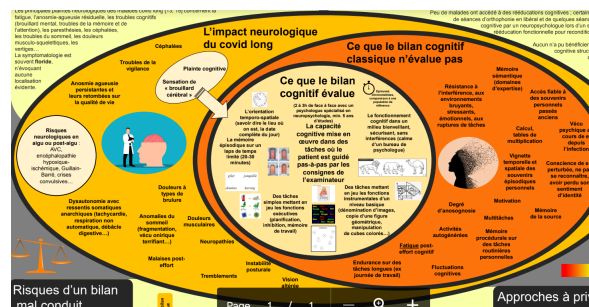
ORIENTATION _____
 (Lignes)

TOTAL _____
 Ajouter 1 point si score total < 12 ans

Sources quoted

- Yong, S. J. (2021). Persistent brainstem dysfunction in long-COVID: a hypothesis. ACS chemical neuroscience, 12(4),73-580. <https://pubs.acs.org/doi/10.1021/acscchemneuro.0c00793>
- Ceban, F., Ling, S., Lui, L. M., Lee, Y., Gill, H., Teopiz, K. M., ... & McIntyre, R. S. (2022). Fatigue and cognitive impairment in Post-COVID-19 Syndrome: A systematic review and meta-analysis. Brain, behavior, and immunity, 101, 93-135. <https://pubmed.ncbi.nlm.nih.gov/34973396/>
- MOCA evaluation cognitive <https://www.mocatest.org/fr/>
- Questionnaire de plainte cognitive ; <http://www.sgca.fr/outils/Questionnaire%20de%20Plainte%20Cognitive.pdf>
- Ashbaugh, A. R., Houle-Johnson, S., Herbert, C., El-Hage, W., & Brunet, A. (2016). Psychometric validation of the English and French versions of the posttraumatic stress disorder checklist for DSM-5 (PCL-5). *PLoS one*, 11(10), e0161645. <https://pubmed.ncbi.nlm.nih.gov/27723815/>

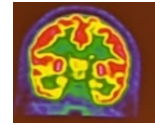
In the same field, see the excellent poster by C. Lebras c.lebras@ch-beauvais.fr neuropsychologist about neuropsychological revalidation. The author draws attention to "people with long covid are unfortunately received by teams specializing in the detection of neurodegenerative diseases for the elderly" and that "the classic neuropsychological assessment situation poorly reflects everyday cognitive difficulties."



Neuroimaging by Dr Guedj



Dr. Guedj, professor of biophysics and nuclear medicine (University Hospitals of Marseille) is the reference in neuroimaging of the Long COVID. He presents the 8 FDG PET scan as an individual biomarker of brain metabolism. Two key questions however: differential diagnosis (other diseases?) and imputability (correlation with symptoms) . The PET (which is not reimbursed in the diagnosis of Long COVID in Belgium) evaluates the consumption of glucose by astrocytes and can thus show hypometabolism and neuroinflammation. It is important to distinguish it from functional MRI (fMRI) which, as its name indicates, shows the functional consequences of a task or a symptom. It shows that there is a correlation between hypometabolism and the total number of symptoms, pain, sleep disorders, cognitive complaints, anosmia, dyspnea, asthenia, language disorders, cognitive performance

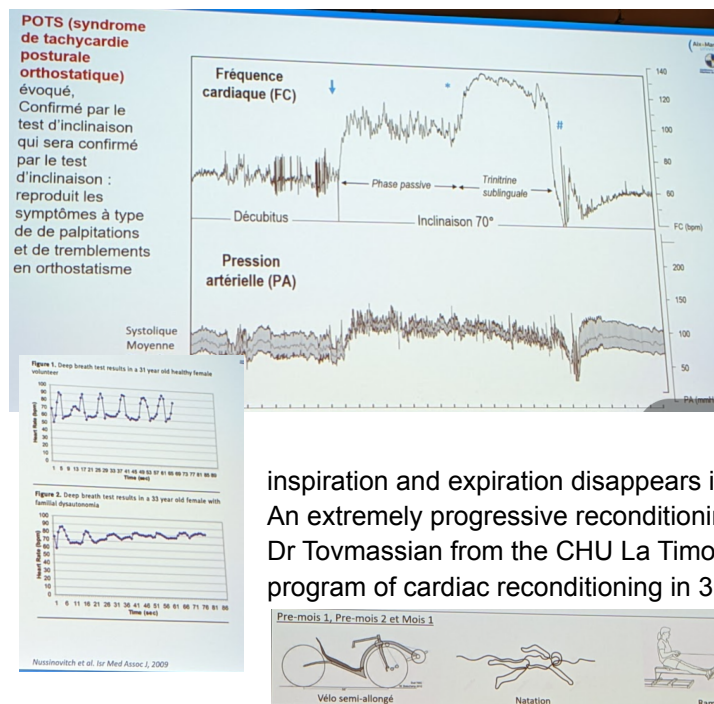


It should be noted that the Belgian experience was gathered using technetium scintigraphy which shows blood flow problems in the cognitive forms of Long Covid (whereas PET shows the result of this disturbance)

Main sources quoted

- Guedj, E., & Horowitz, T. (2022). Brain Metabolic PET Findings on the Long-Term Effects of COVID-19. *Journal of Nuclear Medicine*, 63(9), 1452.
- Meyer, P. T., Hellwig, S., Blazhenets, G., & Hosp, J. A. (2022). Molecular imaging findings on acute and long-term effects of COVID-19 on the brain: A systematic review. *Journal of Nuclear Medicine*.
- Verger, A., Kas, A., Dudouet, P., Goehringer, F., Salmon-Ceron, D., & Guedj, E. (2022). Visual interpretation of brain hypometabolism related to neurological long COVID: a French multicentric experience. *European Journal of Nuclear Medicine and Molecular Imaging*, 1-6
- Jamouille, M., Gisele Kazeneza Mugisha, & Ayoub Zayane. (2022). Follow-up of a cohort of patients with post-acute COVID-19 syndrome in a Belgian family practice. *Viruses*, 14(9), 2000. doi:10.3390/v14092000 <https://orbi.uliege.be/handle/2268/294261>

Dysautonomia during Long covid by JC Deharo



Cardio rythmology, CHU La Timone, Marseille.

The sudden blood pressure drop of POTS can be reproduced and the blood pressure change can be objectified. The cardiac symptoms of LC are specific (tachycardia, exertional exhaustion, post-exertional malaise, dyspnea, chest pain.

The deep inspiration test can easily be performed in consultation. The usual difference in breathing rhythm between

inspiration and expiration disappears in case of dysautonomia

An extremely progressive reconditioning program can be set up. Dr Seder and Dr Tovmassian from the CHU La Timone Marseille present a very detailed program of cardiac reconditioning in 3 to 7 months in the POTS

Sources quoted

- Ståhlberg, M., Reistam, U., Fedorowski, A., Villacorta, H., Horiuchi, Y., Bax, J., ... & Maisel, A. (2021). Post-COVID-19 tachycardia syndrome: a distinct phenotype of post-acute COVID-19 syndrome. *The American journal of medicine*, 134(12), 1451-1456. <https://pubmed.ncbi.nlm.nih.gov/34390682/>

- Blitshteyn, S., & Whitelaw, S. (2021). Postural orthostatic tachycardia syndrome (POTS) and other autonomic disorders after COVID-19 infection: a case series of 20 patients. *Immunologic research*, 69(2), 205-211. <https://pubmed.ncbi.nlm.nih.gov/33786700/>
- Nussinovitch, U., & Shoenfeld, Y. (2009). Autoimmunity and heart diseases: pathogenesis and diagnostic criteria. *Archivum immunologiae et therapeuticae experimentalis*, 57(2), 95-104. <https://pubmed.ncbi.nlm.nih.gov/33786700/>
- Bisaccia, G., Ricci, F., Recce, V., Serio, A., Iannetti, G., Chahal, A. A., ... & Gallina, S. (2021). Post-acute sequelae of COVID-19 and cardiovascular autonomic dysfunction: What do we know?. *Journal of cardiovascular development and disease*, 8(11), 156. <https://www.mdpi.com/2308-3425/8/11/156>
- Writing Committee, Gluckman TJ, Bhave NM, Allen LA, Chung EH, Spatz ES, Ammirati E, Baggish AL, Bozkurt B, Cornwell WK 3rd, Harmon KG, Kim JH, Lala A, Levine BD, Martinez MW, Onuma O, Phelan D, Puntmann VO, Rajpal S, Taub PR, Verma AK. 2022 ACC Expert Consensus Decision Pathway on Cardiovascular Sequelae of COVID-19 in Adults: Myocarditis and Other Myocardial Involvement, Post-Acute Sequelae of SARS-CoV-2 Infection, and Return to Play: A Report of the American College of Cardiology Solution Set Oversight Committee. *J Am Coll Cardiol*. 2022 May 3;79(17):1717-1756. <https://pubmed.ncbi.nlm.nih.gov/35307156/>
- Papadopoulou, M., Bakola, E., Papapostolou, A., Stefanou, M. I., Gaga, M., Zouvelou, V., ... & Tsivgoulis, G. (2022). Autonomic dysfunction in long-COVID syndrome: a neurophysiological and neurosonology study. *Journal of neurology*, 1-2. <https://pubmed.ncbi.nlm.nih.gov/35536408/>

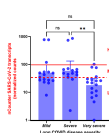
Covid-Long and biomarkers

Poster; antiphospholipid antibodies; Muller et al. APHP Marseille

presence of antiphospholipid antibodies in patients (n=230) LC versus cured (18% versus 2%) with more headache, concentration and memory problems

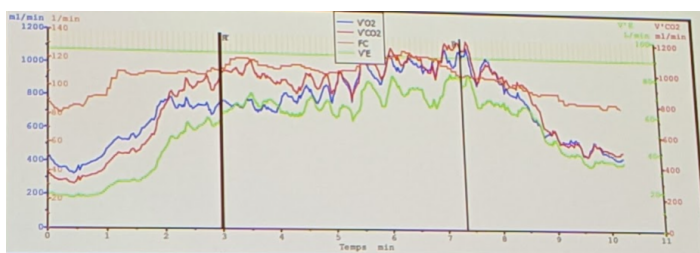
- Uthman, I. W., & Gharavi, A. E. (2002, February). Viral infections and antiphospholipid antibodies. In *Seminars in arthritis and rheumatism* (Vol. 31, No. 4, pp. 256-263). WB Saunders. <https://pubmed.ncbi.nlm.nih.gov/11836658>
- Miyakis, S., Lockshin, M. D., Atsumi, T., Branch, D. W., Brey, R. L., Cervera, R. H. W. M., ... & Krilis, S. A. (2006). International consensus statement on an update of the classification criteria for definite antiphospholipid syndrome (APS). *Journal of thrombosis and haemostasis*, 4(2), 295-306. <https://pubmed.ncbi.nlm.nih.gov/16420554/>

Poster; Transcriptomics and Long Covid (Van Weyenbergh et all)



Cohort study; the first 48 patients showed high or medium levels of circulating viral RNA in 16/48 (33%) of patients, which decreased ($R=-0.31$, $p=0.037$) with time after initial infection. Paradoxically, viral RNA levels correlated negatively with clinical severity ($R=-0.33$, $p=0.021$), independent of age, sex and vaccination status of patients. <https://hdl.handle.net/2268/296822>

Long COVID and ventilation mechanics



Justine Fria-Masson, Paris.

LC induces respiratory dysfunction characterized by hyperventilation syndrome, periodic sighing, dominant thoracic breathing, forced abdominal expiration and thoracoabdominal asynchrony

Hyperventilation syndrome (HVS) can

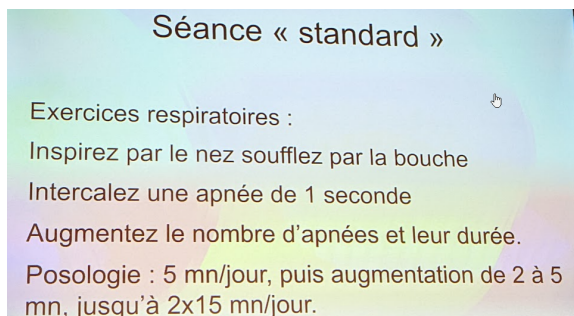
be accompanied by yawning, exertional dyspnea, speech dyspnea, paresthesia, palpitations. The Nijmegen score is high (The Nijmegen score is a sixteen item score ranked from 0 (never occurs) to 4 (occurs, very often. A score $\geq 23/64$ is suggestive of VHS).

Hyperventilation is common in LC. Muscle deconditioning is also involved. Cardiopulmonary exercise testing (CPET) shows 29% of patients with ventilatory inefficiency. Disruption of ventilatory control is also mentioned. An autonomic nervous system dysfunction could also be an explanatory mode associated with endothelial lesions and microangiopathies.

Sources quoted

- Bokov, P., Fiamma, M. N., Chevalier-Bidaud, B., Chenivesse, C., Straus, C., Similowski, T., & Delclaux, C. (2016). Increased ventilatory variability and complexity in patients with hyperventilation disorder. *Journal of Applied Physiology*, 120(10), 1165-1172. <https://pubmed.ncbi.nlm.nih.gov/26869707/>
- Jack, S., Rossiter, H. B., Pearson, M. G., Ward, S. A., Warburton, C. J., & Whipp, B. J. (2004). Ventilatory responses to inhaled carbon dioxide, hypoxia, and exercise in idiopathic hyperventilation. *American journal of respiratory and critical care medicine*, 170(2), 118-125. <https://pubmed.ncbi.nlm.nih.gov/15059786/>
- Baratto, C., Caravita, S., Faini, A., Perego, G. B., Senni, M., Badano, L. P., & Parati, G. (2021). Impact of COVID-19 on exercise pathophysiology: a combined cardiopulmonary and echocardiographic exercise study. *Journal of Applied Physiology*, 130(5), 1470-1478. <https://pubmed.ncbi.nlm.nih.gov/33764166/>
- Rinaldo, R. F., Mondoni, M., Parazzini, E. M., Pitari, F., Brambilla, E., Luraschi, S., ... & Centanni, S. (2021). Deconditioning as main mechanism of impaired exercise response in COVID-19 survivors. *European Respiratory Journal*, 58(2). <https://pubmed.ncbi.nlm.nih.gov/33926969/>
- Crisafulli, E., Dorelli, G., Sartori, G., & Dalle Carbonare, L. (2021). Exercise ventilatory inefficiency may be a relevant CPET-feature in COVID-19 survivors. *International Journal of Cardiology*, 343, 200. <https://pubmed.ncbi.nlm.nih.gov/34537303/>
- Motiejunaite, J., Balagny, P., Arnoult, F., Mangin, L., Bancal, C., d'Ortho, M. P., & Frijia-Masson, J. (2021). Hyperventilation: a possible explanation for long-lasting exercise intolerance in mild COVID-19 survivors?. *Frontiers in physiology*, 1856. <https://pubmed.ncbi.nlm.nih.gov/33536937/>
- Davido, B., Seang, S., Tubiana, R., & de Truchis, P. (2020). Post-COVID-19 chronic symptoms: a postinfectious entity?. *Clinical Microbiology and Infection*, 26(11), 1448-1449. <https://pubmed.ncbi.nlm.nih.gov/32712242/>

The physical therapy of the Long Covid



Philippe Burtin, kinesitherapist, Pau, France treatment of dysfunctional breathing/hyperventilation syndrome. The techniques used and the progressiveness must be well explained to the patient; the patient becomes a partner in the care (empowerment) Factual information is crucial for patient participation

Sources quoted

- Rodrigues, A., Castro, G. M., Jácome, C., Langer, D., Parry, S. M., & Burtin, C. (2020). Current developments and future directions in respiratory physiotherapy. *European Respiratory Review*, 29(158). <https://err.ersjournals.com/content/29/158/200264>
- Thomas, M., McKinley, R. K., Freeman, E., Foy, C., Prodder, P., & Price, D. (2003). Breathing retraining for dysfunctional breathing in asthma: a randomised controlled trial. *Thorax*, 58(2), 110-115. <https://europepmc.org/article/med/12554890>
- Jones, M., Harvey, A., Marston, L., & O'Connell, N. E. (2013). Breathing exercises for dysfunctional breathing/hyperventilation syndrome in adults. *Cochrane Database of Systematic Reviews*, (5). <https://bura.brunel.ac.uk/bitstream/2438/7718/2/Fulltext.pdf>
- Jones M, Harvey A, Marston L, O'Connell NE. Breathing exercises for dysfunctional breathing/hyperventilation syndrome in adults. *Cochrane Database of Systematic Reviews* 2013, Issue 5. Art. No.: CD009041. DOI: 10.1002/14651858.CD009041.pub2. Accedida el 16 de diciembre de 2022. <https://www.cochranelibrary.com/es/cdsr/doi/10.1002/14651858.CD009041.pub2/full/fr#pico>

Covid long pediatric

Camille Brehin (pediatrician, CHU Toulouse (online))

The presentation cites numerous sources. Although there are variations in symptoms between adults and adolescents/children, the condition is very similar. However, supportive measures, especially for the school and family, must be taken. The exhausted adolescent

must be taken seriously and supported. The general evolution can be more rapid than in adults

Sources quoted

- Filippatos, F., Tatsi, E. B., & Michos, A. (2022). Post-COVID-19 syndrome in children. *Experimental and Therapeutic Medicine*, 24(4), 1-10. <https://pubmed.ncbi.nlm.nih.gov/36160884/>
- Miller, F., Nguyen, V., Navaratnam, A. M., Shrotri, M., Kovar, J., Hayward, A. C., ... & Hardeid, P. (2022). Prevalence and Characteristics of Persistent Symptoms in Children During the COVID-19 Pandemic: Evidence From a Household Cohort Study in England and Wales. *The Pediatric Infectious Disease Journal*, 41(12), <https://www.nature.com/articles/s41467-022-34616-8979-984>. https://journals.lww.com/pidj/Fulltext/2022/12000/Prevalence_and_Characteristics_of_Persistent.9.aspx
- Dumont, R., Richard, V., Lorthe, E., Loizeau, A., Pennacchio, F., Zaballa, M. E., ... & Guessous, I. (2022). A population-based serological study of post-COVID syndrome prevalence and risk factors in children and adolescents. *Nature Communications*, 13(1), 1-8. <https://www.nature.com/articles/s41467-022-34616-8>
- Osmanov, I. M., Spiridonova, E., Bobkova, P., Gamirova, A., Shikhaleva, A., Andreeva, M., ... & Munblit, D. (2022). Risk factors for post-COVID-19 condition in previously hospitalised children using the ISARIC Global follow-up protocol: a prospective cohort study. *European Respiratory Journal*, 59(2). <https://erj.ersjournals.com/content/59/2/2101341.figures-only>
- Buonsenso, D., Gennaro, L. D., Rose, C. D., Morello, R., D'Ilario, F., Zampino, G., ... & Valentini, P. (2022). Long-term outcomes of pediatric infections: from traditional infectious diseases to long covid. *Future microbiology*, 17(7), 551-571. <https://pubmed.ncbi.nlm.nih.gov/35264003/>
- Cociolillo, F., Di Giuda, D., Morello, R., De Rose, C., Valentini, P., & Buonsenso, D. (2022). Orbito-frontal cortex hypometabolism in children with post-covid condition (Long Covid): A preliminary experience. *The Pediatric Infectious Disease Journal*, 41(8), 663. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9281418/>
- Di Gennaro, L., Valentini, P., Sorrentino, S., Ferretti, M. A., De Candia, E., Basso, M., ... & Buonsenso, D. (2022). Extended coagulation profile of children with Long Covid: A prospective study. *Scientific Reports*, 12(1), 1-10. <https://pubmed.ncbi.nlm.nih.gov/36319840/>
- Morand, A., Campion, J. Y., Lepine, A., Bosdure, E., Luciani, L., Cammilleri, S., ... & Guedj, E. (2022). Similar patterns of [18F]-FDG brain PET hypometabolism in paediatric and adult patients with long COVID: a paediatric case series. *European journal of nuclear medicine and molecular imaging*, 49(3), 913-920. <https://pubmed.ncbi.nlm.nih.gov/34414470/>
- Morello, R., De Rose, C., Cardinali, S., Valentini, P., & Buonsenso, D. (2022). Lactoferrin as Possible Treatment for Chronic Gastrointestinal Symptoms in Children with Long COVID: Case Series and Literature Review. *Children*, 9(10), 1446. <https://pubmed.ncbi.nlm.nih.gov/36291381/>

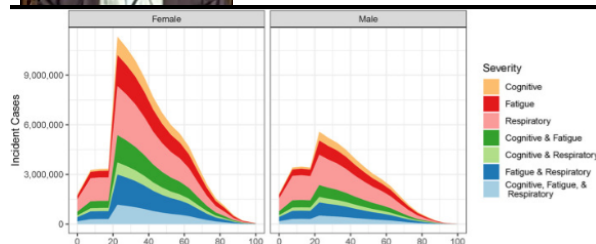
Symptom	Children, %	Adults, %
Fatigue	3-87	28-87
Myalgias/arthralgias	1-61	3-25
Rhinorrhea	20-52	1-10
Headache	5-26	5-20
Depression	1-25	18-25
Sore throat	19-25	4-10
Anosmia	17-23	11-20
Anxiety	1-20	20-23
Dyspnea	6-15	12-30
Chest pain	5-12	5-22
Concentration problem	4-10	16-34
Sleep disorders	1-7	17-25

Rehabilitations in the Long Covid



Nicolas Barizien, H. Foch, Suresnes. Draws attention to the gradient women/men, not only is the proportion of women more important but also the number and intensity of their symptoms.

Thoracic-respiratory synergy. Small lung syndrome. The patient does not know how to breathe. Revalidation technique described in his book. Progressive



respiratory muscle training is essential
 Diagnosis by provocation test
 hyperventilation with capnograph
 Mini Barizian effort test
 Rehabilitation assessment by COVID-19
 Yorkshire Rehabilitation Scale. The C19-YRS consists of 22 items, each rated on an 11-point numerical scale ranging from 0 (no symptoms) to 10 (extremely severe level or impact). 6 min walk

test, 30 sec sit-stand test, hyperventilation test. The cardiopulmonary rehabilitation program will

consist of aerobic exercise, muscle strengthening and breathing exercises 3 times a week for 8 weeks. The aerobic exercise will be performed on a cycle ergometer and will last a maximum of 30 minutes (with 5 minutes of warm-up and cool-down). The intensity will be individualized at the first ventilatory threshold according to the cardiorespiratory effort test and can be increased progressively according to the patient's tolerance.

Sources quoted

- Wulf Hanson, S., Abbafati, C., Aerts, J., Al-Aly, Z., Ashbaugh, C., Ballouz, T., ... & Vos, T. (2022). A global systematic analysis of the occurrence, severity, and recovery pattern of long COVID in 2020 and 2021 (preprint). <https://pubmed.ncbi.nlm.nih.gov/35664995/>
- Nicolas Barizien, Laurent Uzan, Marie-Pierre Samitier. Covid long comment s'en sortir. Marabout. 2021
- O'Connor, R. J., Preston, N., Parkin, A., Makower, S., Ross, D., Gee, J., ... & Sivan, M. (2022). The COVID-19 Yorkshire Rehabilitation Scale (C19-YRS): application and psychometric analysis in a post-COVID-19 syndrome cohort. *Journal of Medical Virology*, 94(3), 1027-1034. <https://pubmed.ncbi.nlm.nih.gov/34676578/>
- Nopp, S., Moik, F., Klok, F. A., Gattinger, D., Petrovic, M., Vonbank, K., ... & Zwick, R. H. (2022). Outpatient pulmonary rehabilitation in patients with long COVID improves exercise capacity, functional status, Dyspnea, Fatigue, and Quality of Life. *Respiration*, 101(6), 593-601. <https://www.karger.com/Article/FullText/522118>
- da Silva Vieira, A. G., Pinto, A. C. P. N., Garcia, B. M. S. P., Eid, R. A. C., Mól, C. G., & Nawa, R. K. (2022). Telerehabilitation improves physical function and reduces dyspnoea in people with COVID-19 and post-COVID-19 conditions: a systematic review. *Journal of physiotherapy*. <https://pubmed.ncbi.nlm.nih.gov/35414491/>
- McNarry, M. A., Berg, R. M., Shelley, J., Hudson, J., Saynor, Z. L., Duckers, J., ... & Mackintosh, K. A. (2022). Inspiratory Muscle Training Enhances Recovery Post COVID-19: A Randomised Controlled Trial. *European Respiratory Journal*. <https://pubmed.ncbi.nlm.nih.gov/35236727/>
- Besnier, F., Bérubé, B., Malo, J., Gagnon, C., Grégoire, C. A., Juneau, M., ... & Bherer, L. (2022). Cardiopulmonary Rehabilitation in Long-COVID-19 Patients with Persistent Breathlessness and Fatigue: The COVID-Rehab Study. *International Journal of Environmental Research and Public Health*, 19(7), 4133. <https://pubmed.ncbi.nlm.nih.gov/35409815/>

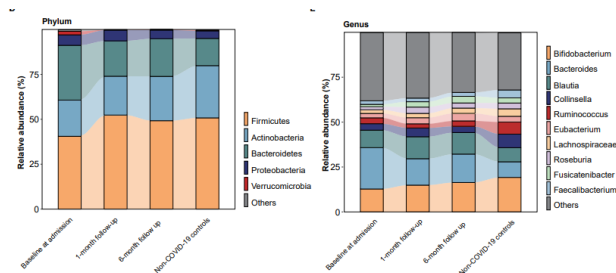
Intestinal dysbiosis and SAMA (online)

Dr Benoit Coffin (gastro, APHP Nord, Paris) Digestive symptoms are frequent in LC. The occurrence of Post Infectious Functional Gastrointestinal disease PI-FGID / Disease Gut Brain interaction (DGBI) is significantly more frequent after LC. Of 320 cases, at 1 month 36 (11.3%) developed symptoms of

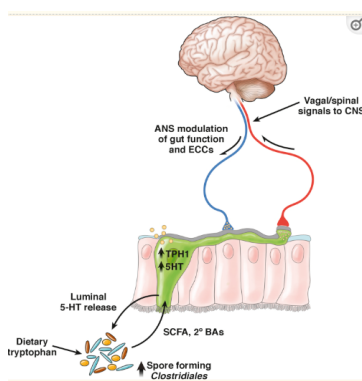
FGID. COVID-19 resulted in significantly more new onset of PI-FGID/DGBI compared with healthy controls at 3 and 6 months of follow-up. Infectious bowel syndrome (IBS) is well known, but post-infectious IBS (IBS-PI) increases intestinal permeability, mast cell activation, and causes dysbiosis, i.e., an imbalance or microbial maladaptation of the gut microbiota. Mast cell infiltration of the colon and release of mediators near the

mucosal innervation may contribute to the perception of abdominal pain in patients with IBS.

The gut microbiota changes in LC. The respective proportion of bacteria changes in parallel



with cytokines and inflammation markers. This dysbiosis persists and evolves and we see a loss of microbial richness and diversity. An association between dysbiosis and symptoms is even observed. We therefore hypothesize a link between changes in the intestinal biome and the appearance of articular, neurological, respiratory symptoms, etc. The brain-gut interaction is mediated by Serotonin. There are a series of clinical trials to evaluate microbiota-based interventions in COVID-19.



Mast cell activation syndrome is thought to be a common but under-recognized chronic multisystem disorder caused by inappropriate mast cell activation and there is a similarity between the symptoms of MAS and LC

Sources quoted

- Golla, R., Vuyyuru, S., Kante, B., Kumar, P., Mathew, D. T., Makharia, G., ... & Ahuja, V. (2022). Long-term gastrointestinal sequelae following COVID-19: A prospective follow-up cohort study. *Clinical Gastroenterology and Hepatology*. <https://pubmed.ncbi.nlm.nih.gov/36273799/>
- Barbara, G. (2006). Mucosal barrier defects in irritable bowel syndrome. Who left the door open?. *Official journal of the American College of Gastroenterology* ACG, 101(6), 1295-1298. https://journals.lww.com/ajg/Abstract/2006/06000/Mucosal_Barrier_Defects_in_Irritable_Bowel.23.aspx
- Yeoh, Y. K., Zuo, T., Lui, G. C. Y., Zhang, F., Liu, Q., Li, A. Y., ... & Ng, S. C. (2021). Gut microbiota composition reflects disease severity and dysfunctional immune responses in patients with COVID-19. *Gut*, 70(4), 698-706. <https://pubmed.ncbi.nlm.nih.gov/33431578/>
- Martin, C. R., Osadchiy, V., Kalani, A., & Mayer, E. A. (2018). The brain-gut-microbiome axis. *Cellular and molecular gastroenterology and hepatology*, 6(2), 133-148. Martin, C. R., Osadchiy, V., Kalani, A., & Mayer, E. A. (2018). <https://pubmed.ncbi.nlm.nih.gov/30023410/>
- Weinstock, L. B., Pace, L. A., Rezaie, A., Afrin, L. B., & Molderings, G. J. (2021). Mast cell activation syndrome: a primer for the gastroenterologist. *Digestive Diseases and Sciences*, 66(4), 965-982. <https://pubmed.ncbi.nlm.nih.gov/32328892/>

Patient testimonials

Video of a physician patient

This online intervention by a man in his fifties, speaking clearly and soberly, obviously shook the assembly. Our colleague explains how he lost control of his professional life, how life shrank like a stone, how his mind became clouded and his memory faded. He speaks movingly of what remains, his warm family life, the support of his loved ones, and the support of his attending physician and all the colleagues who are with him in his desperate efforts to recover cognitively and physically.

The mother of a teenager is then invited to the podium

It is also with great emotion that the assembly follows the moving testimony of this mother; I would like to be a writer to reproduce with precision this deep sense of struggle and resistance that she needed to accompany her intellectually brilliant teenager and great sportsman who suddenly lost his cognitive and physical capacities. She recalls the help put in place, both at school and at home, that allowed her to continue living.

In the assembly, another mother speaks up and says she feels abandoned. Behind me, a woman is crying, her husband is surrounding her with affection. At the break she told me how much she had lost, her whole life is gone and she sees herself destroyed.

Patient involvement: progress and difficulties



by Dr. Oustric representative of the association #ApresJ20 <https://www.apresj20.fr/>

The association, created in October 2020, has 1600 members and is supported by a scientific council. Four areas of work: Recognition, Care, Communication and Research. The denial of recognition, the stigmatization of

patients, the risks of drift have a very important impact on the health and social life of patients. The association notes that there are still no known figures or communication campaigns. It pleads for the patient to become a partner and to train the medical profession and finance research.

Four axes of proposals are formulated,

- Recognition; to grant the status of Long Duration Affection to the people suffering from Long Covid, to train at all levels (health, schools, work) and to support financially the patients
- Care; Establish coordinated care paths throughout the territory, with patient partners and based on scientific literature
- Communication; Long covid must exist in the media
- Research; setting up scientific projects including therapeutic trials



Health insurance support system



A representative from CNAM presented the current situation. As of September 2022 there are more than 5236 people out of work for Long Covid. More than 1000 files have been reviewed by a committee of experts. The HAS experts seem to have put their efforts not only during COVID but also for Long Covid. There is a very well done online referral questionnaire which gives at the end indications on how to find adequate help including a national phone number.

Quoted

- quick response pediatrics
- <https://www.ameli.fr/sites/default/files/Documents/14.%20Fiche%20Enfant%20et%20adolescent.pdf>
- Access your COVID Long questionnaire <https://touspartenairescovid.org/orientation-covid-long>
- Returning to work after a sick leave <https://www.ameli.fr/val-de-marne/assure/droits-demarches/maladie-accident-hospitalisation/arret-travail-maladie/reprendre-travail-apres-arret-maladie>

Post-covid return to work; impact of support

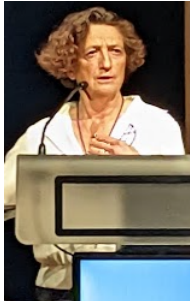
Françoise Le Deist Toulouse business school

The presentation focuses on the employee/manager relationship. The Covid and the Long Covid impact both members of the dyad. The authors consider three fundamental needs of employees; autonomy, competence and social belonging. Satisfying these three variables would lead to a decrease in absenteeism and an increase in performance if the workplace context is conducive to it with a good perceived organizational support (SOP). In order to determine the new needs of post-covid employees, a qualitative method is used (as in medicine), which explores five basic themes: work, illness, needs and expectations, desired help, career shock, and preventive measures. From the analysis of the questionnaires, it appears that various measures should be taken, such as encouraging communication during work stoppages, encouraging part-time work and teleworking, encouraging listening, communicating to explain the illness, avoiding discrimination at work, and systematic re-evaluation. It is not specified whether this model is operational.

- Ryan, R. M. et Deci, E. L. (2017). Self-determination theory. Basic psychological needs in motivation, development and wellness. New York, NY : Guilford Press <https://www.erudit.org/fr/revues/rqpsy/2017-v38-n3-rqpsy03258/1041847ar.pdf>

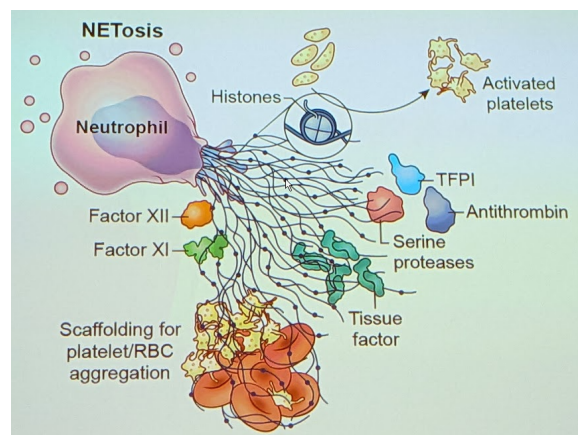
- R interface for Multidimensional Text and Questionnaire Analysis. A free software built with free software. <http://www.iramuteq.org/>

Final presentation by Dr. Salmon



A technically difficult and brilliant presentation by Dr Salmon, infectious diseases specialist, APHP, Paris, based on a particularly rich bibliography. In one year, there has been dramatic progress in understanding the potential pathophysiological mechanisms of long COVID. DS presented a synthesis of published data based on clinical work, involving sufficient groups of long COVID patients and compared to controls. These mechanisms are probably not exclusive.

Not everyone develops long COVID and it is likely that there is a genetic, immune, environmental or even a particular infectious history (viral load, variant, co-infection with herpes viruses). This is evidenced by an overrepresentation of women, atopic terrain, and people who have not developed antibodies against SARS COV 2 among long COVIDs. Long covid patients would express a sub-optimal immunity favoring viral replication and tissue damage. Half of the patients who consulted for post-acute COVID-19 syndrome are not immune to SARS-CoV-2. Detectable T-cell-mediated IL-2 release would be evidence of prior SARS-CoV-2 infection in seronegative LC patients. The pathophysiological mechanisms of LC would be multiple, immune deregulation, activation of coagulation, mitochondrial toxicity, reactivation of the herpes virus, disruption of the microbiota. All this would explain the persistence of the Spike protein or viral RNA in the LC. RNA (virus replication particle) is detected in various human tissues up to 230 days after infection as well as spike protein. T lymphocyte activation is sustained and suggests persistent stimulation by viral antigens. High levels of proinflammatory cytokines are found in the LC. Autoantibodies and secondary mast cell activation syndrome (MCAS) are also present. The role of neutrophils in pathogenesis is being studied, particularly the Netose phenomenon. The intricacy of the different mechanisms remains to be unraveled and it is still difficult to determine what is the persistence of an unresolved infection or the inflammatory sequelae of an initial infection. However, this research already offers numerous perspectives. It will allow the identification of biomarkers to better classify patients and evaluate therapeutic approaches based on the inhibition of these mechanisms.



Sources quoted

- Augustin, M., Schommers, P., Stecher, M., Dewald, F., Gieselmann, L., Gruell, H., ... & Lehmann, C. (2021). Post-COVID syndrome in non-hospitalised patients with COVID-19: a longitudinal prospective cohort study. *The Lancet Regional Health-Europe*, 6, 100122. <https://pubmed.ncbi.nlm.nih.gov/34027514/>

- Sudre, C. H., Murray, B., Varsavsky, T., Graham, M. S., Penfold, R. S., Bowyer, R. C., ... & Steves, C. J. (2021). Attributes and predictors of long COVID. *Nature medicine*, 27(4), 626-631. <https://pubmed.ncbi.nlm.nih.gov/33692530/>
- Salmon-Ceron, D., Slama, D., De Broucker, T., Karmochkine, M., Pavie, J., Sorbets, E., ... & Canoui-Poitrine, F. (2021). Clinical, virological and imaging profile in patients with prolonged forms of COVID-19: A cross-sectional study. *Journal of Infection*, 82(2), e1-e4. <https://pubmed.ncbi.nlm.nih.gov/33285216/>
- Chakrabarti Lisa Mécanismes pathogènes dans le COVID Long - Infectiologie. Présentation en 09/2021. <https://www.infectiologie.com/UserFiles/File/formation/2021/covid-long-2021-2-l-chakrabarti-version-courte.pdf>
- Langton, D. J., Bourke, S. C., Lie, B. A., Reiff, G., Natu, S., Darlay, R., ... & Echevarria, C. (2021). The influence of HLA genotype on the severity of COVID-19 infection. *Hla*, 98(1), 14-22. <https://pubmed.ncbi.nlm.nih.gov/33896121/>
- Scherlinger, M., Felten, R., Gallais, F., Nazon, C., Chatelus, E., Pijnenburg, L., ... & Sibilia, J. (2021). Refining “Long-COVID” by a prospective multimodal evaluation of patients with long-term symptoms attributed to SARS-CoV-2 infection. *Infectious diseases and therapy*, 10(3), 1747-1763. <https://pubmed.ncbi.nlm.nih.gov/34245450/>
- Krishna, B. A., Lim, E. Y., Mactavous, L., Team, N. B., Lyons, P. A., Doffinger, R., ... & Sithole, N. (2022). Evidence of previous SARS-CoV-2 infection in seronegative patients with long COVID. *EBioMedicine*, 81, 104129. <https://www.repository.cam.ac.uk/handle/1810/339697>
- de Melo, G. D., Lazarini, F., Levallois, S., Hautefort, C., Michel, V., Larrous, F., ... & Lledo, P. M. (2021). COVID-19–related anosmia is associated with viral persistence and inflammation in human olfactory epithelium and brain infection in hamsters. *Science translational medicine*, 13(596), eabf8396. <https://pubmed.ncbi.nlm.nih.gov/33941622/>
- Cheung, C. C. L., Goh, D., Lim, X., Tien, T. Z., Lim, J. C. T., Lee, J. N., ... & Lim, K. H. (2022). Residual SARS-CoV-2 viral antigens detected in GI and hepatic tissues from five recovered patients with COVID-19. *Gut*, 71(1), 226-229. <https://pubmed.ncbi.nlm.nih.gov/34083386/>
- Natarajan, A., Zlitni, S., Brooks, E. F., Vance, S. E., Dahlen, A., Hedlin, H., ... & Bhatt, A. S. (2022). Gastrointestinal symptoms and fecal shedding of SARS-CoV-2 RNA suggest prolonged gastrointestinal infection. *Med*. <https://pubmed.ncbi.nlm.nih.gov/35434682/>
- Patterson, B. K., Francisco, E. B., Yogendra, R., Long, E., Pise, A., Rodrigues, H., ... & Mora, J. (2022). Persistence of SARS CoV-2 S1 protein in CD16+ monocytes in post-acute sequelae of COVID-19 (PASC) up to 15 months post-infection. *Frontiers in immunology*, 5526. <https://pubmed.ncbi.nlm.nih.gov/35082777/>
- Swank, Z., Senussi, Y., Alter, G., & Walt, D. R. (2022). Persistent circulating SARS-CoV-2 spike is associated with post-acute COVID-19 sequelae. *Medrxiv*. <https://pubmed.ncbi.nlm.nih.gov/36052466/>
- Craddock, V. D., Cook, C. M., & Dhillon, N. K. (2022). Exploring extracellular vesicles as mediators of clinical disease and vehicles for viral therapeutics: Insights from the COVID-19 pandemic. *Extracellular vesicles and circulating nucleic acids*, 3(3), 172. <https://pubmed.ncbi.nlm.nih.gov/35929616/>
- Grandjean, D., Gallet, C., Julien, C., Sarkis, R., Muzzin, Q., Roger, V., ... & Desquilbet, L. (2022). Identifying SARS-COV-2 infected patients through canine olfactory detection on axillary sweat samples; study of observed sensitivities and specificities within a group of trained dogs. *Plos one*, 17(2), e0262631. <https://pubmed.ncbi.nlm.nih.gov/35157716/>
- Stein, S. R., Ramelli, S. C., Grazioli, A., Chung, J. Y., Singh, M., Yinda, C. K., ... & Chertow, D. S. (2022). SARS-CoV-2 infection and persistence in the human body and brain at autopsy. *Nature*, 1-6. <https://pubmed.ncbi.nlm.nih.gov/36517603/>
- Phetsouphanh, C., Darley, D. R., Wilson, D. B., Howe, A., Munier, C., Patel, S. K., ... & Matthews, G. V. (2022). Immunological dysfunction persists for 8 months following initial mild-to-moderate SARS-CoV-2 infection. *Nature immunology*, 23(2), 210-216. <https://pubmed.ncbi.nlm.nih.gov/35027728/>
- Acosta-Ampudia, Y., Monsalve, D. M., Rojas, M., Rodríguez, Y., Gallo, J. E., Salazar-Urbe, J. C., ... & Anaya, J. M. (2021). COVID-19 convalescent plasma composition and immunological effects in severe patients. *Journal of autoimmunity*, 118, 102598. <https://pubmed.ncbi.nlm.nih.gov/33524876/>
- TE Graber, É Mercier, K Bhatnagar, M Fuzzen... - Water research, 2021 - Near real-time determination of B. 1.1. 7 in proportion to total SARS-CoV-2 viral load in wastewater using an allele-specific primer extension PCR strategy <https://pubmed.ncbi.nlm.nih.gov/34619611/>
- Schultheiß, C., Willscher, E., Paschold, L., Gottschick, C., Klee, B., Bosurgi, L., ... & Binder, M. (2022). Liquid biomarkers of macrophage dysregulation and circulating spike protein illustrate the biological heterogeneity in patients with post-acute sequelae of COVID-19. *Journal of Medical Virology*. <https://pubmed.ncbi.nlm.nih.gov/36458566/>
- Bertin, D., Kaphan, E., Weber, S., Babacci, B., Arcani, R., Faucher, B., ... & Bardin, N. (2021). Persistent IgG anticardiolipin autoantibodies are associated with post-COVID syndrome. *International Journal of Infectious Diseases*, 113, 23-25. <https://pubmed.ncbi.nlm.nih.gov/34614444/>
- Rojas, M., Rodríguez, Y., Acosta-Ampudia, Y., Monsalve, D. M., Zhu, C., Li, Q. Z., ... & Anaya, J. M. (2022). Autoimmunity is a hallmark of post-COVID syndrome. *Journal of translational medicine*, 20(1), 1-5. <https://pubmed.ncbi.nlm.nih.gov/35296346/>
- Merad, M., Blish, C. A., Sallusto, F., & Iwasaki, A. (2022). The immunology and immunopathology of COVID-19. *Science*, 375(6585), 1122-1127. <https://pubmed.ncbi.nlm.nih.gov/35271343/>
- Afrin, L. B., Self, S., Menk, J., & Lazarchick, J. (2017). Characterization of mast cell activation syndrome. *The American journal of the medical sciences*, 353(3), 207-215. <https://pubmed.ncbi.nlm.nih.gov/28262205/>

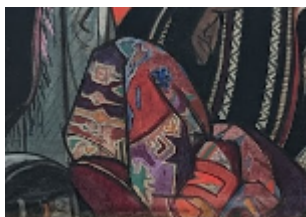
- Gaebler, C., Wang, Z., Lorenzi, J. C., Muecksch, F., Finkin, S., Tokuyama, M., ... & Nussenzweig, M. C. (2021). Evolution of antibody immunity to SARS-CoV-2. *Nature*, 591(7851), 639-644. <https://www.nature.com/articles/s41586-021-03207-w>
- Weinstock, L. B., Brook, J. B., Walters, A. S., Goris, A., Afrin, L. B., & Molderings, G. J. (2021). Mast cell activation symptoms are prevalent in Long-COVID. *International Journal of Infectious Diseases*, 112, 217-226. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8459548/>
- Zhu, S., Yu, Y., Ren, Y., Xu, L., Wang, H., Ling, X., ... & Guo, K. (2021). The emerging roles of neutrophil extracellular traps in wound healing. *Cell Death & Disease*, 12(11), 1-9. <https://www.nature.com/articles/s41419-021-04294-3>
- Pisareva, E., Badiou, S., Mihalovičová, L., Mirandola, A., Pastor, B., Kudriavtsev, A., ... & Thierry, A. R. (2022). Persistence of neutrophil extracellular traps and anticardiolipin auto-antibodies in post-acute phase COVID-19 patients. *Journal of Medical Virology*. <https://onlinelibrary.wiley.com/doi/full/10.1002/jmv.28209>



Majorelle. The carpet souk, Marrakech, 1924. MBA Nancy

Personal conclusion

The knowledge on the Long covid is like Majorelle's painting, fractionated, separated, partitioned, with many gray areas of the unknown and some colorful spots of knowledge. The whole can only be appreciated from a distance and gives the impression of a strange, new and scary world. If this picture was the necessary knowledge to understand the long Covid, we can think that we only see a small part of it and that we do not have yet the global view on the complexity of the problem. There is a lot of research going on. Eventually we will understand more and start therapeutic trials.



The Covid has already caused a considerable upheaval in medical knowledge. The Long Covid sets the record straight. It is a considerable scientific challenge. Apart from the patient's word, no routine biology or examination is useful, no routine imaging is really contributing. Doctors, used to a well known nosography, do not know where to put these patients who are absolutely out of the ordinary and most often the main diagnosis falls; depression, burnout, functional syndrome etc. The patient does not understand why his life has changed, feels guilty, hides, is ostracized by his work environment and worse by his family. He begins his medical wandering and

it is necessary for him to find a doctor who stops and who is surprised at not understanding what is going on in order to finally find a glimmer of explanation. The patient then realizes that even if the disease can be named, his doctor, however trained, knows nothing about it. Those who know less than nothing, which is already something, as Raymond Devos (a French humorist) said, are propelled to the rank of experts and are obliged to share their uncertainties and helplessness with their patients. In the best of cases, and if the physician is willing to step out of his or her traditional pathway, the patient can become a wise partner in diagnosis and care³. Some of them are more familiar with the detours of the Internet than their physician. Information management of this problem is difficult and the terribly primitive computerized medical systems do not help in gathering information. In addition, the economic and ecological expense can be considerable. For example, the increase in PET scans contributes to the increase in nuclear waste while the entire health care system is known to contribute to global warming to the same level as the automobile industry⁴. In this imbroglio of life, charlatans are flourishing on social networks and propagate stupidity at the speed of light. The doctor-patient relationship sometimes becomes an exhausting struggle. You have to be strong to be patient, but you also have to be strong to remain a doctor in these circumstances.

Beware, social networks!



David II Teniers (follower of):
The fortune teller 1650. MBA Nancy

Physician able to search



Hergé, Prof Tournesol, 1945
MUDAC. Lausanne,

Conflicts of interest: none

With the support of the Daniel de Conninck Fund, managed by the King Baudouin Foundation, Brussels, Belgium.

³ Shutzberg, M. (2021). The Doctor as Parent, Partner, Provider... or Comrade? Distribution of Power in Past and Present Models of the Doctor–Patient Relationship. *Health Care Analysis*, 29(3), 231-248.

⁴ Jamouille, M. (21 août 2021). Quaternary prevention and global warming. Paper presented at the 7th Ibero-American Congress of Family Medicine, on line, Brazil. <https://hdl.handle.net/2268/262531>

Content

A message from the WHO	2
Epidemiology of Long covid by François Goehringer	2
The Long Covid Care Pathway by Jérôme Larché	3
Posters	4
Commented poster : Coordinated pathway in RENNES	4
Poster; Care pathway in private practice, Charleroi, Belgium	4
Commented poster; SYMPOCOV cohort	4
Commented poster: Predictive factors for improvement. Hotel Dieu, Paris	5
Poster; Osteopathy and respiratory symptoms of Long covid, the COVOSTEO study	5
A patient's intervention	6
Covid Long and psycho-cognitive disorders by Lucie Hope	6
Neuroimaging by Dr Guedj	7
Dysautonomia during Long covid by JC Deharo	7
Covid-Long and biomarkers	8
Poster; antiphospholipid antibodies; Muller et al. APHP Marseille	8
Poster; Transcriptomics and Long Covid (Van Weyenbergh et al)	8
Long COVID and ventilation mechanics	8
The physical therapy of the Long Covid	9
Covid long pediatric	9
Rehabilitations in the Long Covid	10
Intestinal dysbiosis and SAMA (online)	11
Patient testimonials	12
Video of a physician patient	12
The mother of a teenager is then invited to the podium	12
Patient involvement: progress and difficulties	12
Health insurance support system	13
Final presentation by Dr. Salmon	14
Personal conclusion	16