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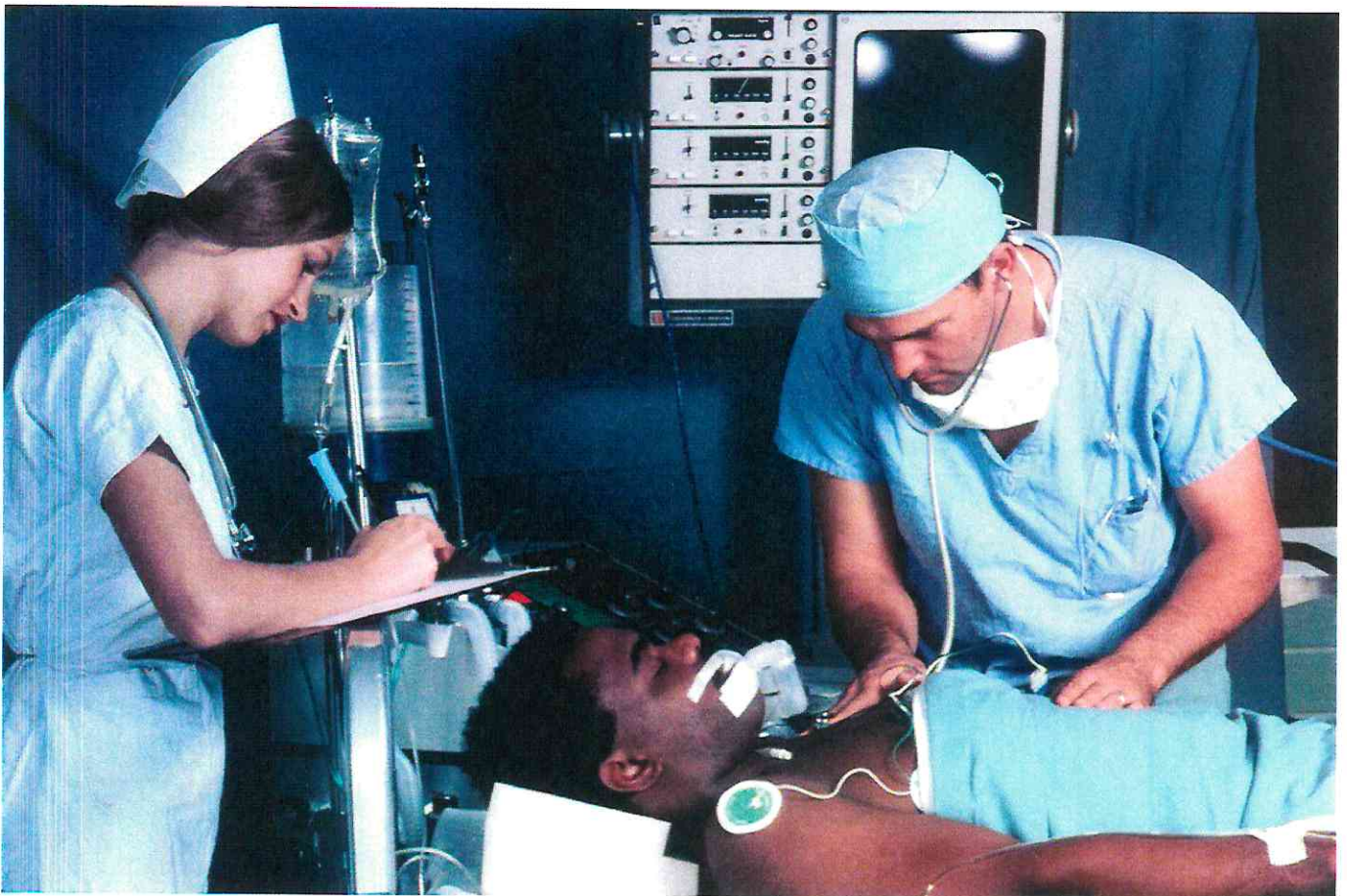
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Evidence showing biological disturbance in Long-Haulers



Tomás Schmauck Dec 22, 2020 · 3 min read ★

It wouldn't be surprising to anyone with Long-COVID (chronic-COVID, etc) the fact that most (if not all) their examinations come fine, which tends to create an important disbelieve by the medical community. In addition, not knowing what is not right makes it harder to find a solution.

Luckily for Long-Haulers, scientists at IncellDx seem to have found blood markers that show biological disturbance in Long Haulers (see paper [here](#)). Furthermore, they have developed a Long Hauler Index algorithm. This algorithm when training was capable of predicting with 97% precision who is a severe case of COVID-19, a long hauler and a non-severe-non-long hauler. After, in the testing split, this predictor was 100% precise with a 100% recall.

In summary, the paper has identified the following markers:

1. **Interleukin-2** is significantly elevated in Long-Covid. This is a type of cytokine signaling molecule that regulates the activity of white blood cells.
2. **Interleukin-4** is significantly elevated in Long-Covid. This is a cytokine (produced by mast cells) that induces differentiation of naive helper T cells
3. **CCL3** is significantly elevated in Long-Covid. This is a chemokine involved in the acute inflammatory state. It also recruits and activates polymorphonuclear leukocytes.
4. **Interleukin-6** is significantly elevated in Long-Covid. This is a type of cytokine (secreted by macrophages) that stimulates the production of neutrophils in the bone marrow.
5. **Interleukin-10** is significantly elevated in Long-Covid.
6. **IFN γ** is significantly elevated in Long-Covid. This is a type of cytokine produced by NK and NKT cells as immune response.
7. **VEGF** is significantly elevated in Long-Covid. This protein stimulates the formation of blood vessels.
8. **GM-CSF** is significantly decreased in Long-Covid. Cytokine that promotes neutrophil proliferation and maturation.

9. CCL4 is significantly decreased in Long-Covid.

In addition, there were 3 extra findings:

- There was no evidence of T-cell exhaustion.
- Long Haulers, mild and severe cases all show elevated CCL5 (RANTES).
- B-cells, CD14+ and CD16+ monocytic subset were significantly elevated.

The pre-print of the paper can be found [here](#). I recommend reading it for further clarification.

This opens a bigger door for scientist to target this issues with appropriate treatment. In addition, Dr. Bruce Patterson (first author of the paper) in a recent interview (where he talks about the research) has emphasized the following:

“To all the Long Haulers out there, I’m very very hopeful, I have no doubt... There is a lot of doubts I have in medicine but this isn’t one of them. I think this is going to be treatable. I think this is going to be a situation where you can get back to where you were. How long it’s gonna take will depend on the appropriate therapies...” (See the interview [here](#), the quote is from 01:10:05).

Follow me on Twitter ([@tschmauck](#)), I will be posting posts in English regarding COVID-19 from now on.

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