Instituto Universitario de Investigación
Biocomputación y Física de Sistemas Complejos
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Networks Virology. Learning from SARS-CoV-2

Viruses are reproductive machineries formed mainly by genetic material (RNA or DNA) and proteins. In general, these proteins interact with specific proteins of the host forming vast networks of virus-host protein-protein interactions (PPI). Although a virus may infect mainly an organ or system of the host, the damages can propagate beyond it, transforming the affection into a multiorganic/multifunctional one. This is the case of SARS-CoV-2, which makes COVID-19 a multiorganic disease affecting a dozen of organs/systems in humans. Here, I develop the hypothesis based on facts that this propagation of extrapulmonary damages takes place via the PPI network of virus-host interactions. It considers that some viral proteins interact with specific human proteins highly expressed in the lungs. Then, these perturbed human proteins navigate outside the lungs via an exosome-mediated transport network, which allows the inter-organ cross-talk. Due to the fact that these "perturbated" proteins interact with their partners in other organs they are capable to transmit such perturbations beyond the lungs. Therefore, there is a network of perturbators from the lungs interacting with a network of vulnerable proteins in other organs, which trigger a range of damages in them. We identify here the perturbators and vulnerable proteins in COVID-19, identifying 13 organs/systems that may be affected by the infection of SARS-CoV-2 and explain some of the extrapulmonary damages observed in clinics. We propose a series of drugs that can be repurposed to treat combinations of these damages in COVID-19 patients. Finally, at a lower size-scale we zoom on these SARS-CoV-2 proteins to investigate their topological structure, which form other networks of amino-acids interacting noncovalently among them. Using these techniques we are able to identify weak pints in such proteins that can be used as pharmacological targets.

***DIA Y HORA:* 16 DE ABRIL A LAS 12:30**

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