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To: Sundhedsministeriet, Sundhedsstyrelsen og Statens Serum Institut
cc: Arbejdsgruppen for Tg v/FVST
cc: **Whom it may concern.**

Re: Covid/Toxoplasmosis correlations

1. Summary:

The symptoms reported for Covid-19 are very similar to those of “Acute Toxoplasmosis”. The observed age distribution in serious Covid-induced incidents matches that of Toxoplasma. Successful Covid treatments has shown to also be effective against Toxoplasmosis.

This leads to the conjecture that Covid and Toxoplasma could interact in terms of **comorbidity**.

- There is an overlap of symptoms in both light and severe cases of Covid/Toxoplasmosis.
- The **age distribution of severe symptoms corresponds with that of Toxoplasma infections** among the population.
 - In the scientific community it is a recognized “problem” that Corona almost does not affect children and young adults. If there is comorbidity with Toxoplasma infection this could explain it.
- The critical brain and CNS related symptoms in Toxoplasmosis is seen reported as Covid symptoms too.
- Successful attempts to cure Covid has been done with medication that also is detrimental to the Toxoplasma parasite.

2. Toxoplasma background

Billions of adults all over the world have a so-called “latent infection” with Toxoplasma gondii (a single celled parasite). In China and the West, this infection is present in at least 25% of the population.

Over time, the latent infection spreads to the **brain, heart, lungs** and **muscle tissue** in the form of cysts – so the longer a person has had the infection, the more it will have spread throughout the body.

It is estimated that the infection rate – as a rule of thumb – follows your age, i.e if you are 20 years old the probability of being infected is 20%, if you are 70 years old the probability is 70%. The distribution of the parasite in the body is usually orders of magnitude larger in a 70-year-old than in a 20-year-old.

If the immune system is challenged – this infection can go from “latent” to “acute” and enter the stage of *Toxoplasmosis*. It will initially show symptoms as dry cough, fever, headache and flu-like symptoms. If it develops further it can trigger pneumonia and Acute Respiratory Distress Syndrome (ARDS), seizures, cardiac arrest and various central nervous system (CNS) disturbances, including encephalitis (inflammation of the brain). Toxoplasmosis has an incubation time of 14-20 days.

Toxoplasmosis can be treated and 100% cured once the diagnosis is made.

3. Comparison of symptoms.

Symptom	Covid	Acute toxoplasmosis
Fever, dry cough, fatigue	Yes	Yes
Influenza like symptoms	Yes	Yes
Shortness of breath	Yes	Yes
ARDS	Yes	Yes
Pneumonia	Yes: “Histological examination showed bilateral diffuse alveolar damage (...) Interstitial mononuclear inflammatory infiltrates dominated by lymphocytes, were seen in both lungs”	Yes: Toxoplasmic pneumonia has been classically associated with bilateral interstitial pulmonary infiltrates
Seizure	Yes	Yes
“Ground-glass opacities” in the lungs	Yes	Yes
Leukocytosis	Yes (at least 30%)	Yes
Lymphocytosis	Yes (at least 66%)	Yes
Neurological disturbances	Yes: "Compared with non-severe patients with COVID-19, severe patients commonly had neurologic symptoms manifested as acute cerebrovascular diseases , consciousness impairment and skeletal muscle symptoms."	Yes: "Patients with cerebral toxoplasmosis mimicking an acute cerebrovascular accident or a brain tumor are particularly frequent." "The patients had marked lymphopenia, fever, diffuse encephalitis, pneumonia, pancytopenia, and myopathy. Muscle involvement; included weakness and wasting, myalgias" ...i.e skeletal muscle symptoms.
Myopathy	Yes	Yes
Lymphadenopathy	Yes	Yes

Symptom	Covid	Acute toxoplasmosis
Arthralgias	Yes	Yes
Mental disturbances	Yes: "Relationship of incidence of schizophrenia and COVID-19 infections in China was calculated. Our data supported that COVID-19 outbreak increased risk of schizophrenia in aged adults."	Yes. If Toxoplasma is being causally correlated to anything, it's schizophrenia.
Can penetrate the brain-blood-barrier in a known fashion	Unknown	Yes
General lung problems	Yes	Yes. Also note that Toxoplasma has ben found in 100% of lung-cancer lung-samples.

4. Comparison of treatments that has been successfully tested on Covid-19

There also are interesting overlaps in the treatments administered for Covid, and the same treatments effects on Toxoplasmosis.

Covid medication/treatment	Effective against Toxoplasma?
Several Covid patients have been successfully treated " Lopinavir/ritonavir "	Yes, very: "Lopinavir/ritonavir caused parasitological improvement in acute toxoplasmosis. Both forms prevented the egress of the tachyzoites, led to apoptosis and autophagy (..), disruption of the parasitophorous vacuole and the nanotubular network."
Several studies suggest that Vitamin D reduces risk for Covid	".. Toxoplasma infection was associated with vitamin D deficiency."
Special note: FURIN . Furin plays an important role in Covid	"Proprotein convertase FURIN constrains Th2 differentiation and is critical for host resistance against Toxoplasma gondii"

5. Other noteworthy observations on Covid-19

- ACE2 receptors (that are critical for infection) are up to 5 times as prevalent in people of Asian origins. The available data on incidents, mortality etc. supports this.

- Nicotine is an effective ACE2 inhibitor. Also recent data shows that only 4% of the severe cases were among smokers, even though some 60% of the Chinese males are smokers. Nicotine is known as a Toxoplasma antagonist too.