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Short Commentary

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The Temptation of St. Anthony: Fighting against an Invisible Enemy in Times of Corona

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The function of the immune system is to offer protection against infections. Most of these micro-organisms are invisible with the naked eye, so the immune system is fighting against an invisible enemy. A strategy which can be used when fighting against an invisible enemy is first to protect yourself and at the same time being constantly on the attack. This strategy is visualized by Jheronimus Bosch in the painting "The Temptation of Saint Antony". An unknown figure on the lower left side of the painting is waving his sword and holding his shield, while being protected and hidden in a large metal funnel (Figure 1). On the other side of the river, Saint Antony himself is totally focused inwards, quietly scooping water in his jar. He obviously is unaware of the potential thread of invisible enemies.

Figure 1: The Temptation of Saint Anthony (1500-1510) by Jheronimus Bosch. The Nelson-Atkins Museum of Art, Kansas City, USA. https://commons.wikimedia.org/wiki/File:The_temptation_of_Saint_Anthony,_by_Jheronimus_Bosch_(Kansas).jpg Assessed March 20, 2020.

The current invisible enemy that has caused a pandemic is SARS-CoV-2. Most members of the corona virus family are rather innocent, causing milder versions of the common cold. Virtually all immune systems have no problem fighting of those corona viruses, hospital admission seldomly is needed, let alone intensive care. However, SARS, MERS, and now SARS-CoV-2 have learned that the large corona family also harbors ugly members [1-3]. SARS-CoV (severe acute respiratory syndrome coronavirus) broke out in November 2002 infected approximately 8000 patients with 744 deaths (case fatality rate 10%). Middle east respiratory syndrome coronavirus (MERS-CoV) which broke out in June 2012 had a higher case fatality rate of 37% (2500 patients, 858 deaths). Both outbreaks were more or less self-contained. With the current SARS-CoV-2 the situation is different. At the moment of writing (20 March 2020) this Coronavirus Disease 19 (COVID-19) has been officially declared a pandemic, and has 252,819 cases worldwide with 10,405 deaths (https://www.worldometers.info/coronavirus/). Also at the moment of writing, there is no effective treatment of the infection (yet) [4-8] and no vaccine (yet) [9,10]. Positive cases of COVID-19 definitely need hospital admission along with isolation and individual care. The supportive care of patients should allow the immune system to clear the infection.

While it is clear that the decisive factor for survival of COVID-19 is the functionality of the immune system, it is unknown what constitutes a protective immune response to SARS-CoV-2. There are indications that innate defense mechanisms could contribute to protection against the new corona virus. Innate immunity can be trained by BCG vaccination [11,12], and based on that principle a study has been started in hospital personnel in Nijmegen and Utrecht, The Netherlands on the protective effect of BCG vaccination. Whether specific antibodies to the corona spike protein would be sufficient or cytotoxic T lymphocytes

would be needed also is unknown at the moment. Yet answers to these questions are fundamental in order to be able to develop an effective vaccine [13]. Fundamental immunological questions indeed, urgently waiting for meaningful answers.

Although the current corona virus most probably originated from bats [14], the epidemiological association is that with a wet fish market [14,15]. As a consequence, the Chinese government now has imposed a ban on consumption of wild animal species. This ban includes eating frog and soft-shelled turtle. All these species are depicted as the invisible enemies in the 'Temptation of St. Antony" (Figure 1), underscoring the visionary talents of Jheronimus Bosch. The chicken and other bird species in the painting are potential sources of novel strains of viruses, in particular influenza virus. First things first, for now target the corona and then start to prepare for influenza.

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