Mathematical Modelling and Data Prediction in Infectious diseases Spread and COVID-19

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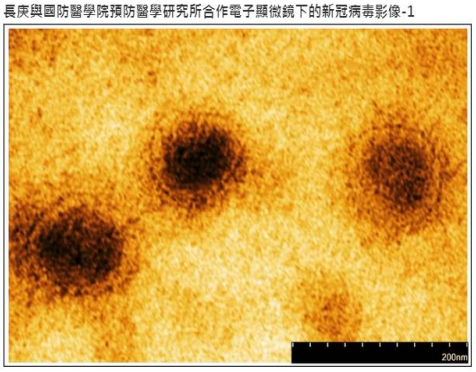

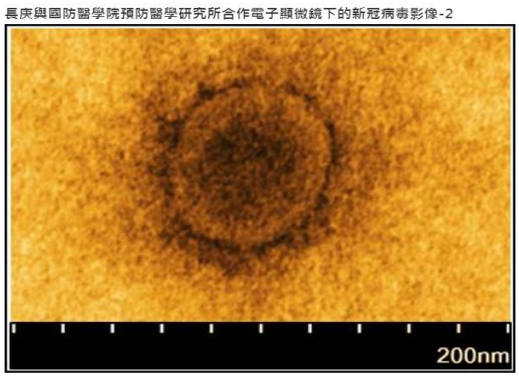

By applying mathematical models, we can usually analyze the spread of infectious diseases among populations. In this studying short course, we plan to work and discuss the topic about the mathematical modelling in infectious diseases spread.

Firstly, we refer [Herbert W. Hethcote, 2000] to quickly survey the concepts and threshold theorems involving the basic reproduction number, the contact number, and the replacement number for the classic, e.g., SIR/SIRD/SEIR, epidemic and endemic models.

Secondly, we divide the proposed models into 2 classes of infective persons, one is the symptomatic infectives with clinical symptoms and the other is the asymptomatic infectives with no or minor (subclinical) symptoms. The impact of asymptomatic cases on the severity of outbreak was explored using simulation studies. Stilianakis et al. (1998) first proposed to include the asymptomatic infectives in a standard SARS model to investigate treatment and chemoprophylaxis strategies and their effects on the spread of the infection. However, the investigating role of asymptomatic infection on the overall transmission dynamics of influenza was analytically explored by Hsu and Hsieh (2008).

Finally, we will apply above mathematical modelling and knowledges in infectious diseases spread to work on the recent diseases problem. Since the emergence of the first pneumonia cases in Wuhan, China, the novel coronavirus disease (COVID-19) has been quickly spreading out to all countries in the word. The outbreak of COVID-19 brought considerable turmoil all around the world. Applying above studies and techniques, we first estimate the basic reproduction number by means of the related mathematical modelling. This is helpful for determining the potential and severity of an outbreak, and providing critical information for identifying the type of disease interventions and intensity. Furthermore, we will also conduct the related

mathematical and numerical recovering analyses to address and detect the infectious diseases spread of COVID-19.