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**THE USE OF CURVE-FITTING IN MATLAB FOR FINDING THE MAIN PARAMETERS OF THE COMPARTMENT MODEL OF EPIDEMICS**

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Compartmental models are used to predict a worldwide spread of infection and declaration of a pandemic. For such cases, researchers use the SIR model. It was used when the outbreak of Ebola virus had happened. It started in Guinea and then spread across land borders to Sierra Leone and Liberia. The epidemiology data were analyzed, and processed using the SIR model.

The SIR compartmental model is based on three linear differential equations with two main parameters β (t) and γ (t) for three chambers or categories of people:

$$\frac{dS}{dt} = -\beta IS, \qquad \frac{dI}{dt} = \beta IS - \gamma I, \quad \frac{dR}{dt} = \gamma I,$$

where S (t) - susceptible to infection people, I (t) – infected ones, R (t) – recovered ones.

Modeling the dynamics of infectious diseases requires to determine whether the spread of the disease can reach epidemic levels or can be gradually eradicated. According to the SIR model, the slowdown in epidemics occurred after the number of infected people reaches its peak. The theoretical model of SIR allows predicting the results of epidemics and the factors that determine its severity.

The physical meaning of β (t) is the number of contacts during which the infection gets transmitted per person per unit time. By reducing the coefficient β by various anti-epidemiological measures, we can reduce the rate of spread of infection

The physical meaning of γ (t) is the share of infected people who have recovered per unit time. It demonstrates how effective the treatment of the infected is.

The development and course of the epidemic depends on these two factors. From the equations it is seen that in the case when $\beta S(t) < \gamma$, then $dI/dt < 0$ and the epidemic dies off on its own. If $\beta S(t) > \gamma$, then $dI/dt > 0$ and the number of the infected people increases dramatically. This leads to a rapid spread of the epidemic. Thus, the way to limit the epidemic may include immunization, which leads to a decrease in the number of susceptible to infection S (t), or a decrease in the coefficient β (t), i.e. the rate of transmission from one person to another. The latter can be achieved through quarantine, lockdown, promotion of disinfection culture.

The values of the parameters β (t) and γ (t) can be determined on the basis of statistical data obtained for three categories of people. The collected data are stochastic in nature and are characterized by strong variability. To more accurately determine the parameters of the chamber model, we used the utility Curve Fitting software environment MATLAB (Mathworks, MA, USA) to determine the analytical function that describes this data set. Having determined the analytical function that most accurately describes the statistics, it is possible to estimate the values of parameters β(t) and γ (t) during a certain period of the epidemic. For example at the beginning of quarantine and accordingly at the end of it. This analysis allows us assessing the effectiveness of anti-epidemiological measures.

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**NANOTECHNOLOGIES - HEALTH HAZARDS**

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Identification and unification of the properties of most nanomaterials (NMs) clearly outlined the area of their application. Exceptional properties of nanoparticles (NPs) have become the driving force of their widespread use in the biomedical field. High photostability, significant quantum yield and absorption coefficient in a wide spectral range allowed to obtain molecular imaging (e.g., NP can be used as probesin vivo by their attach to molecules of proteins, antibodies and nucleic acids; NP can be used as an instrument of evaluation of molecular reactions in the body, etc.).