

Sugar Chain Modified Graphene FET for Detection of Virus

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Abstract

The avian influenza virus and the human influenza virus are selectively detected with high sensitivity using the sugar chain modified graphene FET.

The surface of the cell for human and avian is covered by the sugar chain. The structure of the sugar chain for human and avian which cover the cell has the difference at the end of their structures, i.e., for the human sugar chain, sialic acid is connected to the α 2-6 galactose, and for the avian sugar chain, to the α 2-3 galactose as shown in Fig. 1. Influenza virus recognize this structural difference and the human influenza virus connects to only to human sugar chain and avian influenza virus connects to only avian sugar chain, and there is no cross contamination. This is called as "the barrier of the species". When the avian flu virus changes its structure and get the human infection, it can connect both the avian and the human sugar chains. In order to selectively detect the human infection, the surface of graphene FET was modified by the human sugar chain which can selectively combine to the human virus and not combine to avian virus.

Figure 2 shows the selective detection of the human influenza virus. By increasing the concentration of human virus, human virus which has minus charge connects to the human sugar chain, and the shift of the Dirac point of the graphene FET increases. At the concentration of virus up to 256HAU, the shift of the Dirac point reaches as large as 44.3mV. On the other hand, avian

influenza virus could not connect to the human sugar chain and does not cause the Dirac point shift. Thus, we have succeeded in the selective detection of human type and avian type influenza virus by the sugar chain modified graphene FET.

Using the sugar chain modified graphene FET, we have succeeded in selectively detects the human infective influenza virus within 20 minutes.

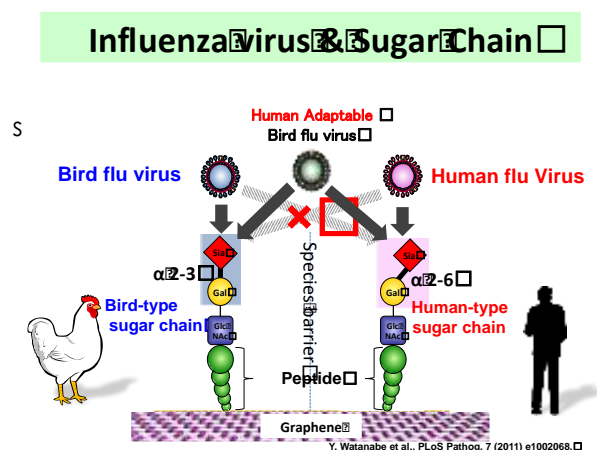


Figure 1: Relation between Avian & Human Flu virus and each sugar chain structures.

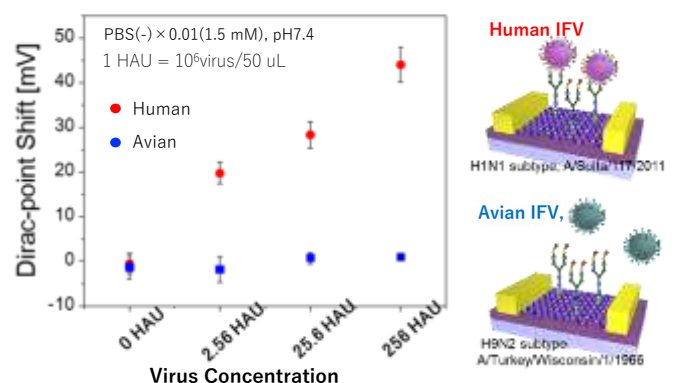


Figure 2: Dependence of Dirac point shift on concentration of human & avian virus.