Wind Effects on the Spread of the SARS Virus at the Amoy Gardens

Lam Chi Hung Louis, Institute of Vocational Education

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ABSTRACT

On 17 April 2003, the Department of Health (DoH) of HKSAR published the report entitled "Outbreak of Severe Acute Respiratory Syndrome (SARS) at Amoy Gardens, Kowloon bay, Hong Kong - Main Findings of the Investigation".

Among all the observations described in the DoH report, the following ten are the most distinctive ones:

a) High concentration of cases in Block E (41% of cumulative total).
b) Cases in Block C (15%).
c) Cases in Block B (13%).
d) Cases in Block D (13%).
e) Cases among all the Unit 8 units of Block E (73%).
f) Cases among all the Unit 7 units of Block E (42%).
g) Floor 10 and above were more affected than the lower floors.
h) Block E cases appeared earlier in the outbreak and showed a point-source type of distribution.
i) Outbreak reached its peak on 24 March 2003 and declined steadily afterwards.
j) Cases in other Blocks which appeared 3 days later were more evenly spread out in time.

The 'bathroom exhaust fan' theory in the report could not fully explain all the observed facts on the distribution pattern of those units with infected residents with respect to their locations. The theory also could not explain why there was a delay of three days between the first batch of infected cases and the subsequent infected cases.

A more comprehensive theory/hypothesis based on wind movements and building aerodynamics is proposed in this paper to explain the observed findings and phenomena.

A very low-pressure region, in which the pressure was reducing progressively with height, was found to have existed in the gap between Block E and Block F when the wind was blowing at a particular angle to the buildings. Air in Unit 7 and Unit 8 residential units on different floors was sucked out from the units to the gap space. The pressure variation created a continuous upward flow of air in the soil pipe stack. The soil pipe stack then acted as a virus carrier production plant.

The wind flow pattern through the building group could also indicate that the spread of the virus from the first infected building (Block E) to the other three buildings (Blocks B, C and D) could have been due to contaminated and moistened dust particles carried by the wind.

Theoretically, under certain wind conditions, similar effects could happen to other buildings at other sites.