

## Health System for Dengue Control in Singapore

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**Abstract :** Dengue fever/dengue haemorrhagic fever (DF/DHF) first appeared in Singapore in an outbreak in 1960. In 1966, the Ministry of Health established the Vector Control Unit which was charged with the responsibility of controlling the dengue vector mosquitoes, *Aedes aegypti* and *Aedes albopictus*. The Unit immediately launched an *Aedes* control programme based on source reduction and public health education. To obtain reliable statistics on disease incidence, DF/DHF was made administratively notifiable in 1966, and finally, legally notifiable in 1977. It was also recognized early in the control programme that long-term and active participation by the community was essential for its implementation. A new legislation called the Destruction of Disease-Bearing Insects Act was thus enacted in 1968. The Act empowers vector control officers to enter and examine houses for mosquito breeding, to take appropriate control measures, and to serve offenders with orders and summonses which carry a fine or imprisonment by the court. With the new legislation in force, the *Aedes* control programme adopted an integrated approach of source reduction, public health education and law enforcement.

When the new Ministry of the Environment was formed in 1972 to take over the responsibility of environmental health, its Vector Control and Research Department and the Quarantine & Epidemiology Department became responsible for the surveillance and control of DF/DHF in the country.

Surveillance of disease incidence and *Aedes* vectors is important in the prevention and control of DF/DHF outbreaks. Disease surveillance is conducted by officers of the Quarantine & Epidemiology Department based on notifications on clinically diagnosed cases as well as on the number of blood specimens submitted by hospitals, clinics, and private practitioners to the Virology Division of the Department of Pathology in the Ministry of Health and the Department of Microbiology of the National University of Singapore for laboratory confirmation of dengue infection. *Aedes* surveillance depends on regular surveys of mosquito larvae and adults in designated DF/DHF-sensitive areas. In addition to destruction of breeding habitats, fogging is carried out when the *Aedes* house index is 2% and above, or when a potential outbreak situation arises such as the occurrence of a focus of two or more DF/DHF cases in an area.

## INTRODUCTION

Dengue fever/dengue haemorrhagic fever (DF/DHF) first appeared in Singapore in an outbreak in 1960. In 1966, the Ministry of Health established the Vector Control Unit which was charged with the responsibility of controlling the dengue vector mosquitoes, *Aedes aegypti* and *Aedes albopictus*. The Unit immediately launched an *Aedes* control programme based on source reduction and public health education. To obtain reliable statistics on disease incidence, DF/DHF was made administratively notifiable in 1966, and finally, legally notifiable in 1977. It was also recognized early in the control programme that long-term and active participation by the community was essential for its implementation. A new legislation called the Destruction of Disease-Bearing Insects Act was thus enacted in 1968. The Act empowers vector control officers to enter and examine houses for mosquito breeding, to take appropriate control measures, and to serve offenders with orders and summonses which carry a fine or imprisonment by the court. With the new legislation in force, the *Aedes* control programme adopted an integrated approach of source reduction, public health education and law enforcement.

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## EPIDEMIOLOGICAL INVESTIGATION

The epidemiological investigation of DF/DHF is undertaken by the Quarantine & Epidemiology Department. The department receives notification of cases, carries out investigation of each case and liaises with the Vector Control & Research Department in the control of the spread of the disease. In addition, the department publishes the results of its investigations in the Weekly Bulletin and the monthly Epidemiological News Bulletin for distribution to relevant personnel. The activities of the department are summarized in Figs. 1-3.

## ORGANIZATION OF VECTOR CONTROL

The organization of vector control has undergone several changes since the Vector Control and Research Department was established. These changes involved vector control responsibility and operations which could affect the implementation of the *Aedes* surveillance and control programme in the field.

Prior to February 1992, the responsibility of vector control was under the charge of two departments, namely, the Environmental Health Department (EHD) and the Vector Control & Research Department (VCRD). Vector control operations belonged to EHD

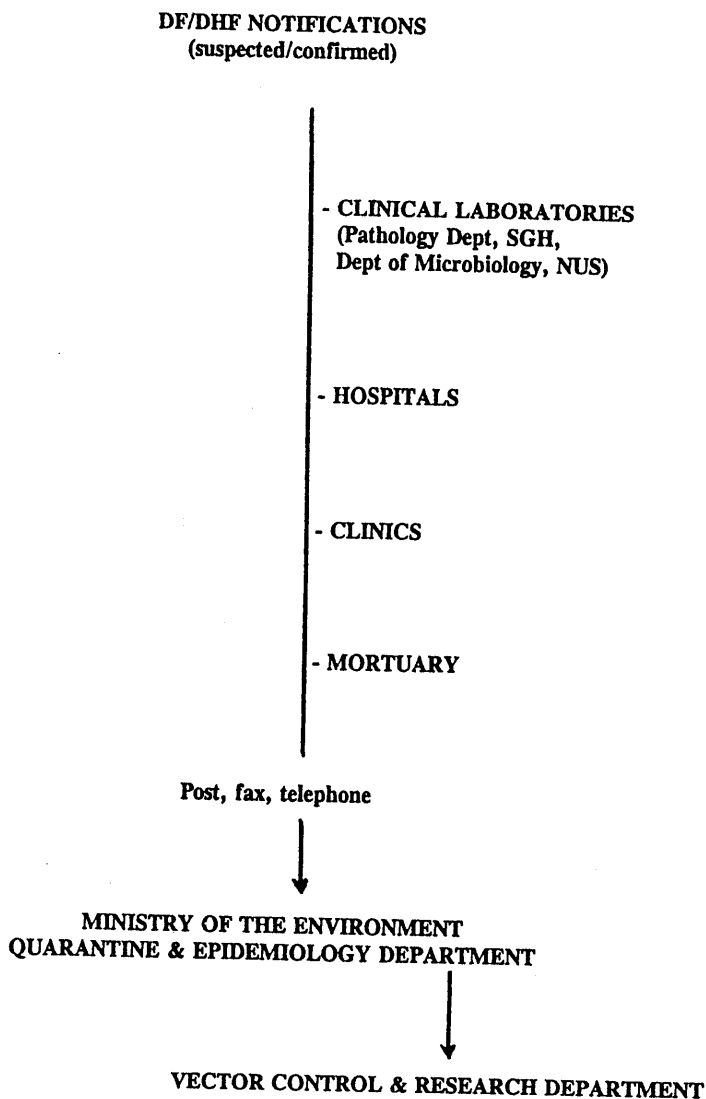


Fig. 1. DF/DHF notification system in the Quarantine and Epidemiology Department

while VCRD was relegated the role of planning, advisory and research. The activities of VCRD included providing guidelines on operations, control methods, insecticides and type of equipment used. In addition, the department also monitored the *Aedes* situation through fixed-interval surveillance as well as counter checked vector control operations performed by EHD (Fig. 4).

The EHD, which had seven offices located in different parts of the island, was responsible for the daily vector control operations. One senior officer in each office was in charge of both vector control and sanitation services.

**QUARANTINE & EPIDEMIOLOGY DEPARTMENT**

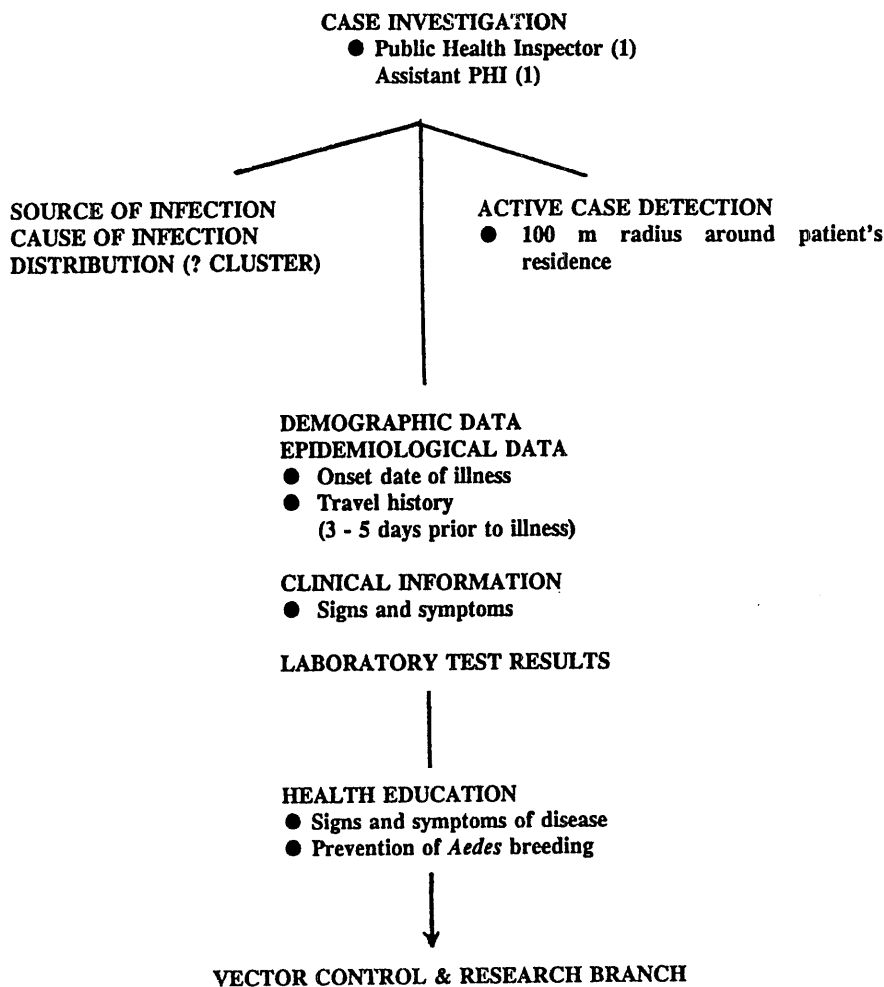


Fig. 2. Case investigation system in the Quarantine and Epidemiology Department

Under this structural organization, two separate departments were involved in vector control activities with separate channels of communication and lines of command. VCRD had no control over activities on the ground while vector control did not receive high priority from EHD which also had other functions. Furthermore, the staff in each office was responsible for all aspects related to vectors in their assigned area with the consequence that almost the entire daily operations were directed at investigation of complaints from the public as this was considered as the most sensitive area by the department.

Following the consecutive DF/DHF outbreaks from 1989 to 1992, the situation was rectified in 1992 and vector control became the sole responsibility of VCRD which now

**DISSEMINATION OF INFORMATION  
(Quarantine & Epidemiology Department)**

**WEEKLY BULLETIN**

- Incidence at end of each week compared with that in previous year
- Distribution to key personnel in Ministries of the Environment and Health

**EPIDEMIOLOGICAL NEWS BULLETIN (monthly)**

- Incidence at the end of each month compared with that in previous year
- Medical practitioners  
Overseas centres and institutions

Fig. 3. Dissemination of information by the Quarantine and Epidemiology Department

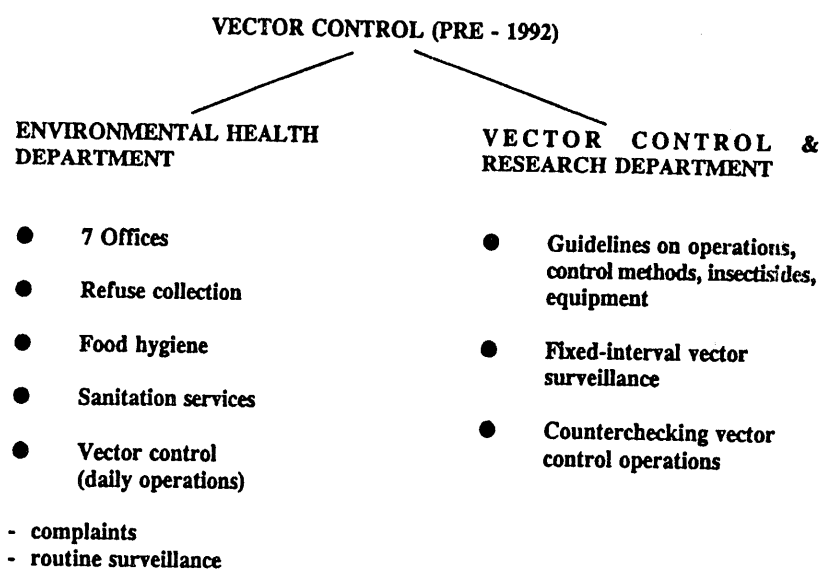


Fig. 4. Organization of Vector Control before 1992

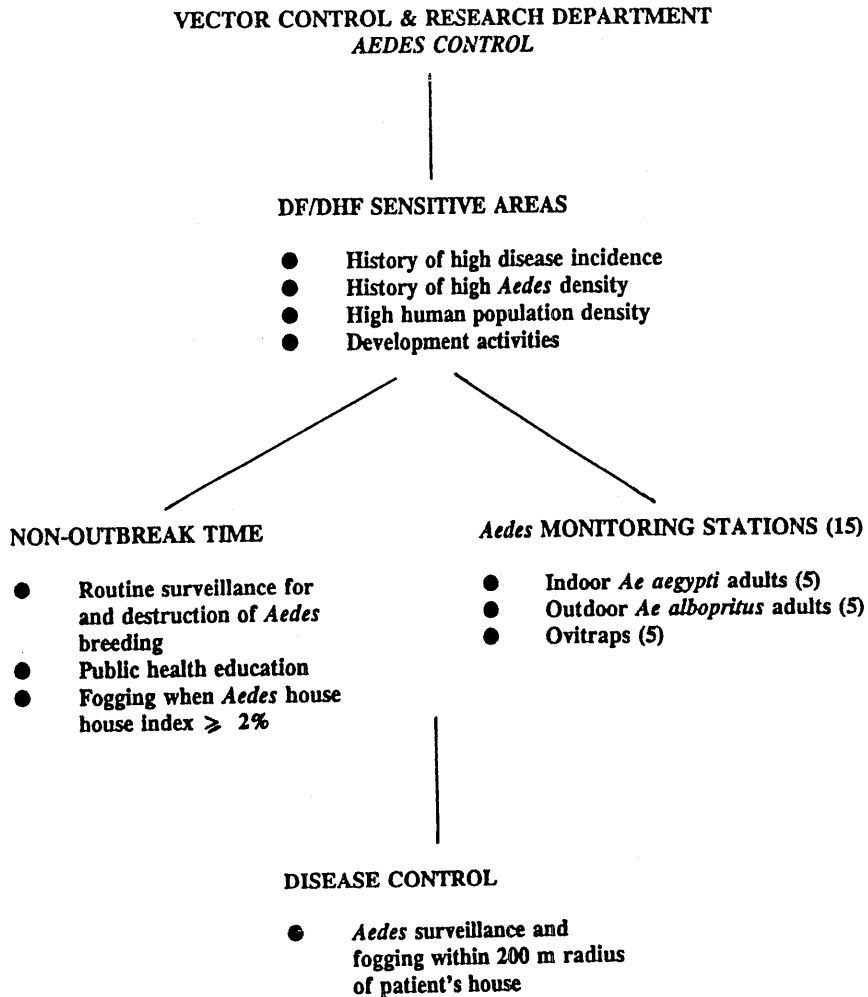


Fig. 5. Activities of Vector Control and Research Department

oversees planning as well as operations on the ground. Staff are now deployed to take charge of the different duties which include complaint investigation, routine, surveillance for DF/DHF prevention, disease control, anti-malarial drain maintenance and fogging.

For *Aedes* control, certain areas of Singapore have been identified as DF/DHF-sensitive areas. These areas were selected on the basis of a history of high disease incidence, high *Aedes* mosquito density and human population and presence of development activities conducive to the creation of potential *Aedes* breeding sites. The *Aedes* control activities carried out by VCRD are summarized in Fig. 5.