GUIDELINES
FOR SURVEILLANCE OF DENGUE FEVER
in the French Departments of America

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Martinique, Guadeloupe, Guyane

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CONTENTS

FOREWORD

Dengue is considered to be an emerging disease with a growing geographical distribution and increasing severity in all tropical and sub-tropical regions of the world.

Up to recently, the Caribbean region was spared from severe forms of the disease. It was not until the 1980s that the first cases of Dengue haemorrhagic fever were reported. After deadly epidemics occurred in Cuba in 1981, in Venezuela in 1989 and 1990, they were outbreaks in the French Departments of America (FDA) : Guyane in 1991 and in Guadeloupe and Martinique in 1994 and 1995.

In 1997, there was very serious Dengue epidemic wich caused nine deaths in Martinique. The French Ministry of Health thus decided to conduct an evaluation of the operating entomological and epidemiological surveillance systems in the French Antilles and Guyane.

The results of these evaluations[1] led to discussions among about forty experts who met in a workshop on June 8-10, 1998 at Fort-de-France in response to an initiative taken by the Antilles-Guyane Regional Epidemiology Unit (CIRE) and the National Institute for Public Health Surveillance (InVS).

The aim of the exercise was to establish procedures wich would be used as guidelines in the future.

[1] Guillet P. – Report on expert mission on the fight against Dengue vectors in Martinique and Guadeloupe (5 - 18/ 10/1997) ORSTOM, Laboratoire de lutte contre les infections nuisibles. Rapport de mission, novembre 1997. Chaud P., Blateau A., Decludt B. – Les systèmes de surveillance épidémiologique de la Dengue dans les Départements Français d'Amérique – Etat des lieux – Propositions. Cellule Interrégionale d'Épidémiologie Antilles Guyane. Réseau National de Santé Publique, mai 1998.

1. Introduction

Dengue is an endemic epidemic disease caused by an arbovirus transmitted by a mosquito of the genus *Aedes* (*Aedes aegypti* in the Caribbean). It is the most common arboviral disease. There are 4 diffrent types of the Dengue virus (DEN-1, DEN-2, DEN-3, DEN-4). The 4 types are antigenically related but do not produce immunological cross reactions; so a given individual can be successively infected by different serotypes. Humans constitute the principal natural reservoir for the Dengue virus and are the natural disseminators of the disease. Clinically, Dengue can occur as a benign disease and follow a self-limiting course lasting a few days, or follows a more severe course in the form of life-threatening Dengue haemorrhagic fever.

Dengue has become a major public health problem in tropical countries. An estimated 2.5 billion persons are exposed to the disease, although reports tends to underestimate the actual incidence. Statistics show that 80 million people are infected annually and that more than 30,000 deaths [1,2] can be attributed to Dengue each year.

The disease is spreading at an alarming rate. The number of reported cases has risen constantly over the last forty years. In the last 15 years, more severe cases of Dengue Haemorrhagic Fever [DHF] or Dengue Shock Syndrome [DSS] have been observed in Southeast Asia, Northern South America and the Caribbean [3].

In the 1950s and 1960s the Pan American Health Organization (PAHO) carried out eradication programmes against *Aedes aegypti* in most countries on the American continent. A major reduction in Dengue cases was achieved in the region with an almost total eradication in some countries [4,5].

From the 1970s, the interruption of the eradication program and the development of international travel, together with rapidly changing lifestyles (poorly-controlled or uncontrolled urbanization, excessive amounts of non-degradable wastes creating breeding sites for *Aedes aegypti*) contributed to increase the number of Dengue outbreaks [6].

They were few sporadic cases reported in Puerto Rico in 1975. This was followed by Dengue Haemorrhagic Fever (DHF) in the Caribbean with outbreaks in Cuba in 1981 (344,203 cases including 10,312 DHF cases and 158 deaths) and in Venezuela (4,025 cases in 1989, 10,962 cases in 1990 and 30,000 cases in 1995) [4,7,8].

Dengue Haemorrhagic Fever (DHF) recently appeared in the French Departments of America (FDA), first in Guyane in 1991-1992 (832 cases including 40 cases of DHF and 6 deaths) [9,10], then in Guadeloupe and in Martinique in 1994 and 1995 [11,12]. With the appearance of severe forms of the disease, the number of positive serologic tests has steadily increased [13,14].

A huge outbreak occurred in Martinique early in July 1997 (1,296 positive serologies in 1997 *versus* 334 in 1996, 365 in 1995 and a mean 70 per year up through 1994). The French health authorities (DDASS, Direction Départementale des Affaires Sanitaries et Sociales) attributed the cause of death to Dengue in 9 persons [15] while only one death was reported in 1995 and 1996 [12]. The serotype identified during this outbreak was DEN-1.

Only three of the four virus serotypes (DEN-1, DEN-2 and DEN-4) have circulated in the Caribbean during the last twenty years [4]. The entry of DEN-3, endemic in some

countries in Central America and identified in Puerto Rico in February 1998, can be expected to reach the French Departments of America [15,16,17]. If the population is not immunized, an epidemic of Dengue Haemorrhagic Fever threatens the French Departments of America in the upcoming years.

Some authors consider that the evolution of Dengue in America since the 1980s has been similar to its evolution in Asia in the 1960s. If the disease pattern continues to evolve as it did in Southeast Asia, more frequent and widespread epidemics of DHF can be expected in the Americas [6,18] (Gubbler, 1993).

Currently, no vaccine or treatment is effective against the virus. Disease control thus depends only on controlling the vector, it requires renewed efforts by both specialists and the local communities.

The only way to avoid the development of severe forms of the disease and subsequent deaths is to maintain Dengue at the lowest possible level of emergence by reducing the *Aedes aegypti* population.

Effective epidemiological surveillance of Dengue is crucial to disease control. Besides contributing to better knowledge of the natural history of the disease and opening new ways of research, epidemiological surveillance should activate vector control programmes and guide their implementation and evaluation [3].

Entomological surveillance must be an integral part of the epidemiological surveillance of Dengue [8,14,19].

Following the epidemic in Martinique in 1997, the general directorate of the French health authorities (DGS, Direction Générale de la Santé) requested the National Institute for Public Health Surveillance (InVS), in collaboration with the Antilles-Guyane Regional Epidemiology Unit (CIRE) to evaluate current modalities of epidemiological surveillance of Dengue in the 3 French Departments of America and also to make proposals for improvement [20].

The goal of this evaluation was to assess the currently operating epidemiological surveillance systems for Dengue in Martinique, Guadeloupe and Guyane, and to make proposals aimed at improving data collection and analysis. Harmonization of the systems in the 3 French Departments of America and neighboring countries, in cooperation with the Caribbean Epidemiology Centre (CAREC) or the Centers for Disease Control (CDC) under the guidance of the Pan American Health Oganization (PAHO), was also a goal.

In October 1997, an expert mandated by the French Health Authorities (DGS) performed a more specific evaluation of the epidemiological surveillance and vector control programs in Martinique and Guadeloupe [21]. The same process will be done in Guyane.

2. Background evaluations

Globally, the two evaluations came to the same conclusions: major efforts have been made and numerous and diversified actions have been carried out, but the lack of coordination or concerted action has prevented the systems from being fully effective.

The principal findings easily fall into two categories: strong points and weak points.

2.1 Strong points

• A growing number of partners (public health physicians, directors of medical laboratories, epidemiologists, public health decision makers…) are increasingly interested in developing and coordinating efforts for an effective surveillance system for Dengue. Because of the recent outbreaks of Dengue Haemorrhagic Fever in the French Departments and the number of deaths they caused, public health professionals recognize Dengue as a priority public health problem and are aware of the need for a reliable surveillance system to provide information, indispensable for effective control.

• Centralized serology tests: The Pasteur Institutes in Guadeloupe and Guyane and the Martinique Departmental Laboratory of Hygiene (DLH) are the only laboratories performing Dengue serologies, which allows for easier access to data.

• Centralized follow-up of viral strains: The Cayenne Pasteur Institute, National Reference Center for Dengue and Arbovirus Diseases, do the serotyping for the three departments. Either viral isolation or RT-PCR techniques are used.

• The Physician Based Sentinel Surveillance System [PBSS] in Guadeloupe and Martinique, coordinated by the Service of Sanitary Actions of the DDASS, currently in the development stage, which reports cases of Flu and Dengue.

2.2 Weak points

• Insufficient reaction : Because of the lack of a vaccine or a specific treatment for Dengue, only preventive measures can be used for disease control. Those who participates in the system must be able to react rapidly to case reports. A highly reactive surveillance system is thus required. However the evaluations conducted show that, depending on the departments and the systems, Mosquito Control Units receive information up to 60 days after events occur.

• Representativeness of surveillance data is unknown: The available data on serology follow-up only concerns a small portion of the population for three principal reasons: a physician is not called in all cases. Most physicians do not prescribe serology tests. Patients do not necessarily have prescribed tests done or tests are done too early. In addition, the representativeness of the physicians participating in the PBSS has not been evaluated.

• Poorly adapted serology management: Excepting specific cases, serology tests have no direct impact on the patient. However, the contribution of serology tests is crucial from an epidemiological point of view. Inscription of Dengue serology tests on the nomenclature of laboratory tests might lead physicians to prescribe fewer and fewer tests and, when tests are prescribed, to prescribe them only for patients with

national health insurance and mutual fund coverage, thus leading to an additional selection bias for available data.

• Lack of formalized practices: Except for a few locally established rules governing particular aspects of surveillance (reporting cases of Dengue Haemorrhagic Fever in Guadeloupe for example), no formal objectives have been established, and no alert procedures or protocols have been defined. This makes the system much less reactive, limiting coordination between partners and incourage total disorganization when partners change, consequently reducing the effectiveness of the actions undertaken.

• A surveillance system poorly structured for Dengue Haemorrhagic Fever: Physicians do not report even some of the most severe cases of Dengue to the health authorities. A system for collecting data on cases of Dengue hemorrhagic fever operates only in Guadeloupe. This insufficiency in the follow-up of severe forms of Dengue probably leads to under-reporting and limits early mosquito control efforts.

• Restrictiveness of the case definition of DHF, WHO case definition requires tests rarely requested in hospital units, the course of the hematocrit is rarely followed and the tourniquet sign is never done.

The severity of "true" cases remain undiagnosed. In addition, practitioners have observed that all fatal severe forms do not respect all the definition criteria for Dengue Haemorrhagic Fever. These cases are not taken into consideration in the public health data.

3. Methods used

During the CIRE evaluation, it rapidly became apparent that to improve the efficacy of Dengue surveillance systems, a number of questions raised by a majority of the partners must be answered first. As the partners themselves generally have the appropriate answers, it was decided to organize a workshop where persons involved in the fight against Dengue could share information.

3.1 Workshop topics

The topics which merit discussion concern matters of international (case definitions), national (mandatory reporting) and local (adaptation of information networks to local competencies) levels. They concern scientific and technical (right time to perform serology tests, case definitions), administrative (information channels) or ethical questions (communicating the patient's address to the Vector Control services). Finally, they can be classified into four categories: entomology and preventive actions, biology and virology, clinical aspects, epidemiology and public health.

3.2 Designating experts

People involved in the Dengue Control in the three departments were identified by CIRE during its evaluation work. Some individuals were clearly comitted on a professional level. They were asked to form a task force charged with examining the different questions raised. This task force was composed of about fifty persons representing the French Departments of America, the French Mission for Cooperation in the Caribbean, the Caribbean Epidemiology Centre (CAREC) and the National Institute for Public Health Surveillance (InVS). The task force was divided into four groups, each with a particular topic of discussion.

Leading experts were designated to organize and moderate the debates in each group:

- **"Entomology and preventive actions": Dr André YEBAKIMA, Medical entomologist, Head of the Mosquito Control Unit, Martinique DDASS / Martinique General Council.**
- **"Clinical aspects of Dengue": Professor Michel STROBEL, Head of the Department of Infectious Diseases, Pointe-à-Pitre University Hospital / Antilles Guyane University.**
- **"Biology and virology": Dr Antoine TALARMIN, Physician-biologist, Pasteur Institute of Guyane, Head of the National Reference Center for Dengue and Arboviruses.**
- **"Epidemiology and public health": Dr Bénédicte DECLUDT, Physician-epidemiologist, National Institute for Public Health Surveillance (InVS).**

3.3 Preparatory work

The leading experts verified that the necessary competencies were united for fruitful debate on the assigned topic.

They were also asked to define the specific objectives of each group. This phase was mainly carried out during informal discussions and exchange of documents between the CIRE and the leading experts. The four leading experts had a coordination meeting with the Director of the National Institute for Public Health Surveillance at Fort-de-France on April 9, 1998.

Each leading expert was also assigned with the task of preparing a list of questions to propose for debate.

3.4 Workshop

The workshop took place on June 8-10, 1998 at Fort-de-France. Some of the participants were unable to attend due to last minute problems (air strike).

The participants discussed the questions in their respective groups. A wide range of specialities were :

- **"Entomology and preventive action": entomologists, physicians and head technicians of the mosquito control units, professor of parasitology, communications expert.**

- **"Clinical aspects of Dengue": professor of infectious diseases, hospital physicians, sentinel physicians.**

- **"Biology and Virology": virologists, physician-biologists, directors of public and private medical laboratories.**

- **"Epidemiology and public health": public health physicians, General Counsel physicians, physician from the Armed Forces Health Services, physician-epidemiologists, health engineers, public health nurses.**

Plenary sessions were held regularly to coordinate the work of the four groups and harmonize discussions. Advances made by each group were validated by all the participants at the plenary session that followed.

The "Epidemiology and public health" group worked in a different way, its members divided themselves into subgroups to better respond to the expectations and needs of the different participants.

The members of the "Epidemiology and public health" group debated the question of defining the objectives of surveillance and the operational aspects of the surveillance system in full group meetings.

The goal was to coordinate the proposals of the different subgroups and elaborate general goals and guidelines for surveillance of Dengue.

4. Workshop output

4.1 Entomology and preventive actions

4.1.1 Objectives

1. **What is expected from an effective epidemiological surveillance system? What information do the Mosquito Control Unit need? In what form? Within what delay? To do what?**
2. **Entomology surveillance: What should be monitored? Interpretation of results? Practical implications?**
3. **How should surveillance data on cases of Dengue be linked with entomological surveillance data?**
4. **Patient confidentiality and geographical localization of cases of Dengue.**
5. **What strategies should be defined in case of an outbreak or "grouped cases" of Dengue hemorrhagic fever?**
6. **Social communication, repercussions?**
7. **What can the Geographic Information Systems contribute?**
8. **What new tools for aiding decision making?**
9. **What pertinent preventive actions and under what conditions?**
10. **What short-term and mid-term directions for research?**
11. **How to implement regional cooperation (between French departments and other Caribbean countries)?**
12. **Surveillance of airport zones and sanitary controls at international borders. What strategy?**
13. **What surveillance measures for *Aedes albopictus*?**

4.1.2 Synopsis of discussions

1. What is expected from an effective epidemiological surveillance system? What information do the Mosquito Control Units need? In what form? Within what delay? To do what?

• The Mosquito Control Unit need the following information:

- all suspected cases of Dengue should be reported as soon as possible (maximum 10 days after consultation), with indication of the geographical localization (community or quarter);

- suspected cases of severe disease: immediate reporting with an address as precise as possible;

- serologically confirmed cases (classic Dengue or severe Dengue), as rapidly as possible (maximum 10 days after sample taking); exhaustive reporting with precise geographical localization.

Geographical precision and rapid information transmission are crucial for effective operation of the mosquito control units.

2. Entomology surveillance: What should be monitored? Interpretation of results? Practical implications?

• Currently, entomology surveillance is focused on larvae; it would be important to determine other indicators (level of female stingers, productivity of breeding sites, transmission potentiality…). With this, surveillance priorities can be established, control unit actions can be targeted better, and prevention messages can be adapted to the local situation.

3. How should surveillance data on cases of Dengue be linked with entomological surveillance data?

• To date, there is no close correlation between entomological indicators and the incidence of Dengue. Other factors intervene: level of immunization in the population, individual sensitivity, vector capacity…
If possible, the Mosquito Control Units should verify the reported cases of Dengue and entomological indicators (Larva indices, Yébakima weighted index[2] [22] in a geographical sector).

4. Patient confidentiality and geographical localization of cases of Dengue.

• Patients' right to confidentiality should not however jeopardize the health of the entire community. As public health services, Mosquito Control Units must have sufficiently precise information concerning the residence of the patients in order to be effective. The DASS is requested to promote this approach among health workers.

5. What strategies should be defined in case of an outbreak or "grouped cases" of Dengue hemorrhagic fever?

• Grouped cases of classic Dengue
- entomological surveys;
- besides chemical treatments, action must be taken by other partners: municipalities, associations, populations, political decision makers, administrations. These efforts are essential to physically eliminate breeding sites for *Aedes aegypti*.

• Sporadic cases of severe Dengue of Dengue hemorrhagic fever:
- action by household (household survey, larvicidal and adulticidal treatments, sanitary - education of the occupants). If possible, these actions should be conducted in the presence of municipal representatives.

• Epidemic:
- activation of the Crisis Unit
- notification of the news media
- active participation of the municipality and territorial authorities.
- chemical treatment.

An outbreak of Dengue requires:
- a rapid and as effective as possible action by the Mosquito Control Units, particularly application of anti-adult chemical treatments.
- active municipal participation to eradicate breeding sites.

[2] **Breteau index (number of positive harbors for 100 houses) weighted by productivity coefficients of different larva harbors.**

6. Social communication, repercussions?

• Social communication must be developed in mosquito control actions. This approach is essential because of the anthropic nature of *Aedes aegypti* breeding sites.

***Purpose*: to understand the expectations of the population, to better adapt prevention messages and strategies. To develop socio-anthropologic studies, surveys. Knowledge-Attitudes-Practices (KAP).**

***Objective*: obtain the participation of the community in order to achieve a durable change in behavior. To be successful, this implies the participation of:**
- other competencies such as the social sciences,
- other partners (physicians, associations, educators, stakeholders) in daily actions and for setting up elaboration of plan of action.

7. What is the role of a GIS?

• Several factors influence the epidemiology of Dengue: entomological factors (the mosquito and its breeding sites, the virus…), human factors, climatological factors… The Geographic Information Systems group together diverse databases useful for establishing an eventual link. The Geographical Information Systems are increasingly used for operational management of the Mosquito Control Units (example management of the 1997 epidemic in the Martinique).

It would be desirable for the Mosquito Control Units of the three French departments to use the same system in order to merge their data.

8. What new tools for decision making?

• Weighted Breteau index, developed in Martinique by A. Yébakima [22] is one step in this direction. It can certainly be improved, but it does allow an approach to the problem and help set priorities for managing the different operations. Other aids for decision-making would be useful for the Mosquito Control Units. This is a priority direction for research.

9. What kind of preventive actions can be taken and under what conditions?

• There is a need to initiate long-term programmes in primary schools. Educators need to be more involved

• There is a need to involve municipal boards in long-term programmes (for example pilot projects) in order to develop a community approach for Vector control.

10. What kind of preventive actions can be taken and under what conditions?

• KAP surveys: Biological action; Insecticide resistance.

11. How to implement regional cooperation (Inter FDA and Caribbean)?

• Establish regular official meetings between the services of the three French Departments of America (LAV[3] Guadeloupe, SDD[4] Guyane, Martinique Mosquito

[3] Lutte Anti-Vectorielle (Anti vector service)
[4] Service Départemental de Désinfection (Departmental disinfection service)

Control Unit). Encourage exchanges with other Caribbean countries (Brazil and Suriname for Guyane), PAHO, CAREC…

12. Surveillance of airport zones and sanitary controls at international borders. What strategy for border and airport surveillance?

• There is a need to stimulate exchanges between the three French Departments and to write a proposal in order to submit to the MOH.

13. What surveillance methods for *Aedes albopictus*?

• Surveillance of this species is needed in each department as it is already present in southern United States, Central America, Saint-Dominique, Brazil, and some European countries (Albany, Italy). This surveillance should also include:

- identification of tire containers and treatment of these containers

- regulations for importing and stocking retreated tires.

- surveillance of airports and sea ports (entomological surveillance with ovitraps, spraying with adulticides if needed…).

4.2 Clinical aspects of Dengue

4.2.1. Objectives

4.2.1.1. General objectives

1. To participate in better evaluation of the incidence and clinical patterns of Dengue Fever in our departments.

2. To promote dissemination of knowledge, both for physicians and the general population.

3. To provide guidelines for applied clinical research.

4.2.1.2. Operational objectives

1. To agree about the case definition of a suspected case of Dengue in order to establish a sensitive surveillance system (clinical signs, indirect laboratory indicators…).

2. Make available *in fine* Dengue case definitions (suspected case, probable case, confirmed case).

3. To promote widespread use of adequate available laboratory diagnostic tools.

4. Establish severity criteria for required hospitalization.

5. Also make available common definitions for cases of Dengue Haemorrhagic Fever (DHF) and/or Dengue shock syndrome (DSS).

6. Propose mandatory reporting of all cases of certain or probable severe Dengue and DHF/DSS as well as reporting of all deaths in cases of confirmed or simply suspected Dengue.

7. Establish standardizedform (serology or viral isolation request, complementary form for laboratory confirmation, reporting form for DHF/DSS and in case of death…).

4.2.2. Synopsis of discussions

1. Define a suspected case of Dengue in order to establish a sensitive coherent alert system (clinical arguments, suggestive laboratory results…).

• A case of suspected classic Dengue is defined by the association of at least:
- sudden-onset high-grade fever (≥38.5°C) of less than 10 days duration,
- pain: headache ± joint pain ± muscle pain ± back pain,
- and lack of any infectious focus.

• A case of probable classic Dengue is:
- either a case of suspected Dengue with at least two of the following clinical and biological criteria:
1. Skin rash
2. Minor signs of bleeding
3. Thrombocytopenia (platelets < 100,000/mm^3)

4. CRP < 30 mg/l
- or a suspected case of Dengue occurring during an outbreak.

• A certain case is a suspected or probable case of Dengue confirmed by at least one of the following laboratory tests:
- MAC-ELISA of a single serum sample evidencing specific IgM,
- serum culture or PCR identifying the Dengue virus,
- significant rise in specific IgG titers (≥4-fold) on two serum samples drawn at least 15 days apart.

The proposed definitions of suspected cases, probable cases and confirmed cases of classic Dengue are given in Appendix 4 (data worksheets n° 2 and 3).

These case definitions differ from the WHO definitions (cf. appendix 2); they are however very similar to those used by the CAREC (cf. appendix 3):

- The definition of probable classic Dengue does not include a serologic test (specific IgM assay).

- Serological proof of a probable case using IgM assay is limited to evidencing specific IgM on one serum sample by MAC ELISA since IgM assay on consecutive serum samples is exceptional in everyday practice.

2. Also make available common definitions for cases of Dengue Haemorrhagic Fever (DHF) and/or Dengue shock syndrome (DSS).

• The definitions of Dengue Haemorrhagic Fever (DHF) and Dengue shock syndrome (DSS) are identical to the clinical criteria defined by the WHO and the Centers for Disease Control (cf. Appendix 2 and Appendix 4, Worksheet 5).

• Biological confirmation in case of probable DHF or DSS is made by one of the following methods:
- identification of the Dengue virus in serum or an postmortem material (liver biopsy…), or culture or PCR,
- evidence of significant rise in specific IgG titers (4-fold) on two serum specimens draw at least 15 days apart,
- evidence of specific IgM in one serum sample by MAC-ELISA.

• The definition of severe Dengue was elaborated in order to allow surveillance of Dengue cases with signs of gravity requiring hospitalization even though all the criteria of DHF and DSS may not be present.

The definitions of probable Dengue and certain severe Dengue, Dengue hemorrhagic fever, and Dengue shock syndrome are given in appendix 4 (Worksheet n° 4, n° 5).

3. Establish criteria of gravity for required hospitalization.

• It is recommended to hospitalize a patient with suspected Dengue either because there is an associated potential risk factor (pregnancy, child under 1 year of age, very elderly subject, immunodepression, etc.…), or because there is at least one element of gravity (signs of bleeding, signs of shock, malaises, syncopes, etc.…). A list of hospitalization criteria is given in worksheet n° 7.

4. Establish standardized data worksheets (worksheet for ordering serology or viral isolation, complementary worksheet in case of laboratory confirmation, reporting work-sheet in case of DHF/DSS and in case of death…).

• A worksheet for ordering biological confirmation of the diagnosis of Dengue allows collection of a few indispensable data (patient characteristics, chronic data, presence of signs of gravity).

A report indicating the presence of one (or more) sign(s) of gravity should allow the DDASS to actively follow cases of severe Dengue.

A proposed "Good examination for laboratory confirmation of the diagnosis of Dengue" is given in appendix 4 (Worksheet n° 8).

• A report form for cases of severe Dengue has been written. It is given in appendix 4 (Worksheet n° 6). This form is designed for reporting cases of severe hospitalized cases of Dengue.

These worksheets constitute proposals which could be slightly adapted depending on specific requirements of each department but still maintaining a global standardization to obtain comparable data.

5. Propose mandatory reporting of all cases of certain or probable severe Dengue and DHF/DSS as well as reporting of all deaths in cases of confirmed or simply suspected Dengue.

• It is proposed that of all cases of severe Dengue, Dengue hemorrhagic fever, and Dengue shock syndrome, whether suspected or confirmed, as well as all deaths occurring in patients with suspected Dengue, be reported to the DDASS.

Hospitalized cases of severe Dengue should be reported using the "Reporting form for severe Dengue" (cf. Appendix 4, worksheet n° 6). Outpatient cases of severe Dengue should be reported to the DDASS using the "Good examination for laboratory confirmation of the diagnosis of Dengue" form (cf. Appendix 4, worksheet n° 8) which includes items for indicating signs of gravity.

4.3. Biology and virology

4.3.1. Objectives

1. Harmonize diagnosis techniques: Indicate ideal conditions to collect the samples, preservation and transportation of samples, and identify a standardized technique for IgM testing ; When should an IgG test be run? When must the serotype be determined?

2. Prepare guidelines for practitioners: Define the contribution of isolation and serology for surveillance of Dengue, the advantages and limitations of the diagnostic tests, when to take the sample, for what isolation and what serologic diagnosis? Interpretation of results.

3. Find early markers for surveillance. Define, clinically and biologically, a case of suspected Dengue, find non-specific biological markers best adapted to early detection of an outbreak.

4. Implement research projects: Primary or secondary nature of Dengue, depending on the gravity, serologic surveys to determine the importance of the outbreak, surveillance of other arboviruses, establishment of departmental serology banks.

4.3.2 Synopsis of the discussions

4.3.2.1 Harmonize diagnostic techniques

Laboratory techniques for the diagnosis of Dengue include test for specific IgM, currently performed in each French Department of America by a single laboratory[5] and direct detection of the virus (culture and RT-PCR) performed by the NRC[6] .
For the diagnosis of severe (fatal) forms, post mortem biopsies must be performed for a pathology study (preservation in Bouin's fluid or formol) and virology studies (fresh-frozen at –80°C). Biopsies must be obtained from at least the liver and from other organs depending on the clinical signs.

To harmonize techniques, the NRC sends reagents to the Martinique Departmental Laboratory of Hygiene and the Guadeloupe Pasteur Institute and internal and external quality control tests are run. The NRC is in charge of the internal quality control using pools of positive and negative sera and the external quality controls are supplied by the CAREC.

4.3.2.2 Prepare guidelines for practitioners (cf. Appendix 4, Worksheet n° 9)

The principal reason for the diagnosis of Dengue is to obtain epidemiological data. Indeed, due to the long delay to laboratory diagnosis, the patient is generally cured when the physician is informed. There is rarely any real direct benefit for the patient.

However, as public health partners, practitioners are interested in epidemiological surveillance and subsequent disease prevention.

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[5] Pasteur Institute of Guadeloupe, Departmental Laboratory of Hygiene of Martinique, and Pasteur Institute of Guyane
[6] National Reference Center for Dengue and Arboviruses (Pasteur Institute of Cayenne)

In certain cases, laboratory diagnosis can also have a direct interest for the prescriber, confirming the clinical diagnosis and allowing better follow-up of later suspected cases during an outbreak.

In order to enable effective surveillance of Dengue, a sufficient number of samples must be addressed to the laboratory:

• early samples (before the 4th day of disease) for direct identification of the virus and for following the circulating serotypes,

• late samples (after day 5 or 6) for serology, to detect an outbreak as early as possible and take necessary steps for exposed persons.

Ideally, serologic and virologic tests should be alternated: approximately 1/4 of the early samples (before the 4th day of disease) for isolation and/or RT-PCR and 3/4 of the samples after day 5-6 for serology.

If the number of early samples arriving at the NRC for viral isolation or RT-PCR is not enough to determine the circulating serotype(s); participants in the sentinel network and directors of medical laboratories should be solicited.

a) Advantages and limitations of viral isolation and RT-PCR

With these two examinations the circulating serotype of the Dengue virus can be identified and any new serotype detected.

Emergence of a new serotype, often followed more or less rapidly by an epidemic, is a crucial indicator for surveillance.

Culture is a long laborious process taking about 7 days, but it does have the advantage of enabling isolation of other arboviruses and thus provides a wider surveillance.

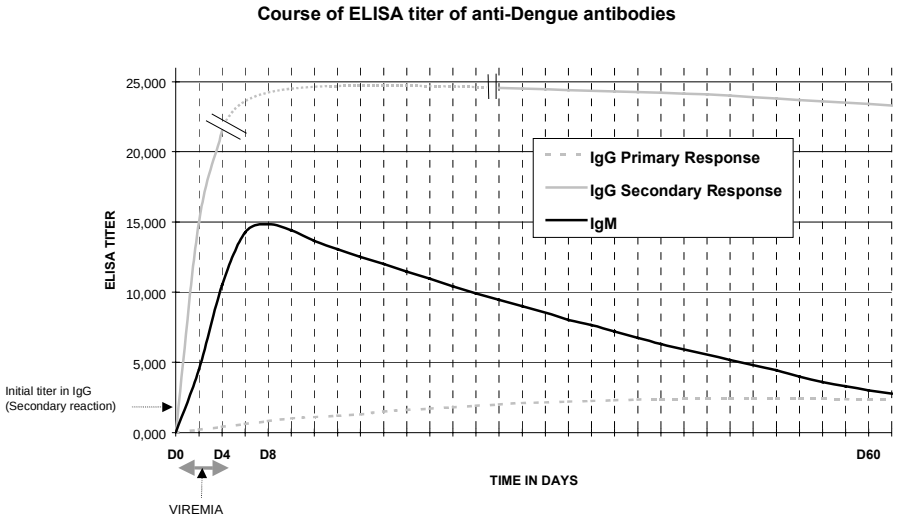
RT-PCR is more rapid. In case of a motivated emergency (early phase of an epidemic, post mortem, severe case…) results can be obtained in 24 or 48 hours after reception of the sample, depending on the extraction technique used.

These two techniques performed on serum are positive for about the first four days of disease, that is during the period of viremia.

b) Advantages and limitations of serodiagnosis

Detection of anti-Dengue IgM antibodies is a simple and reliable test. However, as non-commercial reagents are used, the technique is long and difficult to adapt to small series.

The presence of anti-Dengue IgM is a sign of recent infection by a flavivirus which, in the epidemiological and/or clinical context, is assumed to probably be the Dengue virus. False positives can occur in case of concurrent infections



Search for IgG is not considered to be useful for routine epidemiological surveillance. It is reserved for certain patients with severe forms for whom the laboratory has two samples in order to differentiate primary Dengue from secondary Dengue (research project).

4.3.2.3. Find early biological markers for surveillance

• The existing surveillance systems for Dengue are not highly reactive or representative:
- because following specific serology results does not give rapid responses (results are obtained at best 15 days after onset of clinical signs),
- because the suspected cases followed by sentinel physicians are poorly representative as they are limited to the referral population of the physician.

With the aim of improving both reaction time (possibility of obtaining results within 1 week) and improving the representative quality of the results (the area covered by a laboratory corresponding to that of several physicians), it is proposed to complete the current surveillance systems by following non-specific indicators associated or not with fever.

For Martinique and Guadeloupe, it was decided to test the number of cell counts retrospectively and the number of cell counts associated with thrombocytopenia and/or leukopenia prospectively. The surveillance could be based on a network of voluntary laboratories who report all requests for blood cell counts in patients suspected of having Dengue. The prescribing physician could then simply prescribe blood cell count and platelet count and mention "fever" or "suspected Dengue" on the prescription. The laboratories would report all such requests to the DDASS.

In Guyane, it was decided that the surveillance would be done on the number of orders for thick blood smear for the cities of Cayenne and Kourou. For Saint-Laurent

du Maroni, the number of negative thick blood smears should be tested as well as the number of negative thick blood smears associated with thrombocytopenia below 150,000/µl.

The decision to use one of these markers depends on the laboratory's computer setup and its usefulness in the fight against Dengue; it is made after a test period to determine precise performance (sensitivity, specificity and PPV).

Indicators should be followed weekly.

4.3.2.4. Organize research projects.

• The only projects retained were:
- evaluation of non-specific biological markers as surveillance tools
- surveillance of other arboviruses in the French West Indies by regularly sending early serum samples for mosquito cell cultures and revelation using a wide range of antibodies specific for different viruses.

5. Guidelines for Dengue surveillance

5.1. Definition of the surveillance goals

The participants agreed that the objectives and surveillance practices should be adapted for four periods.

5.1.1. Objectives during non-epidemic or endemic periods

(1) To detect increases in the number of suspected cases, serologically confirmed cases, and occurrence of all cases of severe Dengue.

(2) To provide the Vector Control Unit with guidelines

(3) To evaluate the level of virus circulation and identify the serotypes involved.

5.1.2. Objectives during the early phase of an epidemic

(1) To confirm the epidemic

(2) To activate and guide vector control measures

Note: As the pertinent epidemic thresholds of the followed indicators is currently unknown, detection of an epidemic will be based on a group of arguments:
- increase of the rate of positive serologies,
- opinion of the sentinel physicians
- increase of the number of suspected cases…

(3) To confirm or identify circulating serotype(s) and topotype(s)

5.1.3. Objectives during an epidemic

(1) To monitor the trends of the epidemic (time, site, person, gravity)

(2) To identify high-transmission zones and guide anti-vector actions

(3) To organize patient management.

5.1.3. Objectives during the final phase of an epidemic

(1) Confirm the end of the epidemic.

Note: As the pertinent epidemic thresholds of the followed indicators are currently unknown, the final phase of an epidemic will be based on a group of arguments as for detection of an epidemic:

- decrease of the number of suspected cases

- opinion of the sentinel physicians

- rate of positive serologies coming back to endemic level

5.2. General methodology

5.2.1. General organization of the surveillance (cf. Appendix 5)

• The workshop groups agreed that four epidemiological surveillance systems are needed:

1/ Detection of suspected cases by a network of sentinel physicians in private practice and in hospitals and by military physicians.

2/ To monitor the requests for serology tests and their results performed by specialized laboratories (Pasteur Institute, Departmental Laboratory of Hygiene) and serotypings requests sent by these laboratories to the Cayenne RNC.

3/ To follow up serologies and serotypings requested by the Armed Forces Health Services.

4/ To follow up cases of severe Dengue in hospital units.

• An entomology surveillance system should also be piloted by the anti-vector services.

• The epidemiological surveillance systems should be managed by the DDASS.

• Data should be analyzed by the DDASS weekly (evolution of suspected cases, cases of severe Dengue, serology).

• In order to facilitate identification of outbreaks and decision making for preventive action, it is recommended that an "observation committee" be established for each French Department of America. The main participants implicated in the fight against Dengue should be members of this committee (entomologist, DDASS physician, specialized laboratory biologist, hospital physicians, sentinel physicians…) to serve as surveillance indicators.

The committee should meet in case of a suspected outbreak to confirm the alert and meet regularly during an epidemic. A meeting should be held at least once a year.

• An intervention plan (modeled on an ORSEC plan) should be elaborated for each department and the political authorities (Préfecture) should create a Crisis Unit.

5.2.2. Propositions for improving the surveillance systems

5.2.2.1. Reporting modalities

• All suspected cases of Dengue must be reported by the sentinel physician within the framework of a telephone survey conducted by the DDASS physician.

• The report on the number of suspected cases must be completed by information concerning each case (age, residence, cases in contacts…), (cf. appendix 4, Worksheet n° 2).

• Hospital physicians (medicine, pediatric and emergency units) who are DDASS correspondents must be integrated into the network of sentinel physicians.

• All severe cases must be reported and should be included, by decree, on the list of Mandatory Disease Reports.

• The worksheets for ordering samples, collection of data on suspected cases, and reporting cases of Dengue must be standardized among the three departments (cf. models proposed by the group on Clinical Aspects of Dengue, Appendix 4, Worksheets n° 2, n° 6, n° 8).

• Serology results are transmitted immediately to the DDASS, the day they are obtained.

• The Mosquito Control / Anti-Vector Units must receive without delay, via the DDASS, the addresses of patients with severe Dengue, serologically confirmed Dengue, and suspected Dengue.

5.2.2.2. Accessibility to serology and serotyping

• A system for transporting serum from private laboratories to the Pasteur Institutes or the Departemental Laboratory of Hygiene must be organized and funded.

• A system for transporting serotyping orders from the Guadeloupe Pasteur Institute or the Departemental Laboratory of Hygiene to the Cayenne NRC must be organized and funded.

• Funding for serologies must be provided by a specific budget of the Health Ministry in order for serologic tests to be accessible to all patients with the objective of surveillance and prevention.

5.2.2.3. Feedback

• The NCR must address without delay culture and RT-PCR results to ordering laboratories and to the DDASS.

• The DDASS must send monthly feedback information to the surveillance partners (sentinel physicians, hospitals, laboratories…).

• Automatic weekly output of surveillance indicators and reporting must be implemented by the CIRE. A weekly report of the geographical distribution of cases must be prepared for the Mosquito Control / Anti-Vector Services.

• A regional epidemiology bulletin (Dengue and other diseases) should be implemented by the DDASS in collaboration with the CIRE.

5.2.3. Recommendations for anti-vector actions

• Regular meetings of the Mosquito Control / Anti-Vector Units in the 3 French Departments of America must be implemented.

• Surveillance of *Aedes albopictus* must be initiated in the 3 departments.

• The contribution of the social sciences must be integrated into the preventive action programs, particularly with more widespread use of the KAP[7] studies.

• Community projects must be developed, thus the requirement to promote and practice mosquito control and not uniquely anti-vector actions.

• Each Mosquito Control or Anti-Vector Unit must have a Social Communications Service.

• Research projects must be developed, particularly in the following domains:
- resistance against insecticides,
- decision making tools and contribution of the Geographical Information Systems
- biological actions.

5.2.4. Other recommendations

• Exchanges between neighboring counties (CAREC) and among the French Departments of America (transmission of epidemiology data, professional meetings) must be organized by the CIRE.

• Diagnosis, management of Dengue cases, and their surveillance must be integrated into continuing medical education programs.

5.3. Surveillance modalities by period

5.3.1. Non-epidemic or endemic period

• Primary care physicians should be encouraged to order serologies for all suspected cases (guidelines, continuing education…).

• All early samples are addressed to the NRC at least once a month (excepting emergency situations).

5.3.2. Early phase of an epidemic

• Primary care physicians should be encouraged to order serologies for all suspected cases.

• Available early samples must be addressed to the NRC without delay and processed immediately.

• All health care partners as well as the anti-vector units will be informed that an epidemic may occur shortly.

• More widespread geographical coverage was considered to be necessary during this period in order to identify zones of increased risk where the anti-vector services could intervene. The Health Actions Services of the Guadeloupe and Martinique General Councils propose to solicit the participation of dispensary physicians who will provide with information on suspected cases seen at their clinics in the framework of their public health activities.

[7] **Knowledge of attitudes and practices**

• Entomology surveys and targeted actions of the anti-vector services will be immediately implemented.

• Active search for severe cases (crossing physician reports and laboratory reports of severe cases) must be implemented.

5.3.3. During an epidemic

• The epidemic is monitored by following the evolution of suspected cases reported by sentinel physicians.

• The surveillance committee should implement regular monitoring of the epidemic.

Orders for serologies in ambulatory patients should be limited to the epidemiology surveillance framework.

• Serodiagnosis remains however indispensable for severe cases.

• The medical community must be informed regularly of the evolution of the epidemic.

• The virus or viruses involved will be monitored on early samples (at most about 50 per month) addressed to the NCR. Those patients with the most clinically suspected cases or who develop seroconversion between a prior sample and the earliest serum sample should be selected in priority.

• Individual case surveillance (physician/patient) should be instituted to monitor all patients presenting signs of aggravation (guidelines for clinicians).

• A Crisis Unit including a representative of the national authorities (Préfet) and of the General Council, and a member of the Observation and Surveillance Committee (as well as any other expert as needed) could be constituted in order to manage implementation of prevention and information actions.

5.3.4. Final phase of an epidemic

• The medical community should be informed of the end of the epidemic.

• A final report on the epidemic (amplitude of the epidemic in terms of time, geographical location, serotype(s), cause(s), actions taken, problems encountered) will be made by the Observation and Surveillance Committee.

• Complementary evaluations could be made:
- a new evaluation of how the systems operated and the quality of their actions,
- an evaluation of entomological actions should also be made,
- an estimation of the overall cost of the epidemic,
- complementary surveys could be conducted depending on the final outcome (representative value of the reports, serology survey…).

6. Conclusion

Dengue has become a worldwide public health problem involving not only developing countries but also countries with a high economic level such as southeastern United States or some Caribbean countries including Puerto Rico and the French Departments of America. This workshop enabled health professionals in the region to contribute to the general discussion on means of improving knowledge, control, and prevention of Dengue.

In the context of the recent aggravation of the disease and with the threatening perspective of an explosion in the number of cases due to the arrival of the DEN-3 virus, which has been circulating recently in the Caribbean and central America. In the three French Departments of America, it is a priority for the Health Ministry and regional services to implement a Dengue surveillance system for severe forms of the disease in the upcoming years.

This document presents a synopsis of the work conducted at the workshop and represents the framework upon which a comprehensive Dengue surveillance system can be constructed in the departments of the French Antilles and Guyane.

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8. Appendices

Appendix 1

List of participants in the Workshop on
Dengue in the French Overseas Department

June 8-10, 1998 – Fort-de-France

Working group: Biology and virology

	Name	*Title*	*Establishment*
	Mrs BAJAL	**Medical laboratory director**	**Saint-Pierre**
	Dr BUCHER	**Biologist**	**Fort-de-France University Hospital**
	Dr CAMPIONE	**Virologist**	**CAREC[8]**
	Dr DURAND	**Physician, virologist**	**IMTSSA[9]**
	Dr GONIN	**Hospital physician**	**Fort-de-France University Hospital**
	Dr GOURSAUD	**Physician, biologist**	**Pasteur Institute Guadeloupe**
	Dr LAFAYE	**Director, Departmental Laboratory of Hygiene**	**General Counsel**
	Mr RAPHA	**Director, Medical laboratory**	**Le Lorrain**
Moderator:	**Dr** TALARMIN	**Head physician biologist, NRC[10] for Dengue and Arboviroses**	**Guyane Pasteur Institute**

Working group: Clinical aspects of Dengue

	Name	*Title*	*Establishment*
	Dr AIRA	**Sentinel physician**	**Vieux Habitants (97119)**
	Dr CABIE	**Hospital Physician – CISIH**	**Fort-de-France University Hospital**
	Dr DENIS	**Sentinel physician**	**Fort-de-France (97200)**
	Dr GHOUTI	**Sentinel physician**	**Cayenne (97300)**
	Dr LAMAURY	**Hospital physician – *Dermatology and Infectious Diseases***	**Pointe-à-Pitre University Hospital**
	Dr NUMERIC	**Hospital physician – *Emergency Unit***	**Fort-de-France University Hospital**
Moderator:	**Prof** STROBEL	**Infectiologist, *Head of the Depart-ment of Dermatology and Infectious Diseases***	**Antilles-Guyane Medicine Unit, Pointe-à-Pitre University Hospital**

[8] Caribbean Epidemiology Centre
[9] Institute of Tropical Medicine, Army Health Services, Marseilles
[10] National Reference Center

Working group: Entomology and Prevention

	Name	*Title*	*Establishment*
	Prof CARME	**Parasitologist**	**Antilles-Guyane Medicine Unit, Cayenne General Hospital**
	Mr GUSTAVE	**Head of the Anti-vector Service**	**DDASS Guadeloupe**
	Mr HO-A-SIM	**Technician, Departmental Disinfection Service**	**Guyane General Counsel**
	Mrs MOUTENDA	**Communications expert, Mosquito Control Service**	**DDASS/ Martinique General Counsel**
	Dr RAWLINS	**Parasitologist, entomologist**	**CAREC**
	Dr VENTURIN	**Physician, Head of the Departmental Disinfection Service**	**Guyane General Counsel**
Moderator:	**Dr** YEBAKIMA	**Medical entomologist, Head, Mosquito Control Service**	**DDASS/Martinique General Counsel**
	Mrs YP-TCHA	**Engineer, Mosquito Control Service**	**DDASS/Martinique General Counsel**

Working group: Epidemiology and Public Health

	Name	*Title*	*Establishment*
	Mr BLATEAU	**Sanitary engineer**	**Antilles-Guyane CIRE**
	Dr CHAUD	**Physician, Inspector of Public Health**	**Antilles-Guyane CIRE**
Moderator:	**Dr** DECLUDT	**Physician, epidemiologist**	**InVS**[11]
	Dr FLACHET	**Physician, epidemiologist**	**Health Ministry, Sainte-Lucie**
	Dr LAJOINIE	**Physician, Inspector of Public Health**	**DDASS Martinique**
	Dr LEBORGNE	**Director, Interarmy Health Service**	**DIASS**[12] **Antilles**
	Dr LEWIS	**Physician, epidemiologist**	**CAREC**
	Dr MAZILLE	**Physician, Sanitary Action Services**	**DDASS Guadaloupe**
	Dr MEUNIER	**Physician, Regional inspector**	**DIRSS**
	Mrs NADEAU	**Nurse, Sanitary Action Services**	**DDASS Martinique**
	Dr PAVEC	**Physician, epidemiologist**	**Guyane Pasteur Institute**
	Dr RELTIEN	**Physician, epidemiologist**	**Ministry of Health – Grenada**
	Mrs ROUGY	**Sanitary engineer, assistant**	**DDASS Guyane**
	Dr THEODORE	**Assistant director, Departmental Solidarity Service**	**Guadeloupe General Counsel**
	Dr VIGEE	**Physician, Health Actions Service**	**Martinique General Counsel**

[11] **National Public Health Network**
[12] **Direction of the Interarmy Health Services**

Appendix 2

WHO definitions of probable and confirmed cases of classic Dengue and Dengue hemorrhagic fever (DHF) and Dengue shock syndrome (DSS)

Definitions of Dengue proposed by the P.A.H.O. and the C.D.C.[13]

Clinical description

Disease with fever, frontal headache, retro-orbital pain, joint pain, muscle pain, and rash.

Case definition

Probable

• fever and
• 2 or more of the following signs:
1. **headache**
2. **retro-orbital pain**
3. **muscle pain**
4. **rash**
5. **manifestations of hemorrhage,**

• and, positive serology (search for IgM positive on 1 serum sample 5 days after onset of clinical signs)

Confirmed

Case confirmed by the laboratory:

• 4-fold rise in specific IgG or IgM titres between 2 serum samples drawn at least 2 weeks apart, or
• Identification of the Dengue virus on a serum sample or an autopsy specimen.

Case to report

All probable and all confirmed cases

Clinical definition of Dengue Hemorragic Fever (DHF)

All 4 following signs must be present:

• Fever or episode of recent fever, and

[13] **"Dengue and Dengue hemorrhagic fever in the Americas: Guidelines for prevention and control", Pan American Health Organization – Scientific publication n° 548.**

• Objective manifestations of hemorrhage evidenced by at least one of the following signs: positive tourniquet sign, petechia, ecchymosis, purpura, mucosal bleeding, digestive bleeding, bleeding at an injection point or other sign of hemorrhage, and

• Thrombocytopenia < or = 100,000 and

• Plasma leakage due to increased capillary permeability manifested by at least one of the following criteria: 20% or more increase in hematocrit compared with the reference population, or 20% drop in hematocrit after treatment, or signs commonly associated with plasma leakage (pleural effusion, ascitis, hypoproteinemia).

Clinical definition of Dengue Shock Syndrome (DSS)

All the clinical signs of Dengue hemorrhagic fever must be present and associated with a 20 mmHg reduction at least in the systolic-diastolic differential.

Case of hemorrhagic Dengue fever or Dengue Shock Syndrome to report

All cases presenting the above described criteria and at least one of the following criteria must be reported:

• Serological confirmation or positive search for virus, or

• History of exposure in an endemic or epidemic zone.

Grades of severity of hemorrhagic Dengue fever

Grade I: **Fever with non-specific general signs, the only sign of hemorrhage is a positive tourniquet test**

Grade II: **Spontaneous signs of bleeding in addition to the signs of Grade 1**

Grade III: **A 20 mmHg reduction at least in the systolic-diastolic differential, weak rapid pulse, low blood pressure, cyanosis of the extremities**

Grade IV: **Deep shock with non-measurable pulse and blood pressure.**

Appendix 3

Definition of suspected, probable and confirmed cases of classic Dengue and cases of Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) used by the CAREC

Definitions of cases of Dengue used by the CAREC.

Dengue virus is carried by the *Aedes aegypti* mosquito. Infection may result in a broad spectrum of disease from minor acute febrile illness to shock.

Dengue Fever (DF)

Suspected

• A rash illness with fever

Probable

• History of fever 38°C (101°F) or more, (if not measured, "Hot" to touch) for at least 2 days
and
• Two or more of the following:
- **Myalgia / arthralgia**
- **Headach**
- **Retro-orbital pain**
- **Macropapular rash**

Confirmed

A *Confirmed* case is a *Suspected* or Probable Case with 1 or more of the following:

• Laboratory confirmation:
- **isolation of dengue virus from sera or tissue OR**
- **detection of serum dengue IgM antibodies (MAC-ELISA) OR**
- **a 4-fold serologic rise in IgG titre**

• Epidemiologic linkage
- **A Suspected or Probable case of DF may be accepted as "confirmed" for reporting purposes during epidemic or significant levels of endemic transmission.**

Dengue Hemorrhagic Fever (DHF)

Probable

All criteria must be present:

• Fever, or recent history of acute fever

• Hemorrhagic tendencies, as evidenced by at least <u>one</u> of the following:

- **Postive tourniquet test[14]**
- **Petechiae, ecchymoses, or purpura**
- **Bleeding from mucosa, gastrointestinal tract, injection sites, or others**
- **Thrombocytopenia (100,000 mm^3 or less)**
- **Plasma leakage due to increased capillary permeability as manifested by at least <u>one</u> of the following:**
    - **Hematocrit on presentation that is ≥20% above average for that age and population**
    - **≥20% drop in hematocrit following treatment**
    - **Commonly associated signs of plasma leakage: pleural effusion, ascitis, hypoproteinemia**

Confirmed

A Confirmed case is a Probable case with 1 or more of the following:

• Laboratory confirmation
- **isolation of dengue virus from sera or tissue OR**
- **detection of serum dengue IgM antibodies (MAC-ELISA) OR**
- **a 4-fold serologic rise in IgG titre OR**
- **a single HAI titre of 2560 or more**

• Epidemiologic linkage
- **During epidemic or significant levels of endemic transmission, a history of exposure in dengue endemic or epidemic areas may be sufficient criteria to accept a probable case of DHF as "confirmed" for reporting purposes.**

Dengue Shock Syndrome (DSS)

Probable

A Probale case fulfils the criteria for a Probable case of DHF
<u>and</u>
• Evidence of circulatory failure manifested by all of the following:
- **Rapid and weak pulses**
- **Narrow pulse pressure (20 mmHg or less) or hypotension for age[15]**
- **Cold clammy skin and altered mental status**

[14] The tourniquet test is performed by inflating a blood pressure cuff to a point midway between the systolic and diastolic pressures for 5 minutes. A test is considered positive when 20 or more petechias per 2.5 cm (1 inch) square are observed. The test may be negative or mildly positive during the phase of profound shock. It usually becomes positive, sometimes strongly positive, if the test is done after recovery from shock.
[15] Hypotension: < 5years 80 mmHg, > 5 years < 90 mmHg (systolic pressure) Note that narrow pulse pressure is observed earlier while hypotension is found later, or in cases with severe bleeding.

Confirmed

A Confirmed case is a Probable case with 1 or more of the following:
• Laboratory confirmation
- **isolation of dengue virus from sera or tissue OR**
- **detection of serum dengue IgM antibodies (MAC-ELISA) OR**
- **a 4-fold serologic rise in IgG titre OR**
- **a single HAI titre of 2560 or more**

• Epidemiologic linkage
During epidemic or significant levels of endemic transmission, a history of exposure in dengue endemic or epidemic areas may be sufficient criteria to accept a probable case of DHF as "confirmed" for reporting purposes.

Appendix 4

Worksheets of clinical and biological guidelines

Model worksheets of clinical and biological guidelines[16]

Worksheet n° 1 : **Guidelines for physicians: biological surveillance of Dengue**

Worksheet n° 2: **Guidelines for sentinel physicians for reporting suspected cases**

Worksheet n° 3: **Definition of cases of classic Dengue: suspected, probable, certain or confirmed cases**

Worksheet n° 4: **Definition of cases of severe Dengue**

Worksheet n° 5: **Definition of cases of hemorrhagic Dengue fever with or without Dengue shock syndrome (DHF ± DSS)**

Worksheet n° 6: **Reporting form for cases of severe Dengue**

Worksheet n° 7: **Hospitalization criteria**

Worksheet n° 8: **Order form for laboratory confirmation of Dengue, with items for signs of gravity on the back side**

Worksheet n° 9: **Guidelines for serologic and virologic surveillance of Dengue**

[16] These worksheet models can be adapted slightly depending on the specific situation in each department while maintaining overall standardization to guarantee data comparability.

Worksheet n° 1

Guidelines for physicians: biological surveillance of Dengue

⇨ A few general exams

In order to rule out other causes of acute fever and also to evaluate the gravity of a suspected case of dengue, it is advisable to order at least:

- **a blood count with platelets[17] with CRP**
- **a thick blood smear in case of exposure in a malaria endemic zone**

Other exams may also be helpful, particularly transaminase assay and urine dip tests (Multistix or equivalent).

Don't forget risk factors and signs of gravity warranting hospital surveillance (cf. worksheet n° 7 "Hospitalization criteria")

⇨ Serum sample for laboratory confirmation of Dengue

- During a non-epidemic period, the physician should always try to obtain laboratory confirmation of a suspected case by drawing a serum sample on a dry tube for the departmental reference laboratory for Dengue (Pasteur Institute for Guadeloupe and Guyane, Departmental Laboratory of Hygiene for Martinique). This sample should be sent with the correctly filled out order form for diagnosis of dengue.

- Depending on the delay between the onset of clinical signs and the sample, the laboratory will assay IgM antibodies (delay ≥ 5 days) or perform direct virus isolation (delay < 5 days) (done by the Cayenne Pasteur Institute).

- However, during an ongoing epidemic, prescription of a serum sample for laboratory diagnosis should, if possible, be reserved for severe or atypical forms so as not to overload reference laboratories.

[17] **If the order for blood count does not include a request for laboratory confirmation of dengue (serology or virology) indicate "fever" (or "suspected dengue") on the order. Indicating "fever" (or "suspected dengue") on the prescription allows a surveillance of suspected cases of dengue from blood counts performed by the network of voluntary medical laboratories and triggering targeted and early anti-vector actions.**

Worksheet n° 2

Guidelines for sentinel physicians for reporting suspected cases

All cases of suspected Dengue[18] (cf definition) must be reported by the sentinel physician during the weekly telephone survey conducted by the DDASS physician.

The sentinel physician should provide the following information:

• Number of suspected cases of dengue observed in the last week

• and for each case:

- **initial of the name, first name, date of birth (or age)**
- **residence (town and sector) \ other possible site of contamination**
- **patient residing outside the department in the department for a short time**
- **any knowledge of other cases in contact with the suspected case**
- **presence or not of signs of gravity**

[18] Definition of suspected case of Dengue
A compatible clinical presentation is sufficient to suspect dengue. A suspected case of Dengue is defined by at least:
• high-grade sudden onset fever (>38°5C, 101°F) lasting at least 10 days
• pain syndrome: headache ± joint, muscle, back pain
• no other focus of infection

Worksheet n° 3

Definition of cases of classic Dengue: suspected, probable, certain or confirmed cases

Suspected case:

A compatible clinical presentation is sufficient to suspect dengue. A suspected case of Dengue is defined by at least:

• high-grade sudden onset fever (>38°5C, 101°F) of less than 10 days duration

• pain syndrome: headache ± joint, muscle, back pain

• no other focus of infection

Probable case:

A probable case is:

• either a suspected case of dengue with at least two of the following:

1/ Skin rash

2/ Minor signs of hemorrhage (epistaxis, gingivorrhagia, meno-metrorrhagia, purpura…)

3/ Thrombocytopenia (platelets < 100,000/mm^3)

4/ CRP < 30 mg/l

• or a suspected case of dengue occurring during an epidemic

Certain or confirmed case:

A certain case is a suspected or probable case of dengue confirmed by the laboratory by one of the following:

- **identification of the dengue virus on sera or culture or by PCR**
- **evidence of specific IgM antibodies on sera (MAC-ELISA)**
- **significant serologic rise (4-fold) on two sera drawn 15 days apart.**

Worksheet n° 4

Definition of cases of severe Dengue

Probable case

A probable case of severe Dengue is a case of probable Dengue which does not meet the criteria for DHF±DSS but with at least one of the following signs of gravity:

1/ Manifestations of visceral bleeding

2/ Extensive manifestations of skin and mucosal bleeding

3/ Signs of shock (weak pulse, narrow pulse pressure, peripheral cyanosis, aoligo-anuria…)

4/ Other clinical signs of capillary hyperpermeability (effusion, thick bladder wall at ultrasound)

5/ Sudden drop in temperature associated with pronounced sweating, rapid weak pulse

6/ Malaise, syncope

7/ Neuropsychiatric disorders (agitation, torpor, lethargy…)

8/ Major persistent vomiting

9/ Intense or increasing persistent abdominal pain

10/ Hepatomegalia in children

11/ Major thrombocytopenia (platelets ≤ 30,000/mm^3)

12/ At least 10% rise in hematocrit compared with recovery level or average for age

13/ Hypoproteinemia ≤ 50 g/l and/or hypoalbuminemia ≤ 25 g/l

14/ ASAT ≥ 10 x N

15/ Hyperleukocytosis ≥ 15,000/mm^3

16/ Serum creatinine ≥ 200 µmol/l in cases with no known renal failure

Certain or confirmed case:

A certain or confirmed case of severe Dengue is a probable case of severe Dengue confirmed by the laboratory using one of the following methods:

- **identification of the Dengue virus on sera or autopsy specimens (liver biopsy…), culture or PCR**
- **evidence of specific IgM in sera (MAC-ELISA)**
- **significant rise in specific IgG (≤ 4-fold) on two sera drawn at least 15 days apart.**

Note: The group of clinical experts proposes reporting all cases to the DDASS physician, that is not only cases of confirmed or probable DHF± DSS, but also all cases of confirmed or probable severe dengue as well as all deaths occurring in a subject with suspected dengue. A common reporting form used for all situations is to be filled out and sent by the clinician to the DDASS as soon as possible.

Worksheet n° 5

Definition of cases of hemorrhagic Dengue fever with or without Dengue shock syndrome (DHF ± DSS)

The WHO definitions are retained.

Probable case of DHF:

A probable case of DHF is a suspected case with all 4 of the following criteria (1+2+3+4):

1/ Fever or recent episode of acute fever

2/ Objective manifestations of hemorrhage with at least one of the following signs:

a. **Positive tourniquet sign or equivalent[19]**
b. **Cutaneomucosal bleeding**
c. **Bleeding at points of injection**
d. **Visceral hemorrhage.**

3/ Thrombocytopenia ≤ 100,000/mm^3

4/ Plasma leakage with increased capillary permeability evidenced by <u>at least one</u> of the following:

a. **At least 20% rise in hematocrit compared with the recovery level or normal level for age**
b. **Effusion(s) (pleural effusion, ascitis……)**
c. **Hypoproteinemia < 50 g/l and/or hypoalbuminemia < 25 g/l**

Probable case of DSS**:**

A probable case of DSS is a probable case of DHF associated with at least one of the following:
A/ Rapid weak pulse
B/ Narrow pulse pressure (≤20 mmHg)
C/ Hypotension for age (PAS ≤ 80 mmHg for age < 5 years; PAS < 90 mmHg for age ≥ 5) or ≥ 30 mmHg drop in PAS compared with the subject's usual pressure
D/ Other signs of shock (cold clammy skin, agitation…)

<u>Case of certain or confirmed DHF±DSS:</u>

All cases of probable DHF ± DSS with laboratory confirmation using one of the following methods:

- **identification of the dengue virus on serum or autopsy specimen (liver biopsy…), culture, or PCR**
- **evidencing specific IgM antibodies in serum with MAC-ELISA**
- **significant rise in IgG titres (≥4-fold) on two sera drawn at least 15 days apart.**

[19] The tourniquet test is performed by inflating a blood pressure cuff to a point midway between the systolic and diastolic pressures for 5 minutes. A test is considered positive when 10 or more petechias per 2.5 cm (1 inch) square are observed. The test may be negative in case of shock, but generally becomes positive after recovery from shock.

Worksheet n° 6

Address this form to:

Reporting form
for cases of severe Dengue

Report to the DDASS

- **All cases of probable severe dengue (cf. definition criteria)**
- **All cases of probable or confirmed DHF+DSS (according to WHO criteria)**
- **All deaths occurring in patients with suspected dengue**

General data:

Name (initial):……..……First name:……Date of Birth: …/…/…
Address: ……

Risk factors**:** **Y** □ **N** □ **U**[20] □

Pregnancy □ **Immunodepression** □ **Hemoglobulin** □ **disease** □
Thrombocytopenia □

Clinical signs: **Date of onset: …/…/…**

1. Fever or recent episode of acute fever **Y** □ **N** □ **U** □

2. Manifestations of hemorrhage: **Y** □ **N** □ **U** □
If yes: - positive tourniquet sign or equivalent: **Y** □ **N** □ **U** □
- petichiae or purpura: **Y** □ **N** □ **U** □
- epistaxis, gingivorrhagia or menometrorrhagia: **Y** □ **N** □ **U** □
- extensive cutaneomucosal purpura: **Y** □ **N** □ **U** □
- visceral bleeding: **Y** □ **N** □ **U** □
indicate organ:……..
- others: **Y** □ **N** □ **U** □
describe: ……..

3. Signs of shock **Y** □ **N** □ **U** □
If yes: - rise in pulse disproportional/temperature: **Y** □ **N** □ **U** □
- narrow pulse pressure (< 20 mmHg) or hypotension: **Y** □ **N** □ **U** □
- other signs of shock: **Y** □ **N** □ **U** □
describe:……

4. Other clinical signs of gravity (see list of signs of gravity on following page):
Y □ **N** □ **U** □
If yes, describe: ……..….
……

Laboratory findings**:**

1. Thrombocytopenia (platelets < 100,000/mm^3): **Y** □ **N** □ **U** □
If yes: Lowest platelet count observed=……/mm^3

2. Significant rise in hematocrit (HT): **Y** □ **N** □ **U** □
(rise in HT ≥ 10% recovery HT or normal) **If yes: Maximal HT observed =…… "Recovery" HT =……**

3. Hypoproteinemia and/or hypoalbuminemia: **Y** □ **N** □ **U** □
If yes: Min Prot. obs =……g/l Min Alb. obs. = ……g/l

[20] **Unknown**

Worksheet n° 6 (continued)

Reporting form
for cases of severe Dengue

Laboratory confirmation:

- Positive culture and/or PCR **Y □ N □ U □**
- Positive for specific IgM **Y □ N □ U □**
- Rise in IgG titre serum 2 / serum 1 ≥ 4-fold **Y □ N □ U □**

Clinical course: **Death: Y □ N □ U □**

Hospitalization from ……/……/…… to ……/……/…… <u>If yes</u>, date of death …/…/…

Comments:……

Name of the reporting physician:…… Date of report: ……/……/……

Address: …… Telephone/Fax……

Other clinical and laboratory signs
of gravity of Dengue

1/ Other clinical signs of capillary hyperpermeability (effusions, thick bladder wall at ultrasound…)

2/ Sudden drop in temperature associated with profuse sweating, rapid pulse and major weakness

3/ Malaises, syncopes

4/ Neuropsychiatric disorders (agitation, torpor, lethargy…)

5/ Major persistent vomiting

6/ Intense or increasing or persistent abdominal pain

7/ Hepatomegaly in children

8/ ASAT ≥ 10 x N

9/ Hyperleukocytosis ≥ 15,000/mm^3

10/ Serum creatinine ≥ 200 mmol/l in patients without renal failure

Worksheet n° 7

Hospitalization criteria

Hospitalization is recommended for patients with suspected dengue who have:

EITHER:

➔ **<u>an associated potential risk factor</u> :**

- **pregnancy**
- **children under 1 year**
- **elderly subjects (≥70 years)**
- **immunodepression (HIV, lupus…)**
- **hemoglobin disease (sickle cell anemia……)**
- **chronic thrombocytopenia**

OR:

➔ **<u>at least one</u> of the following signs of gravity:**

- **manifestations of visceral bleeding**
- **extensive manifestations of skin or mucosal bleeding**
- **signs of shock (weak pulse, narrow pulse pressure, peripheral cyanosis, oligoanuria…)**
- **other clinical signs of capillary hyperpermeability (effusion, thick bladder wall at ultrasound)**
- **sudden drop in temperature associated with profuse sweating, rapid pulse, and major weakness**
- **malaises, syncopes**
- **neuropsychiatric disorders (agitation, torpor, lethargy…)**
- **major persistent vomiting**
- **hepatomegaly in children**
- **major thrombocytopenia (platelets ≥ 30,000/mm^3)**
- **at least 10% rise in hematocrit compared with recovery level or average for age**
- **hypoproteinemia ≤ 50 g/l and/or hypoalbuminemia ≤ 25 g/l**
- **ASAT ≥ 10 x N**
- **hyperleukocytosis ≥ 15,000/mm^3**
- **serum creatinine ≥ 200 mmol/l in patients without known renal failure**

Worksheet n° 8

Order form for laboratory confirmation of Dengue*

This form must be returned with the sample to:

……
……
……

1/ Identification of the prescriber:

Name: Dr……..……
Address: ……..……
Tel/ Fax:……

2/ Patient characteristics

Name:…… **First name:……..……**

Sex: M □ F □ **Date of birth: ……/……/……**

Residence (town and sector):……
……

Indicate any other possible site of contamination: ……

Vaccination against yellow fever: **Y □ N □ U □**

If yes, what year?……

3/ Chronological data:

Date of onset of clinical signs: **……/……/……**

Date sample was drawn: **……/……/……**

Stay outside usual residence during the 15 days preceding the onset of fever:
Y □ N □ U □

If yes, where?……

4/ Presence of at least one sign of gravity **(cf. list on following page):**

Y □ N □ U □

5/ Nature of examination ordered***

Viral isolation: □ **Search for IgM: □**

(by culture and/or PCR) **(by MAC-ELISA)**

Other, describe: ……

* **In case of an epidemic, orders for laboratory confirmation in case of suspected dengue should be limited, if possible, to atypical cases or severe forms.**
** **Unknown**
*** **The nature of the examination order depends on the delay between the onset of clinical signs (day 0) and the date the sample was drawn: viral isolation is not possible before day 5 and IgM antibodies can only be detected from day 5.**

Worksheet n° 8 (continued)

Order form for laboratory confirmation of Dengue

Signs of gravity of Dengue

A case of probable severe Dengue is a probable case with at least one of the following signs of gravity:

1/ Manifestations of visceral hemorrhage

2/ Extensive manifestations of skin and mucosal bleeding

3/ Signs of shock (weak pulse, narrow pulse pressure, peripheral cyanosis, oligoanuria…)

4/ Other clinical signs of capillary hyperpermeability (effusion, thick bladder wall at ultrasound…)

5/ Sudden drop in temperature associated with profuse sweating, rapid pulse and major weakness

6/ Malaises, syncopes

7/ Neuropsychiatric disorders (agitation, torpor, lethargy…)

8/ Major persistent vomiting

9/ Intense or increasing or persistent abdominal pain

10/ Hepatomegalia in children

11/ Major thrombocytopenia (platelets ≥30,000/mm^3)

12/ At least 10% rise in hematocrit compared with the recovery level or normal level for age

13/ Hypoproteinemia ≤ 50 g/l and/or hypoalbuminemia ≤ 25 g/l

14/ ASAT ≥10 x N

15/ Hyperleukocytosis ≥ 15,000/mm^3

16/ Serum creatinine ≥ 200 mmol/l in patients without known renal failure

The same reporting form[**] is used for all these different situations. The prescribing physician should fill out completely the reporting form and send it to the DDASS as soon as possible.

The prescribing physician should report all cases of probable or confirmed severe Dengue (*cf definition), all cases of probable or confirmed DHF±DSS (*cf. definition**) as well as all deaths occurring in patients with suspected Dengue to the DDASS.**

***, ** The definitions of cases and reporting forms may be requested from the DDASS (address, telephone)**

Worksheet n° 9

Guidelines for physicians and biologists for serologic and virologic surveillance of suspected cases of Dengue

1/ What tests should be ordered?

• For diagnostic purposes, anti-Dengue IgM antibodies or PCR are needed for all serious cases. Do not forget classic tests useful for determining the degree of severity (cell counts, platelets).

• For epidemiological purposes, serology and virology tests are essential. Sample volume must be sufficient for laboratory tests.

- **early samples (before the fourth day of disease) are needed for direct identification of the virus, in order to follow serotypes,**
- **late samples (after day 5-day 6) for serology, in order to detect early any outbreak and take action to protect persons in contact with the suspected case**

Note: for severe cases or atypical cases, an early sample is particularly useful (cell counts, serology, other tests…)

2/ Who should be tested?

For epidemiologic purposes, the rhythm and number of samples depends on the intensity of the Dengue virus circulation.

• During periods between epidemics, a maximum number of samples from suspected cases is needed to confirm diagnosis and determine the endemic serotypes.

• During early phases of an outbreak, a maximum number of samples should be obtained as rapidly as possible to confirm the epidemic and recognize which serotype(s) are circulating.

• When an epidemic has been confirmed, samples for serology and virology should be limited to severe or atypical cases.

3/ When should the samples be drawn?

• For virus isolation and PCR: before the fourth day of the disease

• For serology, from day 5-day 6 of the disease

• In case of death, serum and post-mortum biopsies (at most 12 hours after death)

Worksheet n° 9 (continued)

Guidelines for physicians and biologists for serologic and virologic surveillance of suspected cases of Dengue

4/ How are the results interpreted?

• Presence of IgM: recent infection by a flavivirus, probably a dengue virus.

• Absence of IgM:

- **Sample before day 5 after onset of clinical signs: sample taken too early, check with second serum**
- **Sample between day 5 and day 10: take another sample**
- **Sample taken after day 10: absence of recent Dengue**

5/ Conditions for sample taking and transportation

• Samples for serology and virology should be drawn on dry tubes (or if impossible, on any type of tube), and held at +4°C before transportation as rapidly as possible on ice to the laboratory performing the tests.

• For Martinique and Guadeloupe, serum samples should be collected twice a week from city medical laboratories.

• These collected sera are then sent on carbo-ice once a month to the National Reference Center for Surveillance of Arboviruses for the Antilles-Guyane Region of the Guyane Pasteur Institute. These sera concern early samples from subjects with suspected Dengue. They are preserved at –80°C.

• For diagnosis of severe (fatal) forms, post mortem biopsies should be obtained for pathology study (on Bouin's fluid or formol) and for virology study (freeze at –80°C). Biopsies should be obtained at least from liver and possibly other target organs.

The order form for laboratory diagnosis of Dengue MUST be filled out and sent with all samples for laboratory confirmation of Dengue (serology and virology)

Appendix 5

Dengue Surveillance Systems*
Operational aspects and data transmission circuits – Summary table

	Sentinel physician network	Serology surveillance	Reporting of severe cases of Dengue	Serotype surveillance by the DLH or Pasteur Institutes	Serotype surveillance by Armed Forces Health Services
Head	**DDASS, Sanitary actions service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**
Information source	**Participating primary care and hospital physicians (pediatrics, emergency, medicine wards)**	**Primary care and hospital physicians City and hospital laboratories Pasteur Institutes/DLH**	**Hospital physicians (and network physicians)**	**Pasteur Institutes DLH NRC**	**Armed Forces Health Services NRC and/or Pharo**
Collection tool	**Weekly report (age, address, severity, case in contact persons)**	**Data sheet (age, address, date of signs, date of sample, severity) + Laboratory report**	**Reporting form**	**Summary table**	**Summary table**
Collection method	**Telephone**	**Fax**	**Fax, telephone (if call from serology data sheets or if sentinel physician) then fax**	**Fax**	**Fax**
Who collects data?	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**
Delay, rhythm	**Every Monday and Tuesday**	**The day the results are obtained**	**The day of diagnosis**	**Monthly or the day of the results in case of an outbreak**	**Monthly or the day of results in case of an outbreak**
Data processing	**Computerized. Automatic report (No. cases by age, town and/or quarter, severity)**	**Computerized. Automatic report (No. cases by age, town, and/or quarter, severity)**	**Computerized. Automatic report (No. cases by age, clinical description, associated factors, DHF…)**	**—**	**—**
Who processes data?	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**
Rhythm of data processing	**Weekly**	**Weekly**	**Case by case, monthly or more often**	**Monthly, or the day results are received**	**Monthly, or the day results are received**
Regular feedback tool	**Summary table of suspected cases, serology orders, confirmed cases, severe cases, serotype results**	**Summary table of suspected cases, serology orders, confirmed cases, severe cases, serotype results**	**Summary table of suspected cases, serology orders, confirmed cases, severe cases, serotype results**	**Summary table of suspected cases, serology orders, confirmed cases, severe cases, serotype results**	**Summary table of suspected cases, serology orders, confirmed cases, severe cases, serotype results**
Feedback method	**Telephone, faxed report**	**Faxed report**	**Telephone, faxed report**	**Telephone if new serotype, faxed report**	**Telephone if new serotype, faxed report**
Rhythm of feedback	**Weekly (telephone) Weekly (LAV) Monthly or bi-monthly (other recipients)**	**Weekly (LAV) Monthly or bi-monthly (other recipients)**	**The day of the report**	**Monthly (other recipients)**	**Monthly (other recipients)**
Recipients	**LAV, sentinel physicians, hospital units, CIRE, General Counsel (Health Action) private laboratories…**	**LAV, sentinel physicians, hospital units, CIRE, General Counsel (Health Action) private laboratories…**	**LAV, sentinel physicians, hospital units, CIRE, General Counsel (Health Action) private laboratories…**	**LAV, sentinel physicians, hospital units, CIRE, General Counsel (Health Action) private laboratories…**	**LAV, sentinel physicians, hospital units, CIRE, General Counsel (Health Action) private laboratories…**
Who controls feedback	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**	**DDASS, Sanitary action service**

* **If some of the epidemiology surveillance activities are delegated, a convention should indicate the operational procedures for the system and the role of each participant.**

SUMMARY

Dengue is considered to be an emerging disease with a growing geographical distribution and increasing severity in all tropical and sub-tropical regions of the world.

Up to recently, the Caribbean region was spared from severe forms of the disease. It was not until the 1980s that the first cases of Dengue hemorrhagic fever were reported. Thus after the deadly epidemics which occurred in Cuba in 1981, then in Venezuela in 1989 and 1990, epidemics occurred in the French Departments of America (FDA), in Guyane in 1991 and in Guadeloupe and Martinique in 1994 and 1995.

In 1997, an unprecedented Dengue epidemic caused nine deaths in the French department of Martinique. The French Ministry of Health thus decided to conduct an evaluation of the currently operating entomological and epidemiological surveillance systems in the French departments of Antilles and Guyane.

The results of these evaluations led to discussions among about forty experts who met in a workshop on June 8-10, 1998 at Fort-de-France in response to an initiative taken by the Antilles-Guyane Regional Epidemiology Unit (CIRE) and the National Institute for Public Health Surveillance (InVS).

It was felt that it would be useful for all those participating in the fight against Dengue to have information on the procedures followed in these discussions leading to the elaboration of guidelines which could in the future be used by the Ministry of Health to guide Dengue surveillance. This was the goal of this document.

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