RegioneEmilia-Romagna

REGIONAL PLAN OF THE EMILIA-ROMAGNA REGIONAL AUTHORITY FOR THE FIGHT AGAINST THE ASIAN TIGER MOSQUITO AND THE PREVENTION OF CHIKUNGUNYA AND DENGUE FEVER – YEAR 2008

CONTENTS

1 FOREWORD

A Chikungunya virus epidemic outbreak occurred during summer 2007 in the areas of Ravenna, Forlì-Cesena, Rimini and Bologna. It has thus proven that vector-borne diseases can spread not only in tropical areas but also in all those sites where the vector (in this case the Asian Tiger Mosquito - Aedes albopictus) is present.
This new scenario is due to the massive presence of carrier insects that are responsible for the transmission of this type of diseases in the Emilia-Romagna Region. It requires an overhaul and timely adoption of effective and sensitive pest control measures as well as health surveillance systems.
These measures are not only required by international health authorities, but they have become absolutely necessary to avoid the recurrence of epidemic outbreaks, like the one that emerged last summer in the Emilia-Romagna Region, which is likely to cause not only public health problems but also serious damage for our regional economy.

The disease transmission risk depends on two factors:

a) Risk of virus introduction through the presence of an infected person in the viremia phase;
b) Risk of virus transmission through competent and efficient vector insects (infestation intensity rate, ethobiological characteristics, etc.).

An outbreak may develop not only from the presence of the vector in a certain area and on the infestation intensity rate, but also on the population living habits, on the readiness of individuals and communities to co-operate for the reduction of larval breeding grounds, on the availability and use of individual protection means against mosquito bites.

Hence, the prevention strategy relies on two main pillars:

a) Asian Tiger Mosquito control and entomological surveillance, by reducing the mosquito population density as much as possible;

b) Early detection of suspect cases and immediate implementation of control measures aimed at preventing any virus transmission from an individual to mosquitoes and from mosquitoes to another individual.

The struggle must be fought on both fronts, since none of these two factors, which must be in place for the disease transmission (i.e. presence of subjects coming from endemic areas whose blood is infected with the virus and presence of the Asian Tiger Mosquito), can be fully eliminated. Therefore, the only possible strategy is a two-fold action, aimed at minimizing the likelihood that both factors are combined.

The Regional Plan has been launched for the prevention of both Chikungunya and Dengue fever, even though, in laboratory conditions, the Asian Tiger Mosquito is competent for the transmission of a large number of Arboviruses, including several forms of Flavivirus, Bunyavirus and Alphavirus: which include West Nile, Sindbis (present in the Mediterranean area), Yellow Fever and many others.
In field conditions, the Asian Tiger Mosquito proved to be competent for the transmission of:

3 Flavivirus (Dengue, West Nile and Japanese Encephalitis),

6 Bunyavirus (Jamestown Canyon, Keystone, LaCrosse, Potosis, Chache Valley Tensaw),

2 Alphavirus (Chikungunya, Eastern Equine Encephalitis).

The decision to deal only with Chikungunya and Dengue was made based on the following considerations:

1. epidemiological criteria linked to the likelihood that an individual in the viremia phase may be in the Emilia-Romagna region:
    a. Chikungunya affects about 1.5 billion people in the world, with a few million people who are affected every year and a resurgence of the Chikungunya virus under way,
    b. Dengue affects about 2.5 billion people in the world, with 50 million people who are affected every year; 2007 was an epidemic year throughout the world and over the past few years, with a progressive increase in the number of imported cases in the Emilia-Romagna region;
2. similarity of both diseases from a clinical point of view and the practicability of a single surveillance system;
3. presence of a specific surveillance system in the veterinary field for West Nile, which is another major disease from an epidemiological point of view, even though it is characterized by a more complex epidemiological cycle and by a different human infection frequency.

Yet, a prevention campaign against Chikungunya and Dengue is required to raise knowledge and attention of the regional health system, and in particular of Operational Infectious Disease Units, on all the imported diseases.

The objectives of the “Regional Plan of the Emilia-Romagna Regional Authority for the fight against the Asian Tiger Mosquito and the prevention of Chikungunya and Dengue Fever” are:

1. optimization of the fight against the Asian Tiger Mosquito to reduce the pest population rate as much as possible,
2. early detection of the presence of potentially viremic patients in view of an immediate and coordinated implementation of health protection measures.

The Regional Plan, which has been designed taking into account the specific situation of the Emilia-Romagna region, complies with the national rules and regulations in the field, with special reference to the compulsory transmissible disease notification scheme, surveillance and control system, international prophylaxis measures and international movement control of goods, blood donations and organ and tissue sampling.

2 EPIDEMIOLOGICAL SITUATION AND SCENARIOS

2.1 National surveillance system of Chikungunya and Dengue

The Ministerial Decree ***15.12.1990 "Information system of diffusion and infectious diseases"*** envisages that any suspected cases of Chikungunya and Dengue fever are to be reported and notified in class V without any particular diagnostic criteria to be met as early as possible.

The system also includes both probable and confirmed cases: individual cases are notified by the Local Health District (USL) to the Regional Authority on a monthly basis and on an annual basis to the Health Ministry.
No surveillance fact sheet is envisaged.

The ***circular letter of the Health Ministry dated August 4th 2006 "Surveillance of Chikungunya"*** sets up a special surveillance system for Chikungunya cases, in relation to the Chikungunya virus epidemic outbreak occurred in the Indian Ocean.
Every suspected or confirmed case must be reported on the specific notification sheet within 48 hours since onset at the same time to:

- the competent Public Hygiene Service (that shall inform the Regional Authority);
- the Health Ministry (Office V - International Infectious Diseases and Prophylaxis);
- the National Health Institute (Infectious diseases Epidemiology Department – National Epidemiology Centre, Surveillance and Health Protection)

In the event of a confirmed case, it must also be reported to:

- the Reference Centre for the surveillance and control of Aedes albopictus in Italy of the National Health Institute (Vector-borne Disease and International Health Department).

The national surveillance system, which is now in place, has set out the following criteria to be implemented for case definition:
By **suspected case** it means a patient with:

- Chikungunya clinical symptoms (sudden onset of fever, shivers, cephalalgia, nausea, vomiting, joint pain with or without phlogosis signs, pain in the lower part of the trunk, and skin rash)
- non confirmed by laboratory test
- positive epidemiological criteria (travelling to an endemic or epidemic area for this disease).

For every suspected case it is necessary to go through the diagnostic procedure at the national reference centres for the laboratory diagnosis.

By **confirmed case** it means a patient with:

- Chikungunya clinical symptoms (please refer to the clinical presentation);
- confirmed by laboratory test (PCR or antibody search).

The national surveillance system is therefore designed to register cases for epidemiological purposes, but it is not designed to implement immediate control measures to stop the spreading of the disease, except for Chikungunya starting from August 2006.
That is why, during the summer 2007 epidemic outbreak, the E-R Regional Authority introduced a surveillance system based on different criteria, and an early case reporting system, designed in 2005 and implemented since 2006 in the Region.

The surveillance system envisaged for 2008, described in the following specific chapter, features a few relevant differences as against the above mentioned national system.

2.2 Dengue and Chikungunya cases imported in the Emilia-Romagna region

2.2.a Dengue

The first case reported in the regional archives (updated since 1999) dates from the year 2000; a further case was reported in 2005. Four cases were reported in 2006 and then six in 2007. These are all imported cases that have been confirmed by laboratory.

The progressive increase in the number of reported cases is undoubtedly linked to the increase in the number of journeys abroad and to the epidemiological evolution of Dengue in the world, but also to a progressive improvement of the sensitivity of the surveillance system, as we are led to think if the number of cases reported in 2007 (three) after the Chikungunya epidemic outbreak is taken into account.
Given the above mentioned considerations, no assessment can be made about the time interval between the identification of a case and its reporting, and between this and the diagnostic confirmation, except for the most recent cases that have been managed by the system, which has been implement to address the Chikungunya epidemic; similarly, reporting has not led to the implementation of any pest control treatments, not even during the times of the year when the vector was present in the Region.

2.2.b Chikungunya

The surveillance system recorded 2 imported cases in 2006, one from Mauritius and another one from India, respectively in April and in November, the former confirmed and the latter probable.

Three further cases were recorded in 2007, all of them coming from India: the first one was the epidemic index case, whereas the two other ones have been reported successively, when a close attention was paid to the issue.

2.3 Description of the 2007epidemic outbreak

The Chikungunya virus epidemic outbreak occurred during summer 2007 in the areas of Ravenna, Forlì-Cesena, Rimini and Bologna.
If the index case coming from a journey to India (region of Kerala) is ruled out, the first case dates from July 4th, whereas in the last case the onset of symptoms dates from September 28th. 337 suspected cases were reported, 217 out of which were confirmed as positive by laboratory test, 30 were classified as probable since patients refused to receive the blood test, whereas for the remaining 89 patients, tests proved to be negative. Figure 1 shows the epidemic curve of confirmed and probable cases, thus showing the time distribution of cases since the onset date of symptoms.
The original outbreak developed in Castiglione di Cervia and Castiglione di Ravenna, where 142 confirmed cases were recorded; the epidemic outbreak then spread out, thus giving rise to smaller secondary outbreaks (Cervia with 19 cases, Ravenna with 9

cases, Cesena with 15 cases, Bologna with 5 cases and Rimini with 6 cases); further sporadic cases were recorded in various spots in the same area (figure 2).

Fig.1

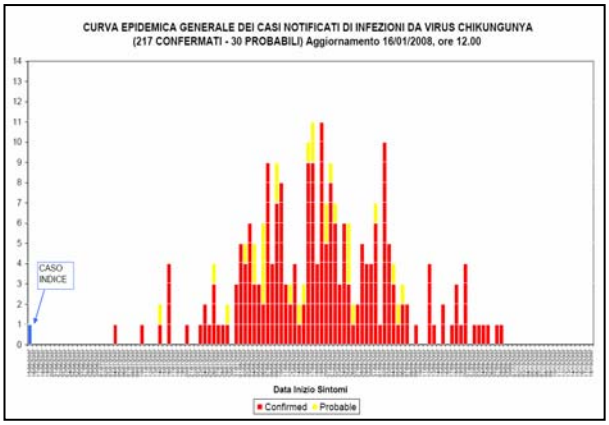

Fig.2

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16/01/2008

The distribution of positive confirmed cases by sex is rather homogeneous (45.6% males, 54.4% females). Cases are mainly concentrated in the more elderly population age bracket: as a matter of fact, 42% was older than 65, with an average age of about 57 years. As for the symptoms, 94.5% of cases reported fever, 93.6% arthralgia, 53.5% skin rash, in a few cases itching and in 94.5% of cases asthenia, 49.8% myalgia and, finally 50.2% cephalalgia.
The first case was reported to the Public Health Department of the Local Health District of Ravenna on August 9th. During the following days an epidemiological investigation was immediately started, thus making a first list of 47 cases already starting from August 14th. The first extraordinary pest control treatment of the whole centre of Castiglione di Cervia was carried out during the night between August 18th and 19th. Between August 23rd and 27th, pest control activities were systematically extended, covering the whole epidemic area. On August 29th the Emilia-Romagna Regional Authority passed the first regional directive addressed to all the Regional Local Health Districts to implement a surveillance system throughout the whole regional territory. The day after, following a laboratory confirmation by the National Health Institute, Chikungunya cases were confirmed and further regional provisions were made in order to implement emergency management procedures. Finally, on August 31st, the Chikungunya virus was isolated by the laboratory of the Experimental Zooprophylactic Institute of Lombardy and Emilia-Romagna, on a sample of Asian Tiger Mosquitoes collected in the area of Castiglione di Cervia and Ravenna.

2.4 CLASSIFICATION OF THE REGIONAL TERRITORY

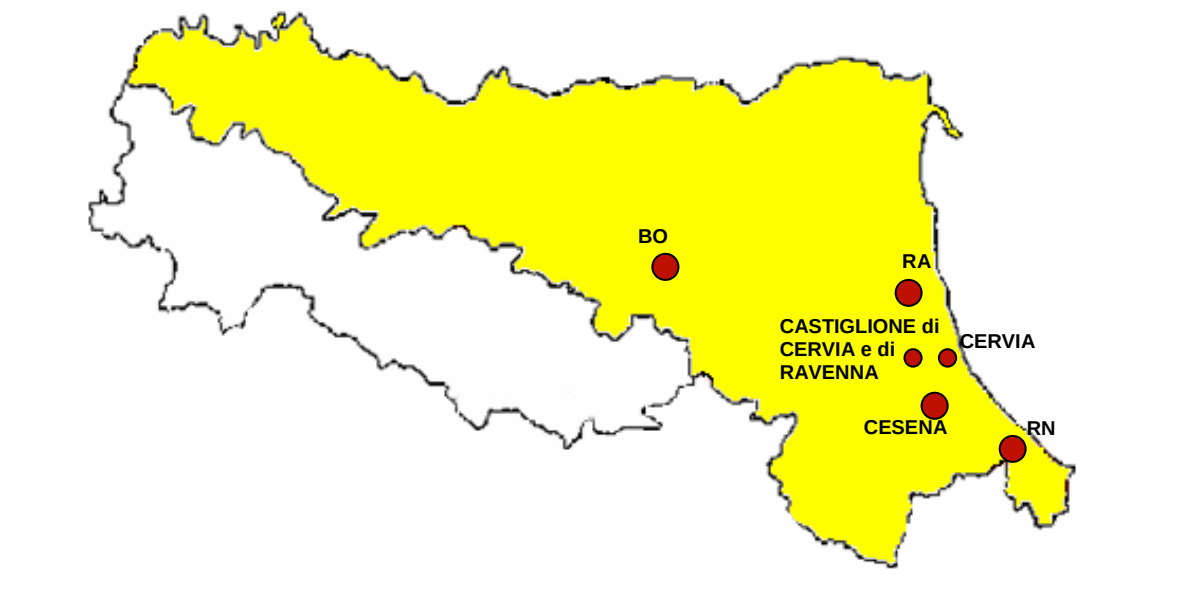
For the purposes of the Plan, the regional territory has been subdivided into the following areas where different types of actions have been planned, as specified in the following chapters:

Area A (white): absence of the Asian Tiger Mosquito.

Area B (yellow): presence of the Asian Tiger Mosquito and absence of previous or present cases.

Area C (red): local transmission with two or more autochthonous cases in 2007. This area corresponds to the Municipality or neighbourhood/hamlet, according to the map reported under item 5.2.

Area D (red): presence of local transmission in 2008 corresponding to the Municipal territory.



2.5 Scenario

Concerning the different scenarios that emerge, the following phases have been identified during which specific actions are undertaken, as described in the following chapters .

Phase 0 – absence of cases or only imported cases;

Phase 1 – presence of one or more isolated indigenous cases or of only one small outbreak of indigenous cases;

Phase 2 – presence of a multiple outbreaks of indigenous cases;

Phase 3 - presence of several large-sized outbreaks of indigenous cases with a high attack rate outbreak (higher than 5%).

3 PLANNING AND COORDINATION

The Regional Plan includes actions under the direct responsibility of the Regional Health Service (health surveillance, diagnosis and control measures to stop the spreading of the disease) and other actions within the remit of Municipalities (pest control activities).
Pest control is the main pillar of the Plan. It is under the two-fold responsibility of two institutions: the Local authorities, and the Municipalities in particular, which are responsible for the direct management of pest control activities (ranging from entomological surveillance to the assessment of expected results on infestation rate) and the Regional Health Service, which is responsible for the assessment of the pest control health impact and for the co-ordination of disease control activities in the event of suspected or confirmed cases.
Hence, there is the need for an effective co-ordination of activities at a regional level. This is the task to be accomplished by the Regional Government and by its technical departments and, at a local level, by the Provincial Authorities (in partnership with the various Municipalities). A specific role is to be played also by the so-called Local Health and Social Conference that serves as an ideal liaison between the health system and the local authorities' system.

3.1 Regional Level

At a regional level, the activities envisaged by the Plan are co-ordinated by the Councillor for health policies, in the framework of the Directorate General for Health and Social Policies: at a technical-operational level, the co-ordination of activities envisaged by the Plan under the responsibility of the Directorate General Services, is entrusted with the Public Health Service in partnership with the Regional Health Agency.

The already existing organization facilities shall be used for the implementation of the new plan. It should also be underlined that the Emilia-Romagna Regional authority has already adopted a few provisions that outline the operational guidelines to address public health emergencies.

As a consequence, during phases 0 and 1 the implementation and co-ordination of actions are under the responsibility of the Directorate General for Health and Social Policies, in liaison with Local health authorities and Hospital Trusts and University-Hospital Trusts at a local level.
The Directorate General for Health and Social Policies is supported from the technical and scientific point of view by the ***Regional Group for the surveillance and the fight against the Asian Tiger Mosquito and*** by the ***Technical and scientific committee***, which have already been set up by formal provisions in order to co-ordinate the various actions.

During the following phases 2 and 3, when more demanding pest control activities are required, the so-called **Regional Crisis Unit for public health emergencies** is in charge. It is chaired by the Councillor for health policies, with planning, co-ordination and control tasks for the implementation of disease control measures; it is responsible

for the development and implementation of guidelines, reference standards and procedures, information, training, and development of formal tools (circular letters, provisions, decrees by the President of the Regional Government) for the implementation of decisions. The members of the Regional Crisis Unit for public health emergencies are appointed by the Regional Government.
The shift from phase 2 to phase 3, as defined under item 2.5, is formally decided upon by the President of the Regional Government on proposal by the Regional Crisis Unit for Public Health Emergencies.

The Regional Crisis Unit for Public Health Emergencies, mainly through the Public Health Service, is operational on a 24/7 basis and serves as liaison with the Health Ministry, the other Regional and Autonomous Provincial authorities and other institutions (Civil Protection Department, Air and Border Health Board, Prefectures, etc.) also with a view to co-ordinate all the necessary planning and operational activities.

At any stage, the President of the Regional Government can call the state of emergency at a regional level, according to article 8 of regional law no. 1/2005; in this event, the institutional co-ordination of emergency activities shall be under the responsibility of the Councillor for health policies.

3.2 Local level

3.2.a The fight against the Asian Tiger Mosquito

Programmes and actions decided upon at a regional level must be implemented locally, in a co-ordinated planning framework that takes into account the specific situation and local needs (scope of action, infestation rate, etc.). This local co-ordination unit must put in place homogenous actions and an effective management, also fostering co-operation with smaller municipalities for an effective infestation surveillance and result assessment and control. It must also implement the necessary procedures to tender the pest control activities.

For this purpose a ***Local co-ordination unit*** must be appointed with the involvement of all the Municipalities and the local health authority competent for that territory, led by the local Health and Social Conference or by the Provincial authority, based on a local agreement, by taking into account the idea to set up a local unit under the direct control of Municipalities, according to the specificities that have been identified at a local level. The local co-ordination unit must receive the technical support of the Public Health Departments of the Local Health Districts and of the technical Services and Departments of the Local authorities.
Every Local co-ordination unit must draft a ***"Local Programme for the fight against the Asian Tiger Mosquito"*** by March 31st 2008, which shall be assessed and approved by the Regional authority with the support of the *Regional Group for the surveillance and fight against the Asian Tiger Mosquito .*
ANNEX 1 reports the list of institutional and organizational partners of every local co-ordination unit.

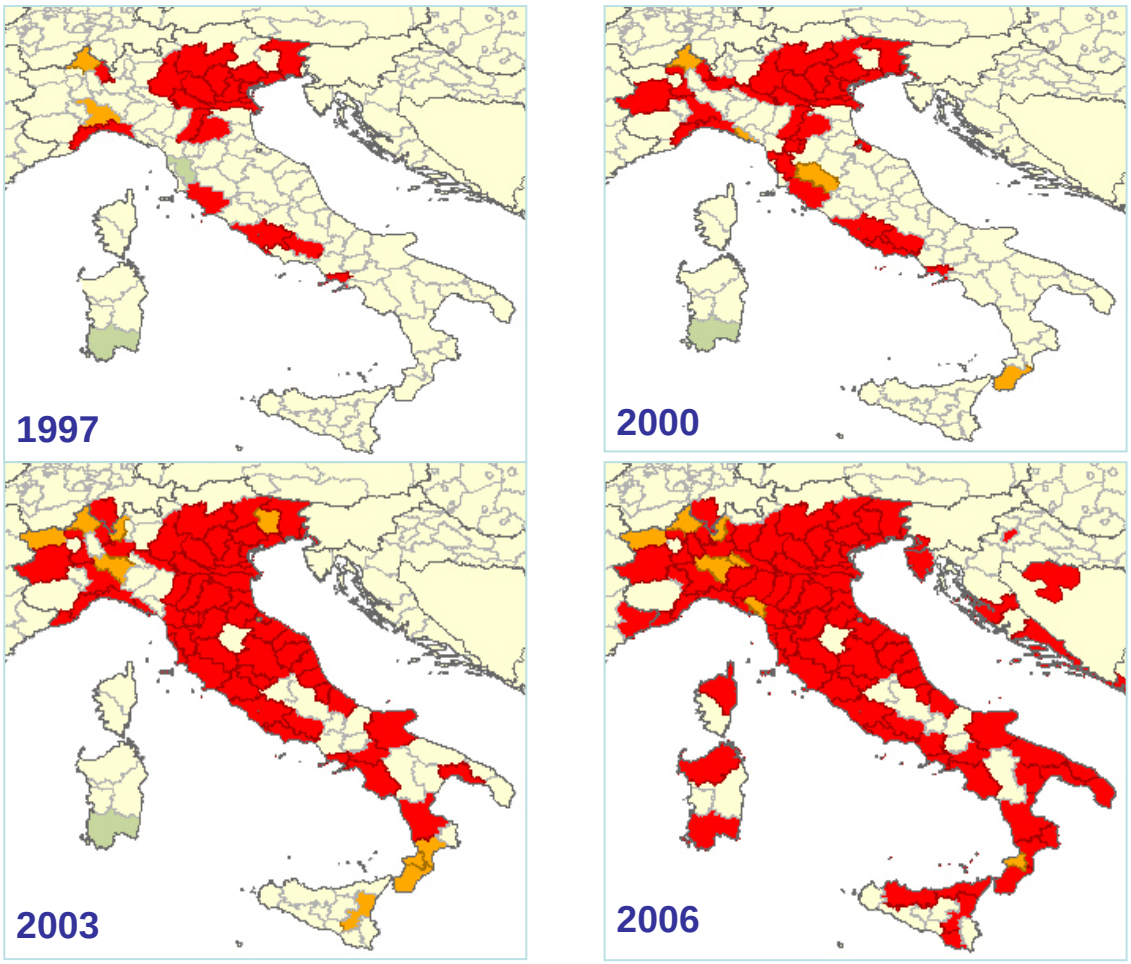
3.2.b Health surveillance and control of Asian Tiger Mosquito borne diseases

Local Health Districts, in liaison with Hospital Trusts and University-Hospital Trusts, are responsible for the implementation at a local level of infection prevention and control measures set forth at a regional level.
Local Health Districts shall formally appoint a **manager**, who shall report to the Local Health District management, with the support of all the main organizations and/or functions involved.
Similarly to what already happens at a regional level, the district organization shall be available on a 24/7 basis during the phases and periods when this is deemed necessary.

4 THE FIGHT AGAINST THE ASIAN TIGER MOSQUITO

The Asian Tiger Mosquito in Italia

The first *Aedes albopictus* cases ever reported in Italy date back to the early 1990's, when this vector was first introduced in Italy through the trading of second-hand tyres. After its introduction the species rapidly spread throughout the territory (see following maps[1]) thus showing a high adjustability degree to the environmental conditions of our country.



The Asian Tiger Mosquito in Emilia-Romagna

The first cases of Asian Tiger Mosquitoes were reported in Emilia-Romagna Region in 1994, close to a large deposit of second-hand tyres that had been imported by a company trading with non-EU Countries, such as the U.S.A. and Japan. Initially, few Municipalities only were involved. Then, over the following decade, the Aedes albopictus progressively spread to the main towns and to almost all the municipalities

[1] Scholte E-J and Schaffner F, 2007. Waiting for the tiger: establishment and spread of the *Aedes albopictus* mosquito in Europe. *In: Emerging pests and vector-borne diseases in Europe* (Editors Willem Takken and Bart Knols). Chapter 14: pp 241-260, su dati di R.Romi e R.Bellini

located on the plain or in low hills of each Province. Starting from summer 2003, the presence of the Asian Tiger Mosquito was massively recorded in all the Municipalities, except for those located in the hills or in the mountains, thus becoming a serious nuisance for the resident population. In many cases, the infestation took many local authorities by surprise, especially those that had never experienced this kind of problem with other mosquito species in the past. At present, in the Emilia-Romagna Region, most Municipalities that are located in areas below 500 m a.s.l. are infested during the April-October period. In a few sites located on the plain and along the coast the infestation period often extends until late November. The maximum density of the mosquito adult population is normally reached in the period between mid August and mid September and is anyway related to weather and climate conditions (temperature, rainfall, wind), to the area characteristics (urban, rural, coastal or hill location) and to the microhabitat characteristics (scope and volume of the outbreak, insolation degree, etc).

4.1 Entomological surveillance

4.1.a Entomological surveillance objectives

The Emilia-Romagna Region has since long implemented a surveillance system against the Asian Tiger Mosquito infestation mainly based on the use of ovitraps and on the active search of adult mosquitoes and larvae on the territory.

The regional plan intends to further strengthen this surveillance system against the infestation of *Aedes albopictus* by increasing the number of ovitraps located on the territory to obtain a quantitative evaluation of the number of pests (see following paragraph). In addition to that, entomological surveillance activities shall be carried out for an early detection of newly coming vectors, such as *Aedes aegypti*, and of infected vectors coming from countries where Dengue and Chikungunya are endemic.

4.1.b Vector import risk

It should be pointed out that the surveillance of the risk of importing mosquitoes that are potentially infected by arbovirus is under the responsibility of the Health Ministry and that the European Commission has alerted the Member States (Ref. EU/2006/007 April 12 2006 addressed to Customs Agencies) about the danger of Chikungunya virus spreading, though the import and transport of cut flowers and of (new and second-hand) tyres coming from the countries where the disease is present, since mosquitoes and their potentially infected larvae might breed in them.

In 2007 the “Public health” and “Veterinary and Food Hygiene” Services of the Emilia-Romagna Region already launched a health entomology project before the Chikungunya outbreak took place (in compliance with the Regional Government resolution no. 1326/2007). The idea was to set up a surveillance system, on the one hand with the aim to provide information about the mosquito populations (population presence and dynamics) with reference to potential and detected vectors, pathogen agents and, on the other hand, to control, through proper laboratory investigations, the presence of pathogen agents within the human and vector population and pets.
Among the various activities, the plan envisaged the entomological surveillance of a few vectors, by means of:

- A study of the population biology and dynamics in the environment, through a few monitoring campaigns in a few specific sites, such as: the port of Ravenna, the airport of Bologna, sites at risk of vector introduction (such as second-hand tyre trading, etc.),
- Capture of adult mosquitoes by means of suitable systems,
- Mapping and georeferencing of controlled sites.

4.1.c Monitoring by means of ovitraps

Monitoring by means of ovitraps, based on the number of eggs laid in containers that attract pregnant female mosquitoes, is an indirect surveillance method that can provide information about the development of the adult population. Data collected by means of a specific arrangement of ovitraps on a regular grid and interpreted with respect to weather and climate data are “proxy indicators”, that is, they can give a rough description of the degree of infestation.

The objective of the monitoring network that has been arranged for 2008 in the Emilia-Romagna region is to assess the level of Asian Tiger Mosquito infestation in all provinces and in major urban centres, through a quantitative definition of the number of eggs.

4.1.d Execution of monitoring activities

Ovitraps shall be positioned in the area by staff of the Department of Public Health, in collaboration with municipality experts, in consideration of the need for homogeneous distribution and after assessing the microclimate conditions of the selected site. Samples shall be collected on a weekly basis by staff selected and trained by the municipalities, and shall be analysed by the laboratory network of the regional environmental agency (ARPA), which shall also compare them to ensure that data is homogeneous.

4.1.e Criteria utilised when choosing the number of ovitraps to position in the area

Based on the analysis of data from the monitoring activities performed in previous years (2005-07), data collected from ovitraps can be compared and analysed only when at least 30-40 of them are located in the area, regardless of the size of the area; it follows that, in order to have an effective system, villages or small towns shall be included in the monitoring network only after completing the provincial monitoring network.

The size of the urbanised area was used to define the number of ovitraps to be placed. Towns and villages without any Asian Tiger Mosquito infestation were not included in the monitoring system.

1. Towns and villages with an urbanised area of 0 - 600 ha

The number of ovitraps was defined based on table 1 below:

Table 1 Criterion utilised for urbanised areas below 600 ha

URBAN AREA (ha)		Min.	Max
0	100	0	5
101	500	6	11
501	600	12	17

2. Towns with an area of 601 - 3000 ha

The number of ovitraps was calculated on the basis of the 2007 monitoring data utilising a level of accuracy of 70 % (D=0.3) or, when there were no data or insufficient data for 2007, by utilising a theoretical figure of 50 ovitraps (table 2).

3. Towns with an area of 3001 - 5000 ha

The number of ovitraps was calculated on the basis of the 2007 monitoring data utilising a level of accuracy of 70% (D=0.3) or, when there were no data or insufficient data for 2007, by utilising a theoretical figure of 60 ovitraps (table 2).

4. Towns with an area above 5001 ha

The number of ovitraps was calculated on the basis of the 2007 monitoring data utilising a level of accuracy of 70% (D=0.3) or, when there were no data or insufficient data for 2007, by utilising a theoretical figure of 70 ovitraps (table 2).

Table 2. Number of ovitraps in Municipalities with an urban areas above 600 ha

Town	**Ovitraps 2007**	**Ovitraps 2008 (D=0.3)**
Lugo	17	35
Carpi	18	50*
Riccione	18	50*
Piacenza	20	52
Parma	22	90
Reggio	25	49
Ferrara	73	44
Bologna	150	103
Faenza	Few data	50*
Cervia	Few data	50*
Imola	No data available	50*
Modena	No data available	60*
Castelfranco Emilia	Insufficient data	50*
Finale Emilia	Insufficient data	50*
Fiorano	Insufficient data	50*
Formigine	17	24
Mirandola	Insufficient data	50*
Sassuolo	Insufficient data	50*
Vignola	10	47
Correggio	No data available	50*
Zola Predosa	No data available	50*
Casalecchio di Reno	No data available	50*
*Theoretical figure		

5. The city of Bologna (the only town with an area > 5000 ha)

Because of the size of the city of Bologna, a monitoring system was established that provides the opportunity to make comparisons among segments of the city area. In particular, the following is envisaged:

- The use of 103 ovitraps will provide a city average
- The use of 120 ovitraps will provide a significant figure for the comparison of two segments of the city area
- The use of 150 ovitraps will provide a significant figure for the comparison of three segments of the city area

6. The main cities in the Romagna Wide Area (Cesena, Forlì, Ravenna, Rimini):

In these 4 cities, the number of ovitraps was calculated on the basis of the 2007 monitoring data (infestation density) utilising a level of accuracy of 80% - D=0,2 (tab.3), that is, higher than in the other cases; this is due to the establishment of some synergy with the research project aimed at defining the relation between ovitraps data and other infestation indicators, which are based on the number of active and/or potential breeding grounds (*House index, Breteau index*, etc.)

Table 3 Number of ovitraps in the main cities in the Romagna Wide Area

Main city	No. of ovitraps
Cesena	123
Forlì	141
Rimini	94
Ravenna	86

7. The provincial level

On the basis of the 2007 monitoring data, and utilising a level of accuracy of 80%, a minimum number of ovitraps was defined to be used at provincial level, to obtain the best possible figure from the monitoring system (table 4).

Table 4. Number of ovitraps per province

Province	Optimal number of ovitraps
Bologna	182
Forlì-Cesena	239
Ferrara	141
Ravenna	190
Reggio Emilia	178
Modena	180
Rimini	189
Parma	174
Piacenza	156

4.2 Control measures against the proliferation of the Asian Tiger Mosquito

With reference to the control measures against the proliferation of the Asian Tiger Mosquito 4 types of actions can be identified:

- ordinary measures are envisaged in all the Municipalities with the presence of the vector, to be carried out during Phases 0, 1 and 2 (see following paragraph 4.2.a),
- in those areas where indigenous cases occurred in 2007, extraordinary "door-to-door" pest control measures are envisaged with larvicidal treatment of the breeding grounds that cannot be eliminated and removal of all potential larval breeding grounds that can be eliminated (see following paragraph 4.2.b),
- measures are envisaged when there are certain or suspected cases (see following paragraph 4.2.c),
- other measures are envisaged on all the regional territory, also in areas that are not directly concerned with breeding grounds (Areas D and B), in case of presence of several large-sized outbreaks of autochthonous cases with a high attack rate outbreak (Phase 3, possibly Phase 2), (see following paragraph 4.2.d).

4.2.a Ordinary control measures against the proliferation of the Asian Tiger Mosquito in the whole area

Ordinary control measures that are carried out in the framework of the fight against the Asian Tiger Mosquito include the following activities:

- Periodical larvicidal treatment in public road drains and education and awareness-raising activities addressed to citizens in the management of private areas;
- Adulticiding in areas concerned with especially intense infestation and in sensitive sites such as schools, hospitals, nursing homes, etc. (after hearing the opinion of the Public Health Department of the Local Health District competent for that territory).

Here as follows a short description of larviciding and adulticiding treatments is provided; for a more detailed description please refer to the technical specifications issued by the Councillor for health policies on January 2nd 2008 (P.G. /2008/101).

1. Larvicidal treatment

The whole urbanised area is subject to larvicidal treatment.
Larviciding in public manholes is carried out from April to October each year, except otherwise indicated with a request for integration. A minimum of 4 cycles of larvicidal treatment per year is envisaged, that can be scheduled at different times according to the type of product used.

All drains (manholes and basement window wells, grids in squares and parking lots) are disinfected, even those that appear to be dry, including those along median strips

dividing road lanes, along roundabouts, on cycle lanes and pedestrian areas, in all roads, squares, green areas as well as in all facilities belonging to the municipality.

Products: the products used for Larviciding must contain Diflubenzuron or Pyriproxyfen in granules, in capsules or in liquid formulation. Products that require treatment stages of less than 4 weeks are not accepted. Larvicidal formulations must be complete with Label, Technical Fact Sheet and Safety Sheet for each of the product suggested.

Equipment: appropriate devices are utilised, such as portable pressure pumps with a tank having a minimum capacity of 10 litres for the distribution of liquid larvicidal formulations or appropriate devices for the distribution of granule formulations. It is also worth noting that, with reference to appropriate devices, when treating “basement window wells” operators must ensure that product and water are mixed according to the recommended doses.
A minimum number of four treatment stages per season is envisaged.

2. Adulticidal treatment

Any day or night adulticidal treatments in sensitive sites are performed by the private company in charge upon request by the Municipality in agreement with the Department of Public Health that will mention the sites to be treated and the time of treatment.

Products:
Products having an adulticiding action against mosquitoes must contain natural pyrethrins and/or synergized mixture of pyrethroids and pyperonil butoxide, to be used at the doses mentioned in the label for the specific use against mosquitoes.
In compliance with current regulations, the suggested products must be registered as Medical and Surgical Products for the outdoor fight against mosquitoes in civil environments.
No formulations are accepted that include (as results from sections 2 and 16 of the “Safety Data Sheet”) among their ingredients components classified with the following risk statements:

- R40 ("Possible risk of irreversible effects");
- R45 ("May cause cancer ");
- R49 ("May cause cancer by inhalation" accompanied by the T+ symbol (death’s head);
- R61 (“May cause harm to the unborn child”);
- R63 (“Possible risk of harm to the unborn child”).

Equipment: For the adulticidal service, the availability of at least 1 operating unit is required (9) which includes a specialist provided with an appropriate vehicle equipped with a Low Flow Rate Nebulizer (LV) to be used for the treatment of large areas (e.g. city streets, public parks) and/or motor-driven shoulder nebulizers for the treatment on foot of areas which are small in size and/or impossible to reach with the nebulizer on the vehicle.

Nebulizers carried on the vehicle or on shoulders must produce cold aerosol with particles having a diameter of less than 50 micron.

4.2.b Control measures against the proliferation of the Asian Tiger Mosquito in the areas where indigenous cases occurred in 2007

A specific and targeted strategy in those areas where indigenous breeding grounds of Chikungunya fever transmission were present in the past, i.e. the Municipalities of Ravenna, Rimini, Cesena and Cervia and Bologna, envisages the following

- a programme for the fight against the Asian Tiger Mosquito, organized according to normal arrangements (see previous letter a);
- extraordinary "door to door" pest control in private properties with larvicidal treatment of the breeding grounds that cannot be eliminated and removal of all potential larval breeding grounds that can be eliminated, to be carried out in two stages. The date when treatments are carried out shall be defined on the basis of the weather conditions of the season, probably the first stage will take place in the first half of April, to be repeated after three weeks. The following areas will be treated this way:
    - all the urban areas in Castiglione di Ravenna and within a distance of 300 metres from the cases confirmed and located in the city of Ravenna
    - all the urban areas in Castiglione di Cervia, the Cervia – Malva area, the area in Cervia south of the canal port up to Pinarella and within a distance of 300 metres from the cases confirmed and located in the remaining coastal and country areas;
    - the neighbourhoods of Villa Chiaviche and Sant'Egidio in South Cervia and the urban centre of San Martino in Fiume in the Municipality of Cesena;
    - an area within a distance of 300 metres from the confirmed cases located in the cities of Rimini and Bologna.

Each of the two treatment stages must be finished within 7 days from its start.
The regional group for the surveillance and fight against the Asian Tiger Mosquito will communicate the starting date of the "door to door" extraordinary action and shall check the quality of the measures performed.

4.2.c Control measures in the presence of certain or suspected cases

Should cases of viral fever caused by Chikungunya or another insect-borne pathogen occur, immediate thorough disinfection is necessary. Activities shall begin within 24 hours since the day when the cases are reported to the local health authority (see item 1 - paragraph 5.3.a).

1. Definition of the area to be treated

If only one case is reported, the area to be disinfected, in the way described below, is equal to a circle having a radius of 100 metres from the home of the sick person. The

Department of Public Health, based on the epidemiological investigation, can give indications as to any other areas to disinfect, especially considering the job of the subject, taking into account the fact that viremia can be present even 48 hours before the onset of symptoms. The Department also has the task to provide the subject with behavioural rules to counter the mosquito bite.
In the event of an epidemic outbreak, found and defined by the local Department of Public Health, the area to be disinfected, in the way described below, shall be extended up to 300 metres from the most peripheral cases of the outbreak itself, besides covering the whole outbreak area.

2. How to execute the disinfection

The disinfection shall be carried out in three stages, with the following synergy: adulticidal treatment, larvicidal treatment, removal of larval breeding grounds. Larviciding shall be carried out following the same procedure of ordinary treatments. The best sequence of treatments is as follows:

- adulticidal treatment at night in public areas,
- adulticidal, larvicidal treatment and removal of breeding grounds in private areas (door-to-door);
- simultaneous larvicidal treatment in public drains.

3. Adulticidal treatments

Adulticidal treatments must be performed with the objective to rapidly lower the density of the carrier insect and the best execution mode is the following.
Products: Pyrethroids are particularly appropriate for these types of actions, because of their killing power. Products with the lowest toxicity and without solvents must be used (such as Xylene and Toluene).
Equipment: according to the accessibility of the areas to be treated, handheld nebulizers can be used, as well as those installed on vehicles. These devices must generate aerosol particles with a diameter of less than 50 micron.
Places to be treated: plants must be treated (bushes, shrubs) in public and private areas, up to a safety height of three-four metres. When treatments are carried out in the roads, both the right and left sides must be treated, possibly by passing twice. In the case of one-way streets, the presence of the city Police is recommended.
Repetitions: adulticidal treatments in public streets must be repeated for three consecutive nights. In the event of heavy rain, the three repetitions must be completed at the end of the storm.
Precautionary rules: treatments must be carried out when there are no persons or animals. In the event of a storm or winds with breezes of more than 3 metres per second, the treatment must be suspended until there are the right weather conditions.

The above-mentioned indications are reported in ANNEX 2.

4.2.d Measures to be carried out in case of presence of large-sized clusters or high attack rate outbreaks (Phase 3, possibly Phase 2)
In this event, which might be defined as serious health emergency, extraordinary pest control actions must be carried out throughout the regional territory, even in areas that

are not directly involved by Chikungunya or Dengue cases, with the aim of significantly reduce the vector population on a large scale.
The specific indications about the measures to be adopted shall be defined on a case by case basis, depending on the specific epidemiological conditions and on the need to use available resources in a rational way, according to the decision made by the Regional Crisis Unit for public health emergencies, after hearing the opinion of the technical support bodies defined under Chapter 3; under these circumstances, it will be possible to extend the protocol set out under item 4.2.c in areas wider than those directly affected by the outbreak, and to consider the possibility to waiver from the "Biocide Directive", according to the case requirements.
Similar measures can be adopted already during phase 2, with reference to the D area (an area directly affected by the epidemic outbreak).

4.3 Operating support tools

The Regional Group for the surveillance and the fight against the Asian Tiger Mosquito promoted the definition of operating tools, supporting the activity of those who, in various positions, fight against the dissemination of the *Aedes albopictus* infestation.

In particular, the following tools have been defined:

1. ***Guidelines for workers***: a first version of a paper aimed at defining strategies for the integrated fight against the Asian Tiger Mosquito had already been released in 2005; printed copies were distributed to Municipalities and Local Health Districts, and they represented a collection of good practices and also a document on the bio-ethological features of this pest. The current text is a review of the previous version, in the light of the adjustment of the active ingredients that can be used in pest control following the adoption of the European Directive on biocides, and the experience acquired in recent years while monitoring the infestation and fighting against the insect (also in the light of the 2007 experience in the control of the Chikungunya fever epidemics
2. ***Protocols*** (ANNEX 2)*:* The first working indications for the management of the fight against the Asian Tiger Mosquito in areas with cases of Chikungunya or Dengue fever are reported both in paragraph 4.2.c of this chapter and in the following Annex ***(ANNEX 2).*** Paragraph 4.2.b defines the actions to be performed in Spring 2008 in the areas where indigenous epidemic breeding grounds were detected in 2007.
3. ***Documents for Municipalities****:* As support tool for the measures carried out by the municipalities, a draft decree was prepared, aimed at increasing the involvement of citizens, in order to improve the overall efficacy of measures. A technical specification draft was also prepared to organise a tender for pest control services. Its aim is to obtain the maximum possible efficiency, in consideration of the specific bio-ecology of *Aedes albopictus* in an urban environment and of "good practices for action", to maximise efficiency and cost-effectiveness of the actions and, at the same time, to reduce to a minimum the health and environmental impact of the fight. It promotes the decision to assign the tender not just on the basis of the maximum economic rebate, but it

envisages the assessment of the quality of the services offered by the competitors.

Both documents have already been sent to the Municipalities, to the Local Health And Social Conferences, to the Provincial Authorities and to the Local Health Districts according to the resolution issued by the Councillor for health policies on January 2nd 2008 (prot. P.G./2008/101)

4. ***Structural training plan****:* an agreement between the Regional authority and the social partners (employers' associations and trade unions) is being defined, for the stipulation of an agreement for the preparation and organization of a structural training plan for civil servants (municipality and healthcare staff) and workers of the private companies that offer pest control services.

4.4 Research.

4.4.a Assessment of the efficacy of ovitraps in the surveillance of the infestation of *Aedes albopictus* (Asian Tiger Mosquito) and in the definition of risk indicators

In the 4 main cities of Romagna Wide Area, ovitraps shall be placed with a higher density than in the rest of the region, in order to achieve a level of accuracy of 0.2. Various residential types shall then be defined in the area (for example, with a prevalence of detached houses with garden, with a prevalence of blocks of apartments and multi-family houses with a courtyard, etc). For each of the 4 cities, a sample of 300 buildings will be drawn, to reflect average housing types.
The number of larval breeding grounds in the sample will be counted, by adopting international standards (*House index, Breteau index, Container index*). 3 rounds of counts will be performed in the 300 buildings in the 4 main cities.
The possibility of a statistic relation between the number of ovitraps and the other indices measured in the sample areas shall then be analysed, in order to check the possibility to use the ovitraps figure in epidemiological risk models, something which is not possible at the moment.
The validation of the efficacy of ovitraps monitoring to obtain a quantitative estimate of the presence of the Asian Tiger Mosquito will give us the opportunity to assess also the efficacy of prevention and fight campaigns in the areas being monitored. In particular, the analysis of the longitudinal and historical series of monitoring data in a specific geographical area, that must be adjusted with respect to weather and climate conditions, will provide the opportunity to compare the development of the infestation.
In parallel, in the selected sites, tests will be performed on the density of biting females by means of samples on humans (human biting rate); 3 test stages are envisaged in the 4 main cities

4.4.b Study to verify the transovarial (vertical) transmission of the Chikungunya virus (CHIKV) in *Aedes albopictus* (Asian Tiger Mosquito).

Objectives

To check the possibility that the virus is transmitted in mosquito eggs, thus leading to the birth of infected mosquitoes, therefore increasing the possibility of infection in humans and creating the conditions for the virus to survive in the environment during winter (overwintering).
Assess the possible frequency of this event.

Modes and actions

Phase 1- field check of vertical transmission
Analysis on eggs and larvae of Aedes albopictus collected in areas already affected by the epidemics to assess the existence of the virus by means of a PCR. Eggs hatch in laboratory conditions and the analysis is therefore carried out only after hatching.
Phase 2- laboratory check of vertical transmission.

A laboratory experiment shall be prepared, in which mosquitoes will be artificially infected and to check and accurately assess their ability to transmit the virus through eggs, and therefore to their offspring. The experimental infection shall be performed on *Aedes albopictus* individuals collected in Romagna in the areas affected by the Chikungunya fever and the viral strain shall be utilized that was isolated from the sample of mosquitoes collected at the end of August in Castiglione di Cervia. Because of the use of “local” material, it will be possible to reproduce the conditions of the epidemic outbreak as closely as possible and therefore to assess the real possibility of vertical transmission

5 HEALTH SURVEILLANCE AND CONTROL OF THE DISEASES TRANSMITTED BY THE ASIAN TIGER MOSQUITO

The Regional surveillance system conforms to the European directives that have not yet been officially transposed into the Italian legislation. The current national provisions in force comply with the Circular Letter on “Chikungunya Surveillance” issued by the Health Ministry, on August 4th 2006, as described by chapter 2.
The liaison with the national surveillance system is ensured pursuant to the agreement with the Health Ministry.

5.1 Scope of the surveillance

1 Early case detection, with a view to enforcing virus control measures in the area where the vector is present. The surveillance system is designed to identify both imported cases (people who have contracted the disease abroad), and any related indigenous cases (people who have contracted the disease in Emilia-Romagna), in the event in which one or more initial cases might go unnoticed

2 Characterization of each case, by making a distinction between imported cases and indigenous cases, based on the epidemiological investigation,

3 quantify the number of cases recorded on the regional territory, describe the epidemiological trend and monitor the process quality, through specific indicators.

It should be pointed out that the early detection of cases is fundamental to implement all necessary vector control measures, as described in the previous chapter, and to reduce the spread of a possible outbreak.

5.2 *Definitions*

Clinical Criterion

Chikungunya Fever: sudden fever onset > 38,5° and invalidating arthralgia, not to be mistaken with any other clinical conditions,

Dengue Fever: sudden fever onset > 38,5° and duration ranging between two and seven days, with the presence of two or more of the following symptoms: severe cephalalgia and retro-orbital pain, arthralgias, myalgias, lumbago, maculopapular rash and haemorrhagic episodes;

Dengue haemorrhagic fever: a haemorrhagic form of Dengue virus infection can also occur: four criteria are present: fever with a duration ranging between two and seven days, haemorrhagic tendency, thrombocytopenia, enhanced capillary permeability (haemoconcentration and/or ascitis or pleural effusion).

Severe forms of Dengue can also be characterized by: encephalopathy, encephalitis, liver failure, cardiomyopathy.

Epidemiological Criterion: referring to an individual who has visited an area affected by a local Chikungunya and/or Dengue fever transmission, or who has resided in an

area affected by a local Chikungunya and/or Dengue fever transmission over the previous 15 days.

***Laboratory Criterion**:* positive to at least one of the following tests:

- virus isolation from a blood test performed within five days since the onset of symptoms,
- presence of viral RNA on RT-PCR on a blood test performed within five days since the onset of symptoms,
- presence of IgM specific antibodies in the serum, on a blood test performed in the acute or post-acute phase 5 days after (from the 5th day to the 30th day) since the onset of symptoms,
- seroconversion or increase by at least 4 times of the antibody title (IgG or total IgM) on a blood test performed after two or three weeks since the first blood test (the first one during the acute phase and the second one during the convalescence phase).

In those patients whose blood test was performed on the 5th day since the onset of symptoms, it is useful to search the virus or viral RNA and the identification of the specific antibodies in the serum.

Based on these criteria, the following categories of cases can be identified:

1. **Suspected case:**
    a. ***Possible Case**: **Clinical Criterion***
    b. ***Probable Case**: **Clinical and Epidemiological Criterion***
2. **Confirmed case***:* positive to the ***Laboratory Criterion***, regardless of the clinical characteristics.

Area affected by a local Chikungunya and/or Dengue fever transmission

An area corresponding either to the Municipality (or to sub-municipal areas – hamlets or neighbourhoods – in specific cases and prior to a formal definition by the Regional Authority), from an administrative point of view, where two or more confirmed Chikungunya or Dengue fever cases have been detected, without each one of them having a history of exposure in another local transmission area.

As far as the Regional surveillance system is concerned, it has been decided that the status of affected area shall be maintained over a period up to 45 days since the onset of symptoms of the last confirmed case that has been detected in the same area.

Furthermore, as a precautionary measure, with reference to the potential vertical virus transmission risk in the Asian Tiger Mosquito, the definition of “local Chikungunya transmission area” shall apply to all the areas where the local transmission occurred in 2007 (as previously described), until spring 2008 (until June 30th 2008), with specific reference to:

- the municipal area of Ravenna, Cervia, Cesena and Rimini,
- the Savena neighbourhood in Bologna.

5.3 Surveillance Characteristics:

Since a local Chikungunya transmission occurred in the Emilia-Romagna Region in 2007 and since the vector is present for long periods of time throughout the year (from April until October), it is necessary to thoroughly train physicians so that they shall take into consideration the Chikungunya or Dengue fever assumption upon diagnosis, in the event of very high fever and invalidating arthralgia affecting patients.

Nevertheless, under other circumstances that will be further specified, the surveillance system shall have to be extremely sensitive. Hence, an active surveillance strategy shall be put in place and Public Health Services shall keep regular contacts with physicians to maintain a high level of sensitivity and to record all cases that are diagnosed (active surveillance).

5.3.a *"Ordinary" Surveillance*

1 . Case reporting

Surveillance is based on *case reporting* – including even merely suspected cases - by physicians. Case reporting shall comply with the procedures set out by the Regional Government Resolution no. 186 dated February 7th 2005 "Implementation of an early reporting system of epidemic events and of sentinel events in healthcare facilities and within the population at large", and by Resolution no. 1925 dated February 16th 2006, issued by the Director General for Health and Social Policies, on the "Approval of a document regulating the early reporting system of epidemic events and of sentinel events in healthcare facilities and within the population at large", approved by the decision no. 186/05 of the Regional Government".

All Chikungunya and Dengue fever cases must be reported to the Regional Authority by means of the ***"early reporting system"*** , based on the following criteria:

- immediate notification, or at the latest within 12 hours since detection by the doctor in charge (either by telephone, fax or e-mail, according to the specifications that have been agreed upon at a local level) to the Public Health Department of the Local Health Unit competent for that area, using the SSCMI form;
- immediate notification by the Local Health Unit to the Regional Authority by means of the ALERT system, by e-mail (alert@Region.emilia-romagna.it) and by telephone (051 6397030 working on a H24/7 basis),
- immediate notification of all the necessary information by the Local Health Unit, in accordance with the Regional Authority to the Municipality for pest control measures to be undertaken (see item 4.2.c);
- sending of the "Notification and surveillance fact sheet of Chikungunya/Dengue cases" *(*ANNEX 3*)* by the Local Health Unit to the Regional Authority – Public Health Department, within the following 24 hours, taking into due account the epidemiological survey outcomes and specifying whether it is an imported, indigenous, suspected or confirmed case. The Regional Public Health Department shall then forward the fact sheet to the Health Ministry and to the National Health Institute.
- Filling in of the "Notification and surveillance fact sheet of Chikungunya/Dengue cases" by the operators of the Public Health Department of the Local Health District, providing all the data related to the laboratory results and to the health conditions of the patients 30 days after the case reporting,

- Filing of the (suspected and confirmed) Chikungunya/Dengue cases in the digital archives of infectious diseases MIF,
- Notification of form 15 and of the surveillance fact sheet by the local health authority to the Regional Public Health Service.

In the periods when the Asian Tiger Mosquito is not present (November – March, except for different formal indications provided by the regional authority concerning special weather and climate conditions), no local disease transmission is possible. Hence, surveillance must exclusively focus on the detection of imported cases: in these periods, no early reporting is required by the local health unit to the Regional authority by means of the ALERT system, and the transmission of the Notification and surveillance fact sheet is required only for probable cases, when the epidemiological criterion is identified.
Furthermore, a longer notification time is set out: 24 hours for the case reporting to the Department of Public Health, and 72 hours for the transmission of the Notification and surveillance fact sheet to the Regional authority.

2. Epidemiological Survey

As soon as the Public Health Departments of Local Health Units receive a notification of a possible or probable Chikungunya or Dengue fever case (thus authorising the transmission of the related fact sheet to the Regional Authority within 24 hours following the case reporting), they shall initiate a thorough and detailed epidemiological survey, in order to:

- fully fill in the notification and surveillance fact sheet, providing all the relevant information concerning the identification and place of residence of the infected subject, in order to contact him/her if necessary and to define the area where the case was detected, so that any possible pest control measures can be undertaken,
- identify the possible exposure to the infection, by tracing back the person's movements, in order to differentiate between an imported and an indigenous case,
- outline a complete picture of the environmental and housing conditions of the affected individual to assess the vector exposure risk; from this point of view, the affected individual and his/her family members must be duly informed and advised, also by means of specific information material, about all the suitable indications to be followed for individual protection from further Asian Tiger Mosquito bites,
- during the epidemiological survey, a venous blood test of the infected subject shall have to be immediately performed and sent to the Regional Laboratory in charge.

3. Laboratory Diagnosis

Laboratory diagnosis tests envisaged by the Chikungunya and Dengue fever surveillance system are performed by the Regional Laboratory in charge (CRREM – Regional Reference Centre for Microbiological Emergencies), i.e. the Operational Microbiology Unit of the Hospital-University Trust S. Orsola Malpighi of Bologna.

For this purpose, the laboratory shall have to be fully operational in order to guarantee the provision of test outcomes within 12 hours since the receipt of the sample, in especially critical situations reported by the Regional Authority.
The lab report must first be sent by fax and then on paper both to the Department of Public Health, which has sent the sample to be tested, and to the Regional Authority.

The Regional Laboratory diagnosis tests allow a case classification (through exclusion or confirmation), regardless of any other examinations carried out on the same blood sample by national Laboratories in charge of Chikungunya. They allow to fill in the notification and surveillance fact sheet, which shall then be sent to the national authority.
The Regional Laboratory, also with reference to the formal accreditation process to be sent to the Health Ministry, shall work in liaison with the national Laboratories in charge of Chikungunya (WHO Centre for the research on arbovirus and on viral haemorrhagic fevers of the National Health Institute, Department of Infectious, Parasitic and Immunomediated diseases and the Virology Laboratory of the National Institute for Infectious diseases “L.Spallanzani” Roma) and it joins European quality control networks for the diagnosis of Chikungunya and Dengue.

4. Web-based Information System

In order to facilitate communication between the various Services involved in the surveillance system and to allow a real-time updating of the data-base, a web-based information system is set up.

5.3.b “Active” Surveillance

By active surveillance we mean the setting up of regular contact systems by the competent Local Health Unit addressed to:

- GPs, Family paediatricians, on a weekly basis;
- Physicians working in healthcare facilities, ERs, on a daily basis.

Any proactive contact of health professionals shall make the whole system more sensitive and effective. It shall raise the awareness, keep the attention level high and encourage the continuous collection of yet unreported cases.
Contacts with notifying doctors must be made by telephone by the Department of Public Health staff. Yet, other alternative operational solutions might be agreed upon at a local level (i.e. the use of automatic methods by means of test messages (sms or e-mail): the adoption of these systems requires a thorough assessment to monitor their effectiveness.
The above-mentioned frequency may be modified on a Regional or local basis, if special needs arise, prior to an agreement with or suggestion by the Regional authority.

Active surveillance must be implemented in the situations reported in the tables here below:

Prevention of indigenous cases Phase 0 - absence of cases or presence of only imported cases

	Area A Vector absence	***Area B*** Vector Presence; absence of indigenous cases	***Area C*** Vector Presence; cases reported in 2007
Fight against the Asian Tiger Mosquito	Mere surveillance	Ordinary measures; if imported cases are detected, extraordinary measures are undertaken, according to 4.2.c	extraordinary measures are undertaken, according to 4.2.b (April 2008). if imported cases are detected, extraordinary measures are undertaken, according to 4.2.c
Health *surveillance*	Ordinary surveillance	Ordinary surveillance	Active surveillance (April-June period)

Prevention of indigenous cases - Phase 1 - presence of one or more isolated indigenous cases or of only one indigenous case outbreak

	Area A **Vector absence**	**Area B** **Vector Presence; absence of indigenous cases**	**Area C** **Vector Presence; cases reported in 2008**
Fight against the Asian Tiger Mosquito	Mere surveillance	Ordinary measures; if imported cases are detected, extraordinary measures are undertaken, according to 4.2.c	extraordinary measures (4.2.c) (100/300 m. around the case/outbreak)
Health surveillance	Ordinary surveillance	Ordinary surveillance	Active surveillance (April-October period)

Prevention of indigenous cases Phase 2 – presence of multiple breeding grounds

	Area A **Vector absence**	**Area B** **Vector Presence; absence of indigenous cases**	**Area C** **Vector Presence; cases reported in 2008**
Fight against the Asian Tiger Mosquito	Mere surveillance	Ordinary measures; if imported cases are detected, extraordinary measures are undertaken, according to 4.2.c	extraordinary measures (4.2.c) (300 m. around the outbreak)
Health surveillance	Ordinary surveillance	Active surveillance (April-October period)	Active surveillance (April-October period)

Prevention of indigenous cases Phase 3 - Presence of multiple large breeding grounds with high attack rate outbreaks

	Area A Vector absence	Area B Vector Presence; absence of indigenous cases	Area D Vector Presence; cases reported in 2008
Fight against the Asian Tiger Mosquito	Mere surveillance	if imported cases are detected, measures are undertaken, according to 4.2.c + extraordinary measures are undertaken (4.2.d)	extraordinary measures (4.2.c) (300 m. around the outbreak) and 4.2.d
Health surveillance	Ordinary surveillance	Active surveillance (April-October period)	Active surveillance (April-October period)

5.4 Patient-Oriented Measures

In order to reduce the spread of the disease, protection measures against mosquito bites, have been recommended. In such a way the CHIKV transmission cycle can be broken. Pest control shall be carried out in the confirmed case residence sites and/or in the surrounding areas, with the support of competent local authorities, as described in the relevant paragraph.

5.4.a Protection from mosquito bites

In order to reduce the risk of the Chikungunya virus fever transmission, as well as other diseases transmitted by arthropods, the most suitable preventive measure is avoiding being bitten by the mosquitoes, which might get infected and transmit the virus.
The behavioural precautionary measures to be adopted are:

- Wear light coloured clothing (dark and bright colours attract mosquitoes), long pants and long-sleeved shirts, to protect the body from mosquito bites as much as possible.
- Avoid the use of perfumes (which attract insects);
- Apply N,N-diethyl-n-toluamide or KBR (also known as Bayrepel or Icaridin) based insect repellents. Repeat the application in case of intense transpiration every 2-3 hours; pyrethroid-based pesticides and insect repellents can be sprayed directly on clothes. It is anyway necessary to strictly comply with the instruction leaflet that comes with the repellent, do not spray them on mucosa or on skin wounds and be very careful while spraying them on children. Before spraying a bug repellent on their skin, pregnant women and children (aged <12 years) should consult their doctor.

- Stay in rooms equipped with air-conditioning or use mosquito window and door screens. Be sure door and window screens fit tightly and are in good repair. These precautions must be adopted also in case of hospitalisation.
- Spray pyrethroid-based and permethrin pesticides in the rooms where you live or use electrical pesticide diffusion devices.

5.4.b Precautionary measures during patient care

In general patients affected by Chikungunya or Dengue fever do not require any hospitalization. Any hospitalization decision will depend on the clinical conditions of the affected patient, on whether pregnant women and children are involved or on whether elderly people already affected by other relevant diseases are involved.
The reporting of a possible Chikungunya or Dengue infection transmission, through exposure to infected blood during patient care in the course of the epidemic outbreak in the Indian Ocean islands back in 2005, highlighted the importance of standard precautionary measures to be adopted for the prevention of diseases transmitted via the parenteral route, in order to avoid the infection risk through contact with the blood of a patient in the viremia phase while providing medical care.
These precautionary measures must be adopted especially in cases of patients with haemorrhagic events. In these cases, invasive procedures must be confined to the strictly necessary ones.
Infected patients' relatives or caregivers must adopt general precautionary measures for the diseases transmitted via the parenteral route, such as, for instance:

- Use gloves, if the care procedure entails contact with the blood of the patient, and change them after providing care to the patient;
- Wash your hands carefully with water and soap, after removing gloves or, anyway, after providing care to the patient.

- If invasive procedures are put in place, you should:
  - Wear gloves;
  - Wear a surgical mask and protection glasses or face mask during invasive procedures and caregiving activities that might give rise to any blood splashing or spraying;
  - Wear a white coat during invasive procedures and caregiving activities that might give rise to any blood splashing or spraying;
  - Handle tools used for caregiving activities that get soiled with blood or other body fluids carefully to prevent the exposure risk of skin and mucosa and the contamination of clothes.

5.5 Preventive measures for travellers in areas affected by the virus transmission

Travellers to affected areas should adopt precautionary measures to limit bug and mosquito bites, similar to the ones reported in the Paragraph 5.4.a.

5.6 Measures for the prevention of transfusion transmission

Prevention measures against the transfusional transmission of Chikungunya virus must strike the best balance between safe transfusion practices and the guarantee of effective availability of blood derivatives, i.e. products that are to be regarded as life-saving aids.

This objective must be met in full compliance with rules regulating safety of transfusion activities and making sure that precautionary measures apply and contribute to a general consistent framework at a regional level and are shared at a national and international level. Preventive measures must be followed by specific co-ordination measures that are aimed at making transfusion products available even when collection is reduced.

The launching of co-ordination activities at a regional level in relation to a case of local Chikungunya transmission shall lead to the setting up of a specific task-force by the Hospital Department in charge. The task-force shall be made up of: the Manager of the Regional Co-ordination and Compensation Centre (CRCC), the Manager of Transfusion Services concerned with the event, the Presidents of blood donors Associations, one Public Health Service expert in charge of the information and operational activities co-ordination. The task-force shall define the prevention measures to be adopted and it shall guarantee the necessary co-ordination of activities with the National Blood Centre.

With reference to the transmission prevention measures, the approach to be adopted in the “Areas affected by a local Chikungunya virus transmission”, according to provisions set out by chapter 5, is based on a method that estimates risk quantification starting from epidemiological data, related to the different precautionary measures.

The risk quantification method includes all confirmed and suspected cases (including possible and probable ones) for each area on the date of reference. Asymptomatic cases account for 15%, based on literature data. An 8-day-long full viremic interval is envisaged for asymptomatic cases and for the presymptomatic viremic period (24-48 hours) for symptomatic cases, taking into account the fact that the donor selection procedures must exclude symptomatic subjects from blood donation. Risk quantification methodological details are illustrated in ANNEX 4.

Even though the task-force shall at any rate validate specific measures, the risk assessment results will allow to identify prevention measures based on the suspension of blood collection in the areas concerned or the adoption of quarantine measures. The risk threshold value has been set at about one case every 380,000 donations, since today such a risk is accepted for hepatitis B during the serological window phase.

As for risk quantification higher than 1:380.000, collection shall be stopped; for risk quantification lower than 1:380.000, quarantine measures shall be adopted with conservation of blood collected for 5 days. Assessing the symptom-free situation during the quarantine period can be made in different ways in the various transfusion centres, based on specific organization and technological equipment provided that traceability, completeness and documentability requirements are fully met. The transfusionist doctor shall validate the suitability of each individual blood bag under quarantine according to the law in force.

Risk quantification shall be carried out at least once on a weekly basis, but even more frequently, according to the indications set by the task-force, by the Public Health Service and notified by the Hospital Service to the regional transfusion Services and to the National Blood Centre.

As regards the donors who have travelled in the areas concerned with local Chikungunya virus transmission, temporary suspension of donation shall be aligned with the decisions envisaged at a national level. The preventive system shall be completed by specific methods for a detailed collection of donors' clinical history and information. This specific aspect must be taken into due account in the event of quarantine measures.
The regional transfusion system has already implemented an effective Chikungunya virus control system to be used for platelet units: for this kind of blood derivative collection can be continued. Plasma collection for clinical use to be processed shall be regulated at a national level in agreement with regions participating in the AIP (Interregional Plasma Agreement) programme.

The task-force shall have the task to monitor the blood availability trend and to plan actions necessary to meet the regional blood requirements.

The reintegration of confirmed cases to the donation programme can occur only after the verification of the virological negativity and/or the evaluation of the specific antibody conditions.

5.7 Organ and tissue donation and transplantation / donation and sampling of the umbilical cord

With reference to organ and tissue donation and to the collection of umbilical blood, if a local Chikungunya case transmission occurs, the Regional Transplantation Centre shall have to be immediately notified. The Centre shall co-ordinate activities with the National Transplantation Centre, which shall update the measures to be undertaken on site.
The Regional Transplantation Centre shall notify the measures to be undertaken to all donation and transplantation units and shall manage the operational co-ordination of measures.
In case of reporting of an organ donor who belongs to one of the following categories:

- Subjects with a previous infection,
- Subjects who have been in contact with affected areas,

it is possible to consider the donor suited if the necessary molecular tests are performed that rule out any infection. In these cases it is necessary to refer cases to national experts (second opinion).

Diagnostic tests shall be carried out in the Regional reference laboratory, namely at the 'Lazzaro Spallanzani' Virology Laboratory of the National Institute for Infectious Diseases of Rome.
The diagnostic procedure is carried out by national experts, who shall identify the risk level, which shall be codified by a specific algorithm.

5.8 Research

The Chikungunya virus epidemic outbreak that occurred during summer 2007 in the Emilia-Romagna region raised many questions about the clinical history and characteristics of the epidemiological spread of a disease, which until that date had occurred only in poorly socially and economically developed countries whose environmental conditions were completely different from those of a European country.
For this reason it was decided to carry out a research work in collaboration with the National Health Institute and the University of Trento, aimed at deepening the knowledge of a few priority aspects such as:

- Assess the actual epidemic outbreak impact and quantify the number of asymptomatic or paucisymptomatic cases, not detectable through the active surveillance system;
- Describe the clinical history of this infection and the factors associated to prolonged clinical forms;
- Assess the characteristics of the virus transmission in humans and vectors and the likelihood of new epidemic outbreaks, through mathematical models;
- Study the possible persistence of the virus on the territory, through the experimental study on transovarial transmission in *Aedes albopictus and* seroprevalence study among pets that might have been affected by the virus;
- Assess the accuracy of the traditional methods for the *Aedes albopictus* infestation monitoring, through comparative studies by means of different indices suggested in literature;
- Assess the effectiveness of actions aimed at reducing the dissemination of *Aedes albopictus*.

Entomological and veterinary studies have already been described under item 4.4 of this report. Here as follows a description of the actions designed in the human is provided.

5.8.a Seroepidemiology Study in the Municipality of Castiglione di Cervia

A seroepidemiology study has been planned in the Municipality of Castiglione di Cervia, where the highest attack rate was recorded in the region on a population sample of more than 300 people.
The study envisages a telephone survey addressed to all the selected people and a blood for the identification of the anti-*Chikungunya antibodies*.
The study is intended to:

a) Quantify the prevalence of subjects positive for the anti-CHIKV *antibodies* and as a consequence the real impact of the infection on the population;
b) Identify the socio-demographic factors or other factors associated to a higher infection prevalence;
c) Describe the knowledge, attitudes and practices of the population vis à vis the *Chikungunya* fever and the fight against the Asian Tiger Mosquito.

If the prevalence of asymptomatic forms detected in Castiglione di Cervia proves to be higher, the prevalence investigation will be extended to other areas within the region.

5.8.b Cohort Study of Chikungunya cases identified in the region

A prospective prognostic cohort study shall be carried out on all the *Chikungunya* disease cases identified in the region. All the people included in the cohort study shall be interviewed by telephone to identify the clinical conditions a few months after the infection. All the people still suffering from the disease symptoms are provided with a referral opportunity for a more thorough analysis of their clinical conditions. A blood test shall be suggested to all of them to determine the antibody title a few months after the infection. The interview and the blood test shall be repeated 1 year after the infection to detect the number of people still suffering from prolonged clinical conditions.

The study is designed to:

a) assess the rate of people with persisting symptoms and possible functional impairments;
b) describe the serological profile trend over time;
c) identify the socio-demographic and clinical factors associated to persisting symptoms, their greater severity and the serological profile trend.

Mathematical Models

Mathematical Models shall be developed with the aim to assess the transmission of the virus within the human population, simulate different types of epidemic outbreaks according to specific parameters, assess the effectiveness of “spatial” pest control strategies (number of mosquitoes; threshold value of the vector density, etc.).

6 TRAINING

6.1 Disease surveillance and control

The updating of technical and organizational skills as well as the continuous training of authority and company managers are considered to be subjects of major importance. Professional and organizational behaviours of health officials and professionals are also equally important.
Hence, training is mainly intended to provide health officials with the capacity and skills to:

- Implement the organizational efforts made by the Regional Authority and by the Local Health Units and to establish a close co-operation to co-ordinate efforts at best;
- Carry out surveillance, reporting, support and control tasks according to the guidelines and protocols that have been set out to address the various circumstances and developments;
- Carry out communication activities to provide citizens with information and to advise travellers to endemic countries for Dengue fever and Chikungunya;
- Design and develop actions in case of emergency.

In addition to company managers, other professionals are involved in operational management, namely:

- Primary care professionals (General Practitioners, Family paediatricians, physicians, healthcare providers, caregivers and nurses);
- Hospital health officials (in charge of infectious disease, medicine departments, microbiology laboratories, etc.);
- Public health department officials for community care management;
- Other health professionals (pharmacists, etc.) for the provision of information to citizens.

The training programme envisages, among other things:

- The use of standard training pathways;
- The training of a suitable number of trainers to be employed in each Local Health Unit, to allow a rapid training of all the staff in charge;

Furthermore, in a more long-term perspective, the plan envisages:

- The organization of regional training courses with ECM accreditation for employees in co-operation with Local Health Districts;
- The setting up of regional training courses with ECM accreditation for primary care physicians, in co-operation with Local Health Districts and the Regional General Practice Education and Training Centre.

Regional reference documents shall be used for the development of training contents, mainly concerning:

- risk characteristics and evolution;
- clinical characteristics of the disease and laboratory diagnosis criteria;
- organization and public health measures that are adopted to control the situation;

- recommendations by health authorities about individual protection systems against Asian Tiger Mosquito bites.

Training to be provided to general practitioners, who are required to report either suspected or confirmed Chikungunya or Dengue Fever cases, is an essential tool for the proper operation of the surveillance system. A special attention must be paid to it.
The surveillance system that is in operation is extremely focused on sensitivity. Hence a thorough discussion is required in view of a shared implementation of clinical criteria for the reporting of suspected case, in order to avoid any unjustified and inappropriate reporting of cases. In this process, a fundamental role must be played by the Operational Infectious Disease Units, which serve as a cultural and professional point of reference at a local level.

6.2 Training on entomological surveillance and fight against the Asian Tiger Mosquito

All these actions shall be carried out at a local level by the Public Health Departments of the Local Health Districts in collaboration with the Municipalities and the supervision of the Regional Group for the surveillance and the fight against the Asian Tiger Mosquito. The following officials shall be involved:

- Public health officials,
- Municipal personnel in charge of contract management,
- Personnel in charge of pest control activities.

7 COMMUNICATION

1.1 Absence of clinical cases of diseases transmitted by Asian Tiger Mosquito bites *(phase 0)*,

The main aim of communication is to enhance the effectiveness of the fight against the Asian Tiger Mosquito and to prevent disease import risks.

Specific Objectives:

1. To raise the awareness about the health risks due to the spread of the Asian Tiger Mosquito, and pests in general, that may carry infectious diseases;
2. To gain wide consensus towards pest control and surveillance activities promoted by the authorities in charge, with the active involvement of the population to reach a greater co-operation among citizens for the fight against the Asian Tiger Mosquito, through larvicidal treatments and the clean-up of breeding grounds in private areas;
3. To inform citizens about the availability and use of individual protection means against mosquito bites and, more generally, to raise the public awareness and involve citizens in individual health and environment protection initiatives;
4. To provide basic knowledge for a more aware management of health emergencies related to the transmission of diseases by means of Asian Tiger Mosquitoes;
5. To provide better knowledge about health risks involved in travelling to certain geographic areas where these diseases are endemic.

For these reasons a comprehensive communication campaign will be launched and organised as follows:

1 – NETWORK SET UP AND PREPARATION
(FEBRUARY - APRIL 2008)
This phase starts with a series of preparatory activities to design actions addressed to the whole community: local authorities, health and social authorities, general practitioners, pharmacies, charitable organisations, trade unions, immigrants' associations, apartment house managers, pest control companies, education and training facilities.

2 – AWARENESS-RAISING AND INVOLVEMENT
(APRIL - MAY 2008)
This phase will be characterized by a broad sweeping action addressed to all the Emilia-Romagna citizens and supported by a multiple set of communication tools. Several targeted activities will be performed in schools during next 2007-2008 school year, starting from September.

3 – *SURVEILLANCE*
(MAY - SEPTEMBER 2008)
This phase of the campaign has identified a few specific target groups for them to play an ongoing role:

- pest control companies and workers,

- general practitioners, ER and healthcare providers,
- tour operators, organizers of folk feasts and festivals, hotel managers, etc.,
- all citizens, as for their active contribution to upkeep their own living environment and to lead a healthy lifestyle.

In the framework of the communication campaign, a special attention shall be paid to information provided to travellers and, in particular, to people coming back to Emilia-Romagna after a journey to their country of origin. Specific actions must therefore be addressed to target groups (travellers and immigrants) by means of specific tools (for instance, cultural mediators might be used) to make sure that people coming from Chikungunya or Dengue endemic areas adopt suitable behaviours, including the early notification of any symptoms to their GPs and use personal protection means against mosquito bites if they live in Emilia-Romagna areas infested by the Asian Tiger Mosquito.

7.1 Emergency phase

In the event of outbreaks of Chikungunya fever or other diseases carried by the Asian Tiger Mosquito (Phases 1, 2 and 3), due to indigenous transmission of Chikungunya virus, a risk communication scheme is mainly intended to:

- build and keep a climate of trust towards institutions dealing with public health emergencies; serve as a reliable and authoritative point of reference, provide information and set up an inter-institutional co-operation network at a regional and national level;
- facilitate access to information to all stakeholders involved to help them perform their tasks at best and answer citizens' questions also based on how the situation evolves and knowledge increases;
- allow health providers - and GPs and prevention officials in particular -, to perform their prevention and control functions;
- establish co-operation with the media, providing them with timely, transparent information in an appropriate manner;
- directly inform a few targeted groups of citizens under certain specific conditions.

Already during ***phase 1*** it is important to thoroughly co-ordinate communication at a local and regional level. All the authorities involved should keep each other updated about the communication initiatives to be undertaken.
Starting from ***phase 2*** communication is also intended to encourage the use of disease prevention and control measures, to ensure the effective operation of the case surveillance and reporting system to follow up the epidemiological evolution of the event and to allow an effective case management:

- by highlighting the need for health professionals, GPs, Family paediatricians, First Aid Service officials and healthcare providers to report all cases, even suspected ones, and to inform the public about the main clinical characteristics of Chikungunya or Dengue fever;
- by reminding the population the main individual protection principles.

During ***phase 3*** the Regional Authority shall be in charge of keeping communication relations with media and institutions, through the Regional Crisis Unit.
During emergency management, it becomes especially important, also for communication purposes, to rely upon an effective information system, as described in chapter 5. Such an information system should be constantly updated and agreed upon by all the stakeholders involved in the system, in order to provide timely and reliable information.

In order to provide proper information during the emergency phase, the following criteria should be adopted.

1. starting from Phase 1 media should be informed about the times when the press releases shall be issued by the local health authority concerned and by the Regional authority. Press releases shall be published according to the following intervals:
    a. during phase 1 a weekly press release shall be issued by the Regional authority and two weekly press releases shall be issued by the local health authority concerned,
    b. during phase 2 and 3 two weekly press releases shall be issued by the Regional authority that summarise the situation and provide an update of cases; daily press releases shall be issued by the local health authorities concerned.
2. at least one regional weekly press release during phases 2 and 3 shall be published also in English.
3. the reports published in press releases shall cover both confirmed cases as well as suspected (probable or possible) cases.
4. in the areas concerned with Chikungunya or Dengue cases, press releases shall, at least periodically, remind the population the need to protect itself against mosquito bites by adopting suited behaviours and individual protection means.

The communication network
At a local level, Health authorities must promote an effective functional integration among all the facilities and partners involved, not only on an organizational but also on a communication scale (hospitals, districts, public health departments, primary care departments, healthcare services; as well as general practitioners and Family paediatricians).

This whole organization is responsible for the implementation of infection prevention and control measures, at a local level, and from the communication point of view, this involves in particular:

1. information and training of healthcare providers involved in the communication network;
2. communication of risks as well as prevention, control and healthcare measures to citizens.

Multiple information sources may give rise to confusion especially during emergency phases. Hence, only one official authoritative spokesman should be appointed for information and communication to be provided to the public.

The Regional Crisis Unit, set up within the framework of the Councillorship for Health Policies, is in charge of the planning and co-ordination of communication activities undertaken by individual Regional Local Health Districts, the Regional authority, as well as the liaison with the Health Ministry and the other Regions, etc.

ANNEX 2

OPERATIONAL GUIDELINES FOR THE IMPLEMENTATION OF AN ACCURATE FIGHT AGAINST THE ASIAN TIGER MOSQUITO IN PRESENCE OF SUSPECTED OR CONFIRMED CASES OF CHIKUNGUNYA and DENGUE WITHIN THE REGIONAL TERRITORY

An immediate and accurate fight against the carrier mosquito must be initiated within 24 hours since the case reporting in the areas that have been affected by Chikungunya or Dengue fever viral outbreaks.

Definition of the area to be treated

If only one single case is reported, the area to be disinfected, in the way described below, is equal to a circle having a radius of 100 metres from the home of the affected person.
The Department of Public Health, based on the epidemiological investigation, can give indications as to any other areas to disinfect, especially considering the job of the subject.
The Department also has the task to provide the subject with behavioural rules to counter mosquito bites.
In the event of an epidemic outbreak, found and defined by the local Department of Public Health, the area to be disinfected, in the way described below, shall be extended up to 300 metres from the most peripheral cases of the outbreak itself, besides covering the whole outbreak area.

How to execute the disinfection

The disinfection shall be carried out in three stages, with the following synergy: adulticidal treatment, larvicidal treatment, removal of larval breeding grounds. Larviciding shall be carried out following the same procedure described in the previous paragraph.
The best sequence of treatments is as follows:

- adulticidal treatment at night in public areas,
- adulticidal, larvicidal treatment and removal of breeding grounds in private areas (door-to-door);
- simultaneous larvicidal treatment in public drains.

Adulticidal treatments

Adulticidal treatments must be performed with the objective to rapidly lower the density of the carrier insect and the best execution mode is the following.

Products: Pyrethroids are particularly appropriate for these types of actions, because of their killing power. Products with the lowest toxicity and without solvents must be used (such as Xylene and Toluene).
Equipment: according to the accessibility of the areas to be treated, handheld nebulizers can be used, as well as those installed on vehicles. These devices must generate aerosol particles with a diameter of less than 50 micron.
Places to be treated: plants must be treated (bushes, shrubs) in public and private areas, up to a safety height of three-four metres. When treatments are carried out in the roads, both the right and left sides must be treated, possibly by passing twice. In the case of one-way streets, the presence of the city Police is recommended.

Repetitions: adulticidal treatments in public streets must be repeated for three consecutive nights. In the event of heavy rain, the three repetitions must be completed at the end of the storm.

Precautionary rules: treatments must be carried out when there are no persons or animals. In the event of a storm or winds with breezes of more than 3 metres per second, the treatment must be suspended until there are the right weather conditions. Low intensity rain or fog do not affect the effectiveness of the treatment. Treatments must be carried out when there are no people. Hence, treatments in public streets must be carried out during the night. Residents living in the areas concerned with the treatment must be informed in advance about the day and time when the treatment will take place and the personnel in charge must make sure that all doors and windows of the houses to be treated in the neighbourhood are closed. The staff must adopt all necessary individual protection means, including mosquito repellents.

Precautionary rules: the company in charge of treatments must release a document that certifies the performance of the treatment and that reports the streets, street numbers, treatment date and products that have been used.

ANNEX 4

Foreword

Following the Chikungunya epidemic outbreak that occurred in the Emilia-Romagna region during summer 2007, all blood and organ transfusion activities were suspended throughout the regional territory.
During the conclusive phase of the epidemic outbreak the need emerged to identify a specific risk level below which the situation might be addressed in the same way as in the case of other diseases where safety procedures do not allow to fully eliminate the risk. It was agreed by the professionals of the field and by the National Blood Centre, to set the risk threshold value at about one case every 380,000 donations, since such a risk is today accepted for hepatitis B during the serological window phase.

Materials and methods

In order to assess the specific risk it was necessary to develop an evaluation method that would be rapidly implemented in the information system used during the epidemic outbreak, and easily replicable, since evaluation had to be updated at least once on a weekly basis.
From a methodological point of view reference has been made to the research work on the West Nile virus transfusional transmission risk evaluation by B.J. Biggerstaff and L.R. Petersen (2002). In particular, reference has been made to the method developed by these researchers for the count of viremic subjects at the time t. V_{0i} is the duration of viremia from the start to the date of onset of symptoms and V_{1i} is the total viremia duration. From a formal point of view, the following count function has been used:

$$V(t) = \sum_{i-1}^{n} I_{(x_i - v_{0i}, x_i - v_{0i} + v_{li})}(t),$$

where $i=1,2,\ldots,n$ is the umpteenth case, x_i-v_{0i} the start time of viremia, and x_i-v_{0i}+v_{1i} is the time when the viremia phase is over. The subjects in the viremia phase have been counted for each day *t* of the epidemic period. Finally, the risk has been defined on a weekly basis, by comparing the estimate of the viremic subjects to the resident population as of 01.01.2007, by attributing to each week the risk recorded on the maximum viremia day. The analysis has been performed both in the epidemic area as a whole and in the individual sites affected by the epidemic outbreak.
The analysis has taken into account all the Chikungunya virus infection confirmed and suspected cases (see chapter 2). In addition to subjects with symptoms related to the Chikungunya virus infection, the evaluation also took into consideration a percentage of subjects that might have potentially escaped the surveillance system, since they proved to be asymptomatic.
Based on data reported by literature and related to the epidemic outbreak that took place in the island of La Réunion, a viremic interval having a total duration of 8 days has been taken into account, by distinguishing between a two-day-long pre-symptomatic period and a 6-day-long post-symptomatic period, including the day of

onset of symptoms (Figure 1). To estimate the number of asymptomatic viremic subjects, it has been assumed that out of 100 Chikungunya cases, 85 subjects present with symptoms and 15 are asymptomatic. Then the daily number of asymptomatic cases has been estimated based on this assumption.
The viremic interval has been built around each date of onset of symptoms, by distinguishing between asymptomatic and symptomatic cases.

Fig. 1. Definition of viremic interval

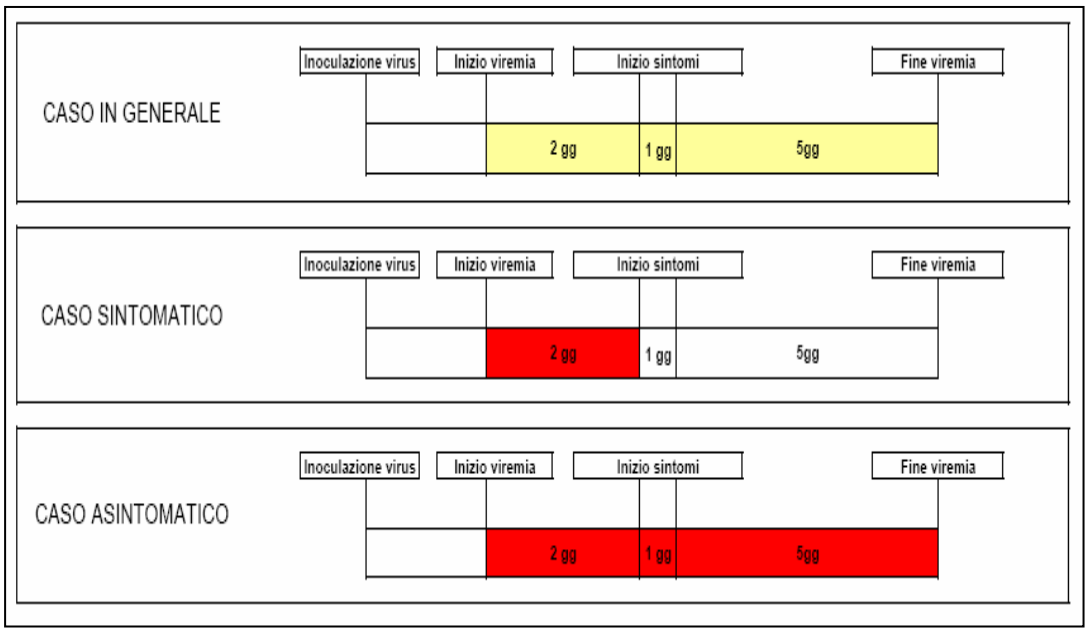


Figure 2. Viremic subject count scheme 1st scenario

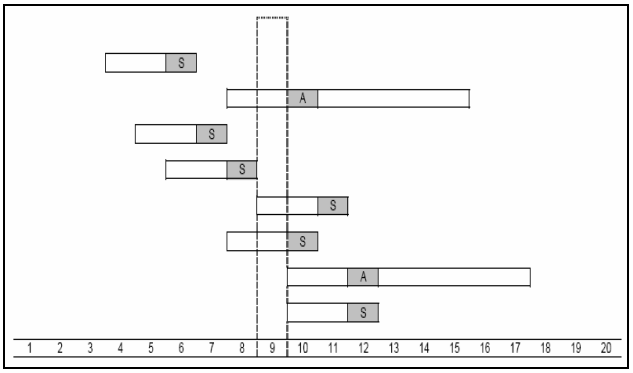
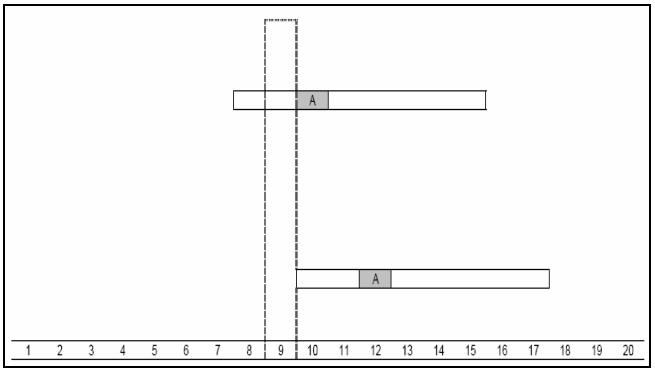


Figure 3. Viremic subject count scheme – 2nd scenario



Two different scenarios have been outlined. In the first one the risk evaluation has included both asymptomatic subjects (considering for each one of them an 8-day-long viremic interval) and symptomatic ones. As far as the latter subjects are concerned, only the pre-symptomatic viremia days have been taken into account, since the likelihood that donation takes place during the symptomatic phase is equal to zero. In

the second scenario, when a quarantine procedure is put in place, the risk evaluation is exclusively based on asymptomatic subjects. Figures 2 and 3 illustrate the counting methods of the viremic subjects in the two different scenarios. The analysis has been performed both in the epidemic area as a whole and in the individual sites affected by the epidemic outbreak. Considering the quality of the case history filter that has been used by the blood transfusion centres and the fact that the donated blood is placed under quarantine, the second scenario has been taken into account, focusing only on asymptomatic subjects.

For each day of the epidemic period the subjects in the viremia phase have been counted and compared with the resident population as of 01.01.2007.

The risk has been defined on a weekly basis, by attributing to each week the risk recorded on the maximum viremia day, and taking into account a risk lower than 1:380.000 as the reference threshold for the lifting of the transfusion ban.