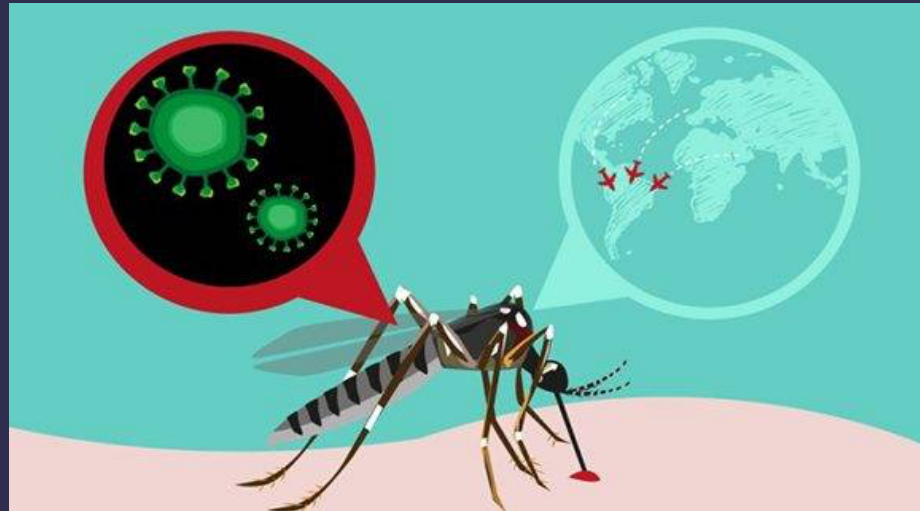


# Pharmacist roll in detection, control and prevention of arboviruses



Cristina Fernández Barrantes, Pharm. D - Costa Rica

# Biography

2

- Degree in Pharmacy from the University of Medical Sciences of Costa Rica and Master in Clinical Pharmacology from the Autonomous University of Barcelona.
- Coordinator of the Drug Information Center at San Juan de Dios Hospital, professor at the Faculty of Pharmacy of the University of Costa Rica
- Granted a scholarship from the Pharmaceutical Forum of the Americas through the FIP Foundation in 2015 to attend the FIP congress in Dusseldorf, Germany.



# Goals

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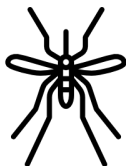
- At the end of the webinar, the participant will be able to:
  - ▣ Recognize generalities of the physiopathology and approach of arboviruses: **dengue, zika, chikungunya and yellow fever.**
  - ▣ Describe strategies that the community pharmacist can perform for the detection, control and prevention of arboviruses.



# Contents

□ 1. Concept of arboviruses → emerging diseases:

- Dengue
- Zika
- Chikungunya
- Yellow fever

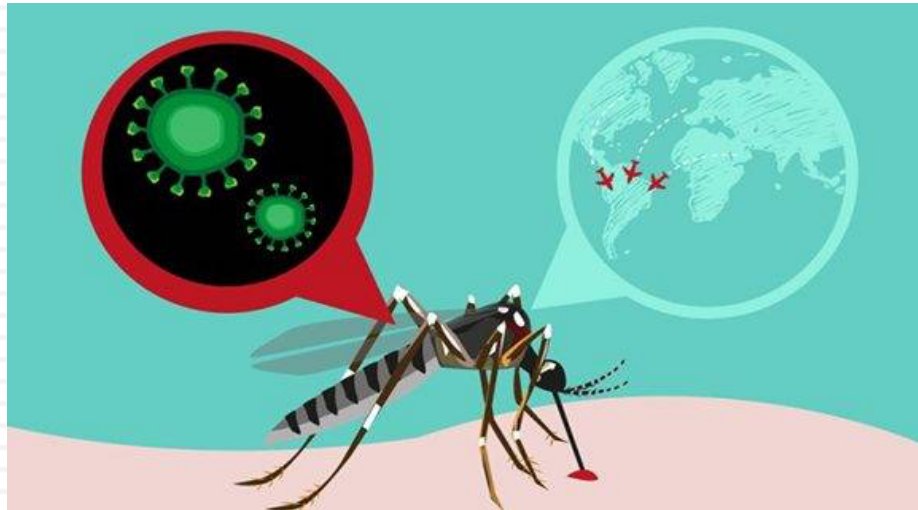


□ 2. Actions that the pharmacist can perform in the detection, approach and prevention of arbovirosis

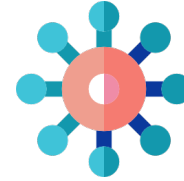
- Patient interview
- Pharmaceutical advice
- Vector control
- Repellent use
- Vaccination
- Educational campaigns



# 1. Arboviruses: Pathophysiology and Approach

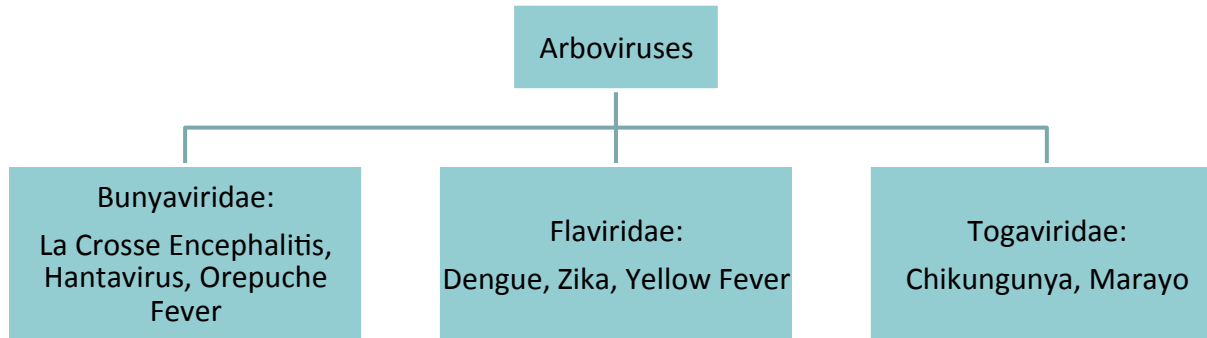


# Arboviruses



6

- Heterogeneous group of viruses that remain in nature
- Arbovirus is name used to refer to any virus transmitted by arthropod vectors
- Arbovirus is an acronym (**AR**thropod-**BO**rne virus)
- The virus replicates in the vector but usually does not harm it
- There are more than 500 virus → 150 virus can cause disease in humans



Adapted from: Acta Pediatr Mex. 2016 mar; 37(2): 111-131

# Arboviruses: vectors

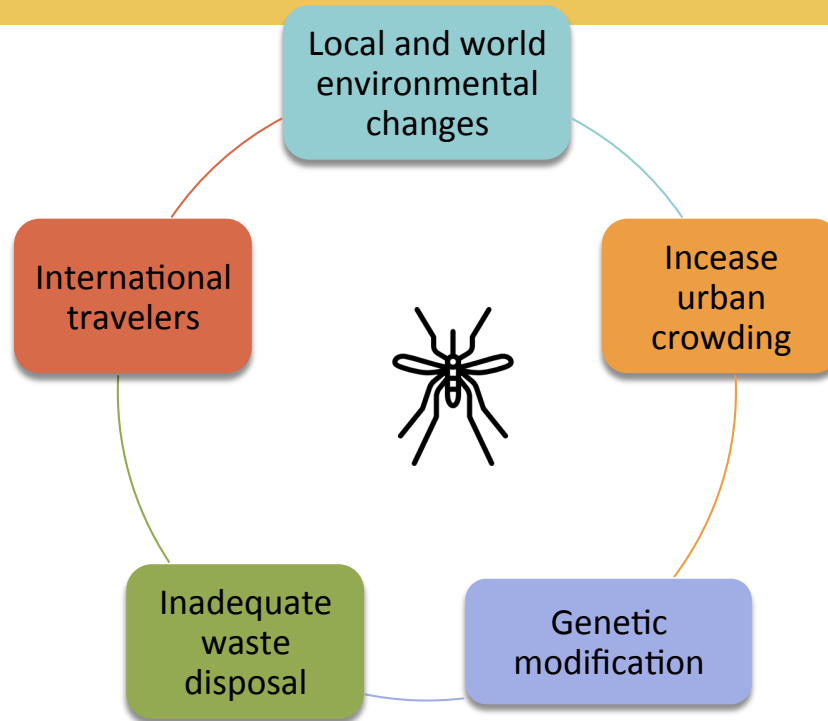
7

- There is a large variety of vectors in nature like mosquitoes, ticks, fleas, among others
- The most important vector in the transmission of arboviruses are mosquitoes of the *Aedes* genus
  - *Aedes aegypti*, *Aedes albopictus*, *Aedes poliniesis*
- Urban cycles- Sylvatic/Rural cycle
- Only the female bites for blood, which she needs to mature her eggs
- Commonly feed at dusk and dawn, indoors in shady areas
- Lay eggs in water containers (stagnant water)



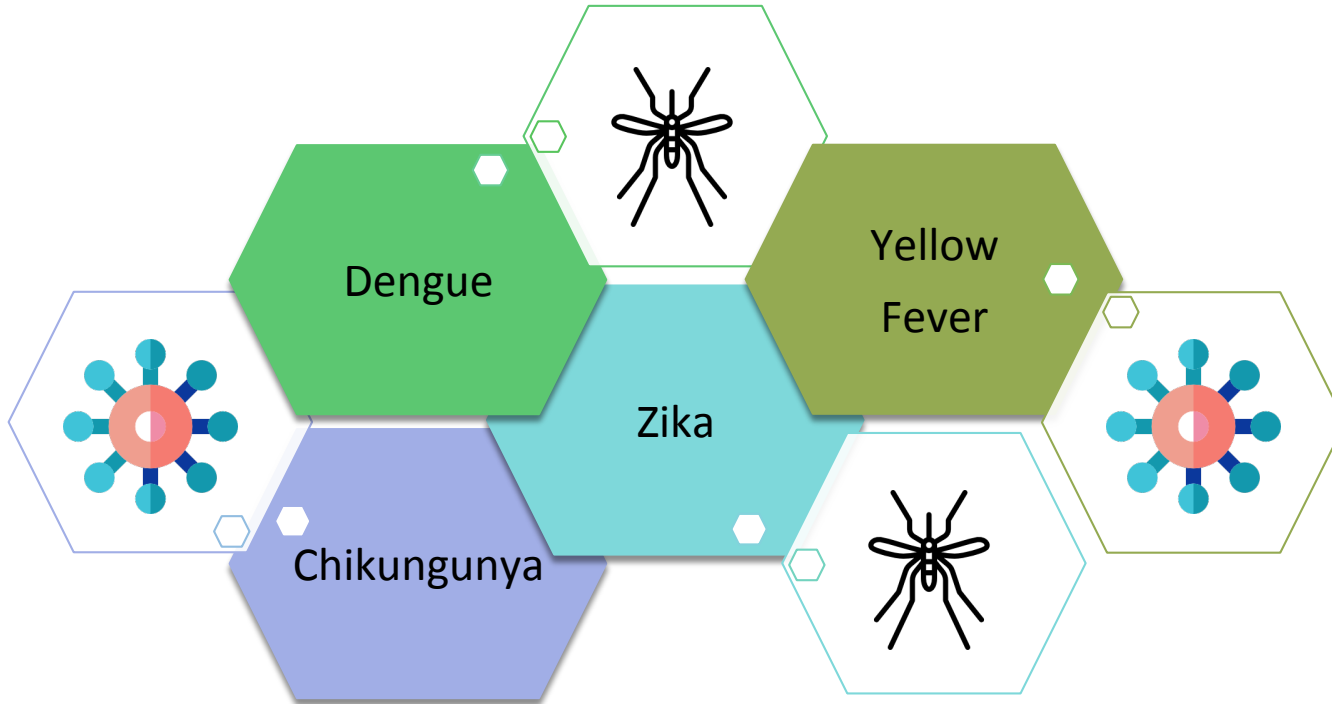
# Arboviruses: vectors

8





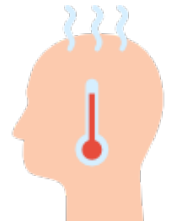
# Arboviruses



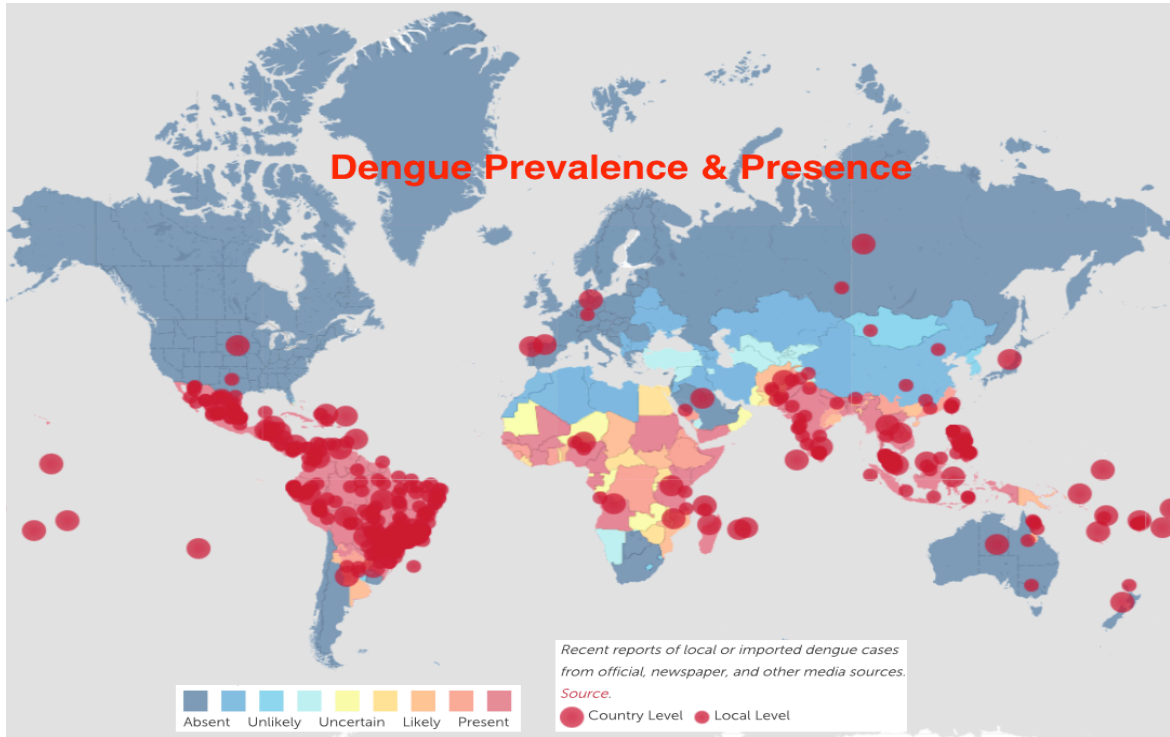
# 1.1 Arboviruses: Dengue

10

- Undifferentiated febrile disease
  - ▣ Severe dengue and non severe dengue
- Four serotypes: DENV-1, DENV-2, DENV-3, DENV-4
  - ▣ Successive infection with two different serotypes is a risk factor for developing the severe forms of the disease
- Tropical and subtropical regions: 3000 million people
- Temperate regions
  
- 390 million infections/year
  - ▣ 96 million asymptomatic
  - ▣ 20 000 deaths/year

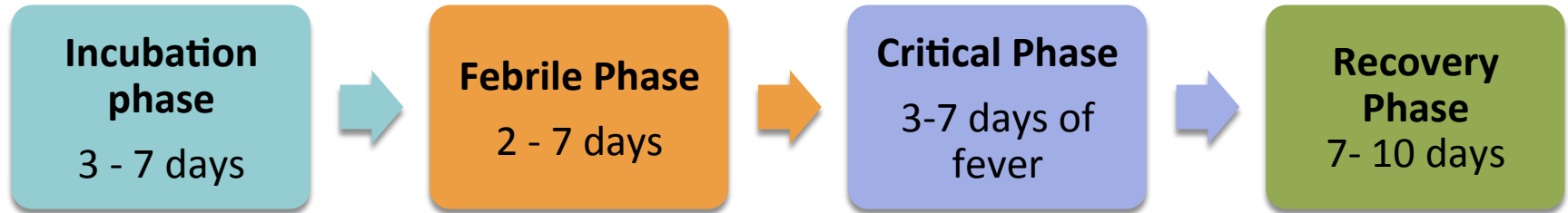


# Dengue distribution worldwide



# Dengue virus infection

12



Organización Panamericana de la Salud. Dengue: Guías para la atención de enfermos en la región de las Américas. Segunda edición 2015. Washington D.C 2015

# Dengue virus infection

13

## Febrile Phase



Sudden high fever 39-40°C



Skin flushing, erythema, body pain, headache, **retro-orbital pain**



Anorexia, nausea, vomit, diarrhea



Minor hemorrhagic manifestations: petechial and ecchymosis

# Dengue virus infection

14

## Critical Phase



Decrease in body temperature, increase of capillary permeability



Hemorrhage



Hemorrhage (Digestive, Pulmonary, CNS)

**Strict medical treatment:**  
prevent hemorrhage.  
Pharmacists should deliver patients in critical phase to a health care center

# Dengue virus infection

15

## Recovery Phase



Hemodynamic status stabilizes, general improvement



Skin rash and fatigue: several weeks after the recovery phase

# Dengue in special populations

16



Pregnancy: risk of preterm birth and low birth weight for infants



Newborn: high mortality, dengue symptoms due to vertical transmission



Elderly: more risk of complications, hemodynamic abnormalities



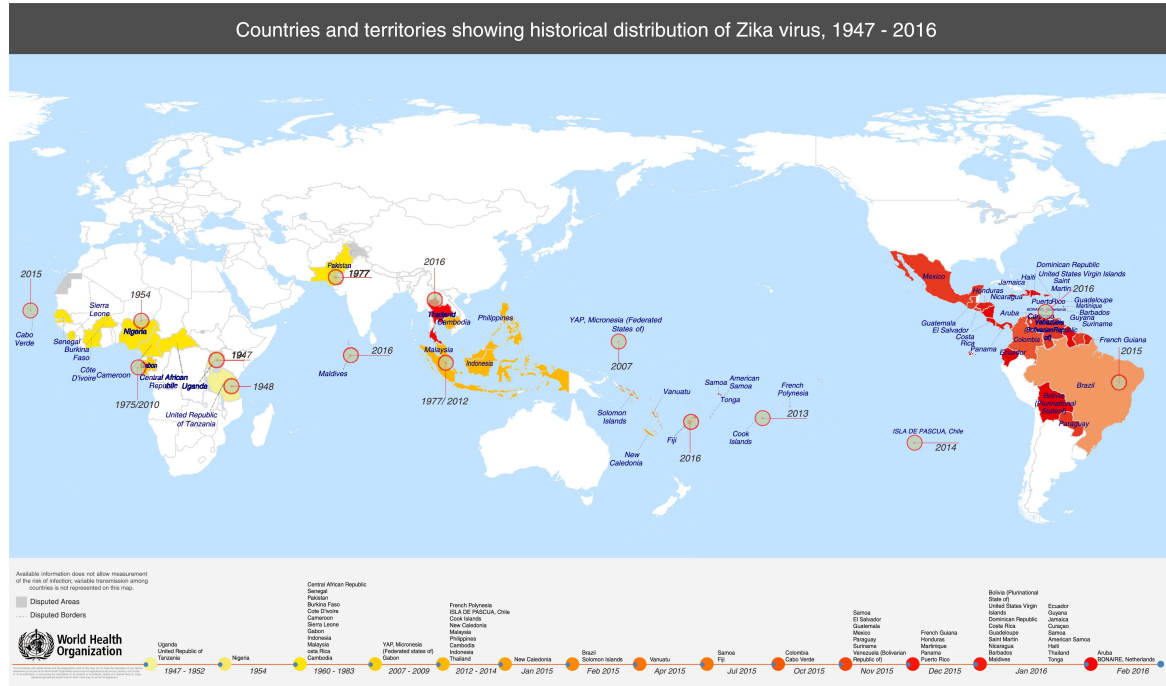
# Arboviruses: Zika

17

- Emerging disease
- First isolation in 1947 from a Rhesus monkey in Zika forest, Uganda
- In 1968 was isolated for the first time in humans
- Outbreaks:
  - 2013 Polynesia → Pascua Island
  - 2015 Brazil



# Zika distribution worldwide



# Zika infection

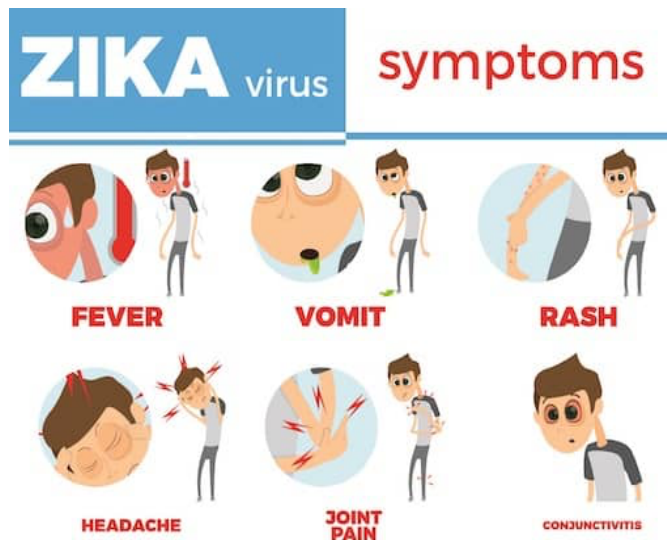
19

- Incubation period is not clear
  - ▣ Less than a week
- Symptoms: 3 to 12 days after mosquito bite
- Vertical transmission
- Sexual transmission
- Blood transfusion

NEJM 374;16 Zika Virus

# Zika infection

There are not  
hematological or  
hemorrhagic  
manifestations



## Surveillance:

- Neurological disorders
- Congenital brain abnormalities

# Zika: neurological complications

21

- ❑ Guilliam Barré syndrome (GBS)
- ❑ Rapid and progressive weakness
- ❑ Severe weakness
- ❑ Paralysis
- ❑ Other complications:
  - ❑ Encephalitis
  - ❑ Meningoencephalitis
  - ❑ Cerebelitis
  - ❑ Inflammatory myopathy



**SGB requires specific medical attention**

**Pharmacist should advise patients to look for medical attention and to educate patients that neurological manifestations is a complication of the infection**

# Zika: Congenital syndrome

22

- 2015: Pernambuco, Brazil
- Increase births of children with microcephaly
- Zika Outbreak at same time
  
- WHO February 2016:
  - ▣ Zika virus infection during pregnancy is a cause of congenital brain abnormalities including microcephaly



Bebé con cabeza de tamaño adecuado



Tamaño adecuado de la cabeza

Bebé con microcefalia



Tamaño adecuado de la cabeza

Bebé con microcefalia grave



# Zika: special populations

23

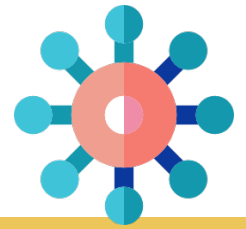


Pregnancy: should seek medical care and advise



Newborn babies: routine pediatric care is advised

# Arboviruses: Chikungunya



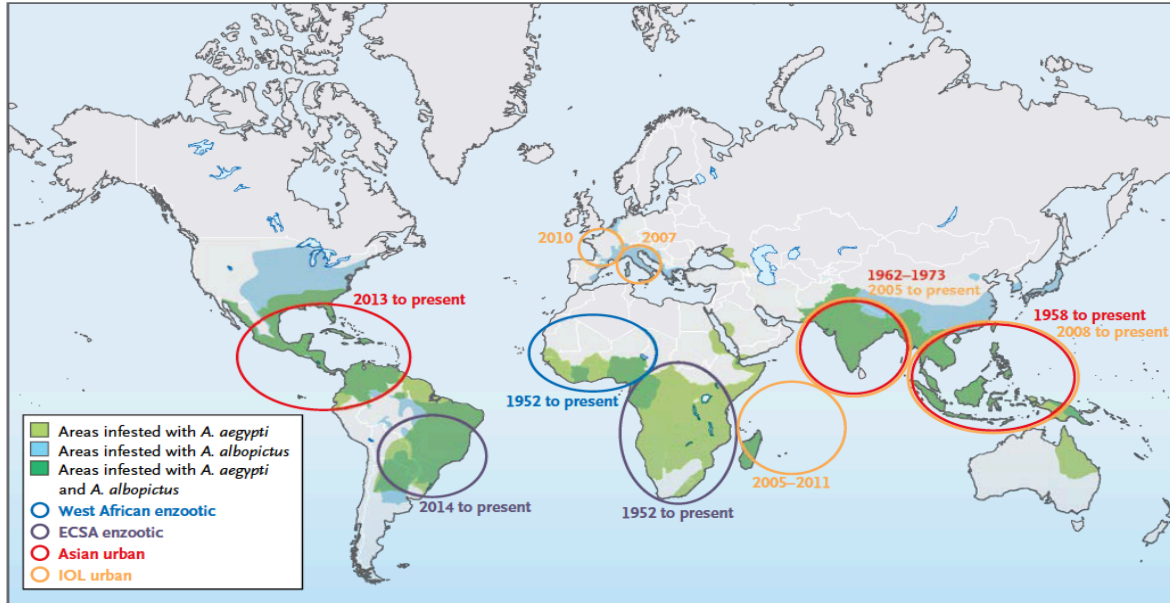
24

- “Chikungunya” → “to become contorted”
  - ▣ Word in Makonde (Tanzania)
  - ▣ Describes the appearance of the patients
  - ▣ First outbreak: 1952-1953
  - ▣ First outbreak in the Americas: 2013
  - ▣ Incubation period: 3 to 7 days
  - ▣ Virus replication occurs in muscles, joints, skin, liver, spleen and meninges

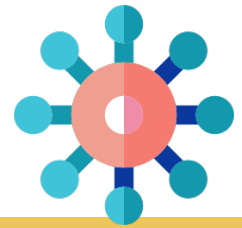
Fuente: NEJM 2015; 372: 1231-9



# Chikungunya distribution worldwide



# Chikungunya Infection



26

## Actue disease

- Sudden fever 39°C
- Joint pain sever
- Muscle pain, headache, nausea, fatigue and rash

## Subactue disease

- Inflammatory manifestations: arthritis, synovitis, tenosynovitis or bursitis
- Intense asthenia

## Chronic disease

- Severe joint pain may be prolonged for several months or years
- Debilitating polyarthralgias

# Chikungunya is special populations

27



Elderly: a large number of symptoms are similar to other conditions present in the elderly leading to an incorrect diagnosis

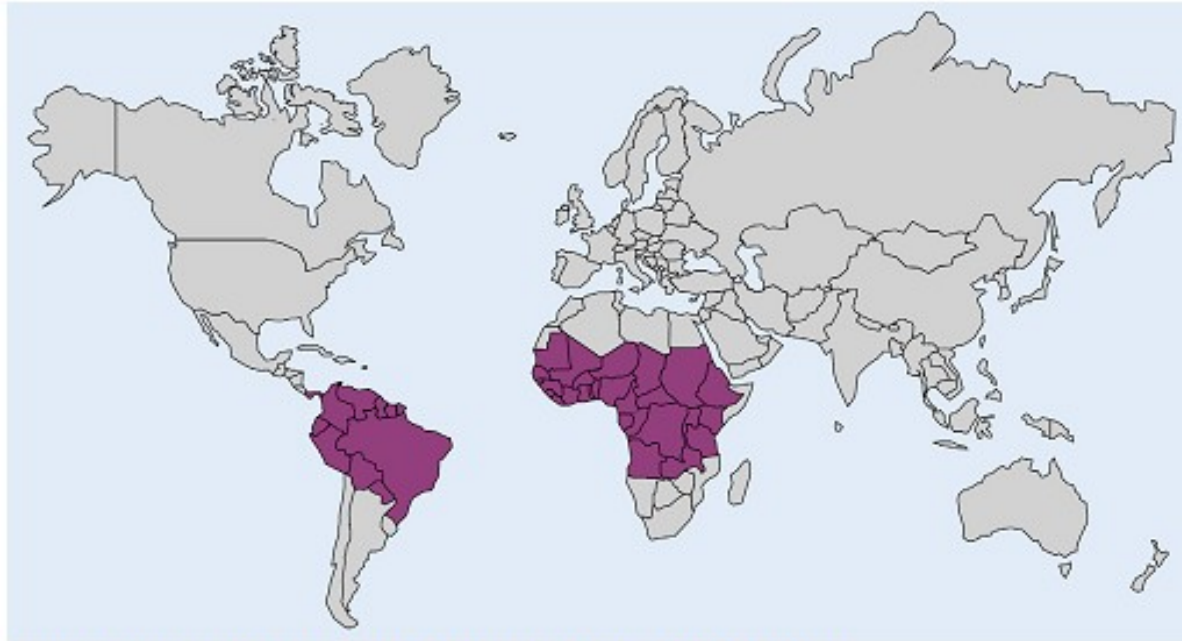
# Arboviruses: yellow fever

28

- ❑ “Yellow fever” → yellow color in skin and eyes (jaundice)
- ❑ Yellow fever was imported into the Americas as consequence of the slave trade from Africa
- ❑ Endemic form tropical areas of South America and Africa
- ❑ Outbreak in Peru in 1995
- ❑ Urban and Jungle cycles
- ❑ 25% of the cases will progress to complicated forms of the infection (toxic phase)

# Yellow fever distribution worldwide

29

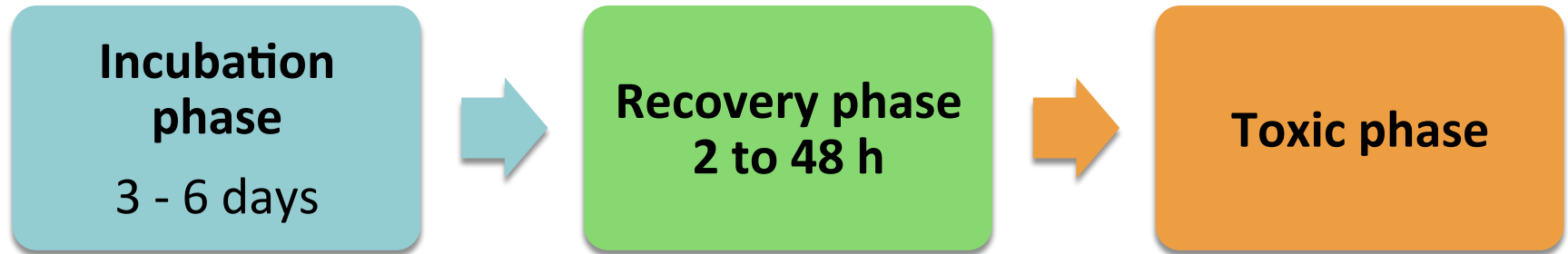


**Figura 1.** Mapa que muestra países afectados por fiebre amarilla endémica.

[http://scielo.sld.cu/scielo.php?script=sci\\_arttext&pid=S1727-897X2017000100010](http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1727-897X2017000100010)

# Yellow fever infection

30



# Yellow fever infection

31

## Infection phase

- High fever (>39°C)
- Muscle pain, backache, headache, loss of appetite, nausea or vomiting, jaundice
- Symptoms disappear after 3 to 4 days

## Recovery phase

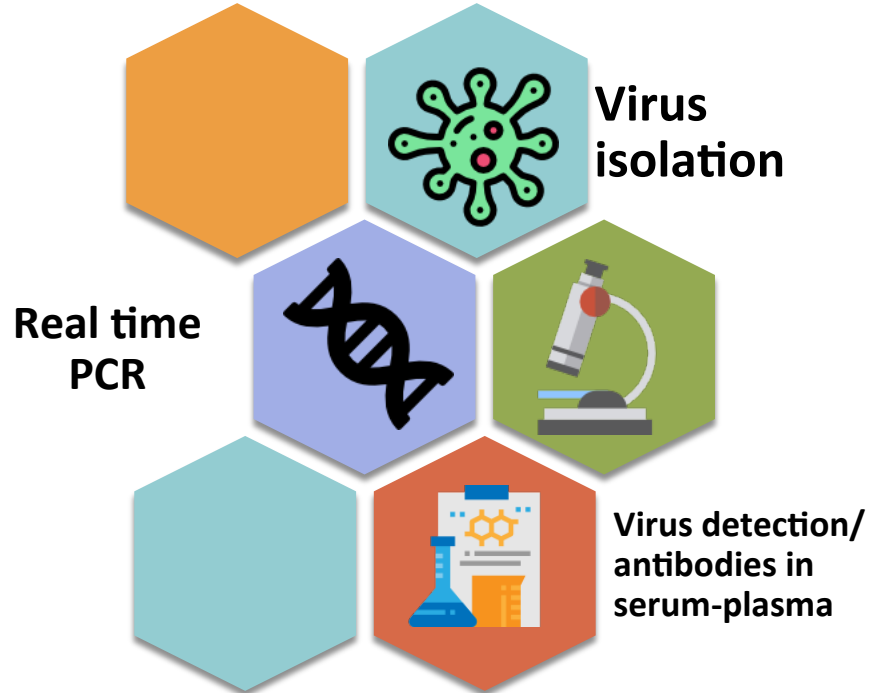
- Symptoms disappear
- General improvement

## Toxic phase

- Jaundice
- High fever returns
- Liver and kidney failure

# Arboviruses: diagnosis

32



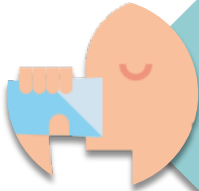


# Arboviruses infection: treatment

33



Paracetamol for pain and fever  
Avoid: Aspirin or other NSAIDs



Oral intake of rehydration solutions, fruit juice and other fluids containing electrolytes



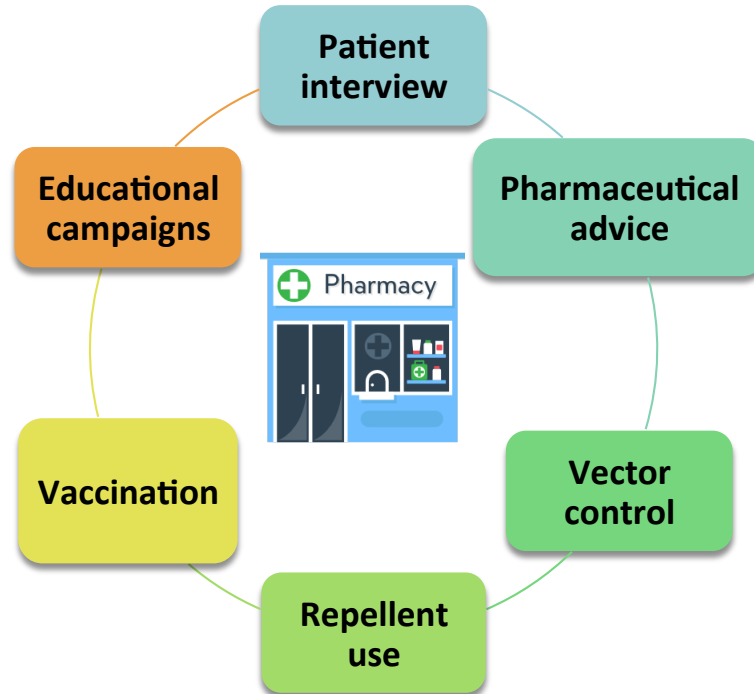
Vaccination: dengue and Yellow Fever



34

## 2. Pharmaceutical strategies for arbovirus surveillance

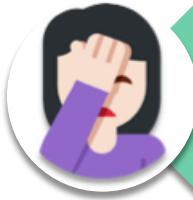
# 2. Actions that the pharmacist can perform



# 2.1 Patient interview



Symptom evolution time



Symptoms and signs description and severity  
Consider a warning sign if the patient is not recovered  
after 5 to 7 days



Housing, previous travel to endemic regions

# 2.1 Patient interview

| CUADRO DE SIGNOS/SÍNTOMAS           |   |   |   |
|-------------------------------------|---|---|---|
| Signos/síntomas                     | Zika  | Chikungunya   | Dengue  |
| Fiebre                              | Si está presente, usualmente es baja                            | Casi siempre presente. Alta y de inicio inmediato   | Siempre presente. Alta y de inicio inmediato                |
| Dolores en las articulaciones       | Si están presentes, son leves                                   | Presentes e intensos en la mayoría de los casos   | Casi siempre presentes y moderados                          |
| Sarpullido/manchas rojas en la piel | Casi siempre presentes, usualmente aparecen en las primeras 24h | Pueden presentarse en muchos casos, después del 3º día del inicio de la enfermedad              | Pueden estar presentes                                      |
| Picor/comezón/prurito               | Puede estar presente y ser de leve a grave                      | Ocurre en casi la mitad de los casos. Pueden ocurrir lesiones con burbujas/ ampollas/ vesículas | Puede estar presente y es leve                              |
| Enrojecimiento de los ojos          | Puede estar presente  | Puede estar presente  | Raro, pero el dolor alrededor de los ojos es muy frecuente  |
| Manifestaciones hemorrágicas        | Ausentes  | Poco comunes  | Pueden estar presentes                                      |
| Otras manifestaciones               | Dolor de cabeza, dolor muscular y malestar general              | Dolor de cabeza, dolor muscular, constipación y dolor del estómago                              | Dolores de cabeza, detrás de los ojos y musculares intensos |

**Detectar los síntomas puede salvar la vida de otros o la suya**  
**ZIKA CHIKUNGUNYA DENGUE**  
 ¡Infórmese!

Los pacientes con zika, chikungunya y dengue pueden ser asintomáticos. El conjunto y la intensidad de signos y síntomas de las tres condiciones son variables.

| SIGNOS Y SÍNTOMAS                            | ZIKA  | CHIKUNGUNYA   | DENGUE  |
|--|---|---|---|
| <b>FIEBRE</b>                                | Si está presente, usualmente es baja                            | Casi siempre presente. Alta y de inicio inmediato   | Siempre presente. Alta y de inicio inmediato                |
| <b>DOLORES EN LAS ARTICULACIONES</b>         | Si están presentes, son leves                                   | Presentes e intensos en la mayoría de los casos   | Casi siempre presentes y moderados                          |
| <b>SARPULLIDO / MANCHAS ROJAS EN LA PIEL</b> | Casi siempre presentes, usualmente aparecen en las primeras 24h | Pueden presentarse en muchos casos, después del 3r día del inicio de la enfermedad            | Pueden estar presentes                                      |
| <b>PICOR/COSEZÓN/PRURITO</b>                 | Puede estar presente y ser de leve a grave                      | Ocurre en casi la mitad de los casos. Pueden ocurrir lesiones con burbujas/ampollas/vesículas | Puede estar presente y es leve                              |
| <b>ENROJECIMIENTO DE LOS OJOS</b>            | Puede estar presente  | Puede estar presente  | Raro, pero el dolor alrededor de los ojos es muy frecuente  |
| <b>MANIFESTACIONES HEMORRÁGICAS</b>          | Ausentes  | Poco comunes  | Pueden estar presentes                                      |
| <b>OTRAS MANIFESTACIONES</b>                 | Dolor de cabeza, dolor muscular y malestar general              | Dolor de cabeza, dolor muscular, constipación y dolor del estómago                            | Dolores de cabeza, detrás de los ojos y musculares intensos |

**IMPORTANTE**

Para cada uno de los síntomas, consulte al médico. Evite automedicarse. Si está embarazada o tiene un hijo menor de 5 años, consulte al médico antes de tomar cualquier medicamento. Evite viajar a zonas con brotes de zika, chikungunya y dengue.

Tratamiento: No hay un tratamiento específico para zika, chikungunya o dengue. El tratamiento es sintomático y se centra en aliviar los síntomas.

Precauciones: Evite viajar a zonas con brotes de zika, chikungunya o dengue. Evite viajar a zonas con brotes de zika, chikungunya o dengue. Evite viajar a zonas con brotes de zika, chikungunya o dengue.

Asesoramiento: Consulte al médico antes de viajar a zonas con brotes de zika, chikungunya o dengue. Consulte al médico antes de viajar a zonas con brotes de zika, chikungunya o dengue. Consulte al médico antes de viajar a zonas con brotes de zika, chikungunya o dengue.

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[http://www.cofar.com/index.php?option=com\\_phocadownload&view=category&id=18:informacion-para-farmaceuticos-sobre-el-dengue-chikungunya-y-zika&Itemid=217](http://www.cofar.com/index.php?option=com_phocadownload&view=category&id=18:informacion-para-farmaceuticos-sobre-el-dengue-chikungunya-y-zika&Itemid=217)

# 2.1 Patient interview

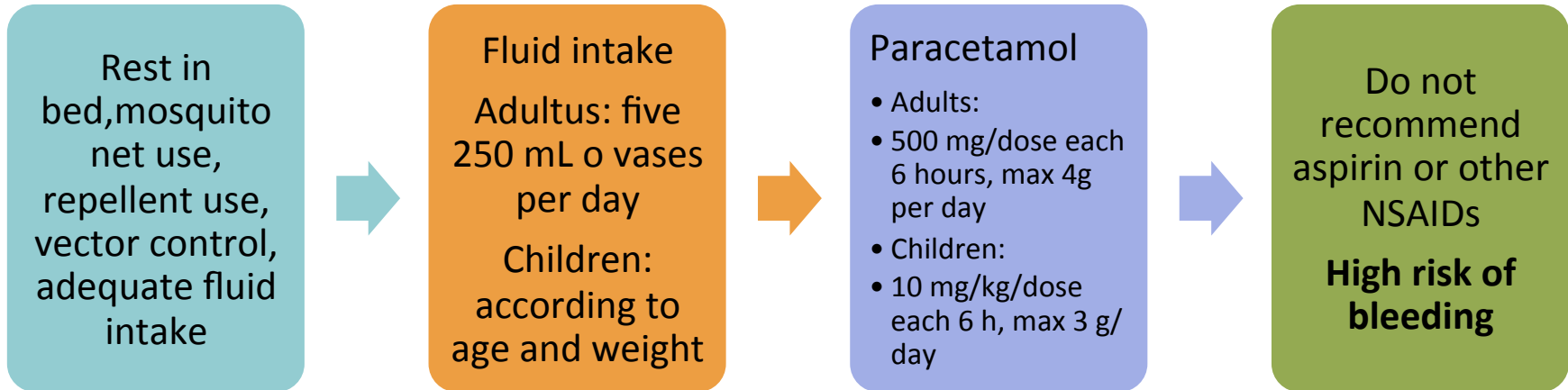
39

- Special population:
  - ▣ Elderly
  - ▣ Pregnancy
  - ▣ Children (under two years)
- Consider a pharmaceutical advice/intervention if the clinical case is not severe

## 2.2 Pharmaceutical advice



40





## 2.3 Vector control



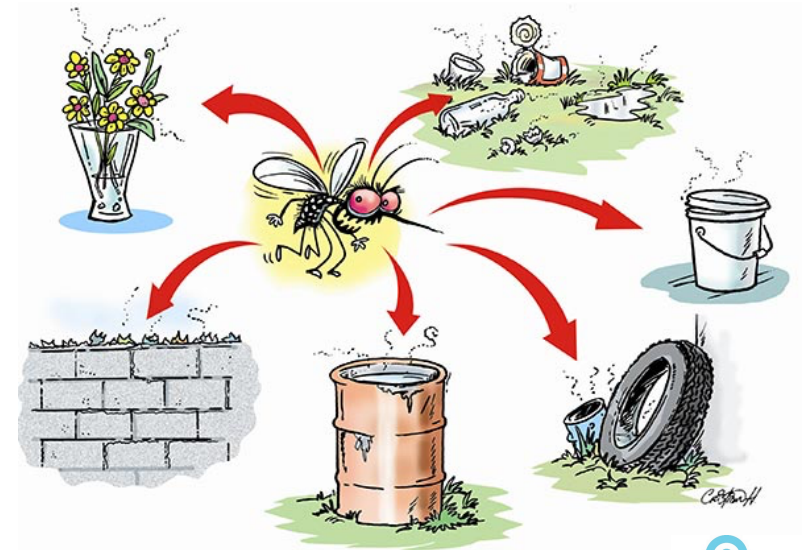
41

- To control the *Aedes* mosquito transmission in immature stages and in the adult stage inside living spaces and adjacent spaces
  - ▣ Avoid the propagation and vector bite
- Mosquito eradication:
  - ▣ Environmental control
  - ▣ Personal protection

## 2.3 Vector control-Environmental control

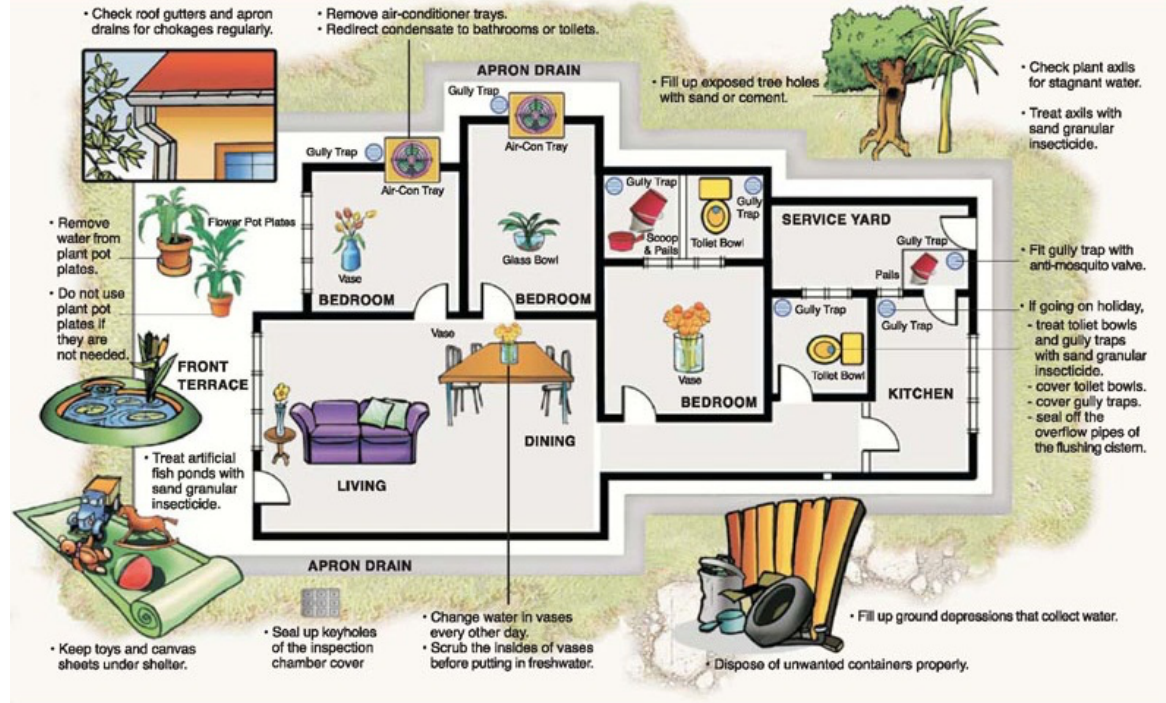
42

- *Aedes* uses a wide range of confined larval habitats, both man-made and natural
- Stagnant water in gardens, flower vases, tires, among others
- **Eliminate mosquito hatcheries**



# 2.3 Vector control-Environmental control

## Check for *Aedes* mosquito breeding in your home Protect your loved ones from Dengue Fever



<https://anshikasawaram.wordpress.com/2014/03/19/dengue-outbreak-making-the-headlines-again-in-mauritius-fiji-west-pacific-and-brazil/>

## 2.3 Vector control- Environmental control

44

- ❑ All pesticides are toxic
- ❑ Pesticides should be handled by trained personnel
- ❑ Fumigation is not the only strategy to eradicate the mosquito
- ❑ **Pharmacist can promote fumigation campaigns in their communities**
  - ❑ Rainy season in endemic areas
  - ❑ Outbreak- outbreak risk



## 2.4 Mosquito repellent use

45

- ❑ Substances that offer protection against mosquito bite due to their smell or chemical properties
- ❑ They produce an unpleasant effect on the sensory endings and produce a blockage of chemical perception of the insects
- ❑ Apply on exposed areas of the body
  - ▣ Body lotion
  - ▣ Roll on
  
- ❑ **Community pharmacist should advice all patients who buy a repellent on the correct way to use them in order to achieve the desired effectiveness and safety**





## 2.4 Mosquito repellent use

46

- 4 to 8 hour protection after use
- They do not kill the mosquito, but they keep it away from the area where the repellent was applied
- Most used repellents:
- **N,N diethyl-meta-toluamide (DEET)**
  - **Do not use in children younger than 2 year old**
  - **Citronella is less effective than DEET, its use is discouraged in the current epidemiological context**
  - **Citronella should be consider in children under 2 year old and pregnant women**



## 2.4 Mosquito repellent use

47

- Repellent should be applied in the following schedule:
- Early morning hours: 7:00 am to 10:00 am or in the late afternoon from 4:00 pm to 7:00 pm
- Consider that the mosquito can bite during the day in dark areas and indoors and at night if the lights are on

## 2.4 Mosquito repellent use



48

- ❑ Check the repellent label: 30% DEET (usual concentration)
- ❑ Follow the instructions on the product label
- ❑ Do not apply the repellent on cuts, wounds or irritated skin or sunburned skin
- ❑ Do not spray in enclosed areas. Spray outdoors
- ❑ Spray the palm of your hands first, then use just enough to apply to the face and around the ears. Avoid eyes and mouth entirely.
- ❑ Keep the repellent out of children's reach
- ❑ Do not allow children to handle the product themselves and do not apply it directly to their hands



## 2.4 Mosquito repellent use



49

- During the year 2015 Argentina reported an increase in the demand and sale of mosquito repellent by 60%  
➔ mosquito repellent unavailable
- Pharmaceutical mosquito repellent compounding:
  - ▣ Colegio de Farmacéuticos de la Provincia de Buenos Aires
  - ▣ Colegio de Farmacéuticos y Bioquímicos de la Capital Federal (Argentina)



## 2.5 Vaccination

50

- Dengue
- Yellow fever
- Community pharmacist can recommend the use of vaccines in endemic areas or in case of travel to endemic areas.
- In countries where legislation allows it, the pharmacist can also apply vaccines
- **Like any vaccine, it may not protect 100% of the population vaccinated. Protection measures against mosquito bites after vaccination must remain**

## 2.6 Educational campaigns

51

- Education should be the central strategy in the control and prevention of arboviruses
- The pharmacist is in a strategic position to inform the patient, provide educational material and perform public health activities:
  - ▣ Newsletters/ Bulletin
  - ▣ Bulletin board
  - ▣ Social network
  - ▣ Participation in media: tv, radio



## 2.6 Educational campaigns



52

- To participate and develop activities of promotion, prevention and health education directed to the community in general.
- Advice patients on the prevention and control measures of the diseases, including vaccination.
- Identify signs and symptoms and refer patients to health services for specific diagnosis and clinical evaluation.
- To recommend, when appropriate, pharmacological options for the relief of signs and symptoms, as well as protective measures, including the use of mosquito repellents.
- Patient follow up: diagnosis, treatment and prevention

## 2.6 Educational campaigns- PFA

53

- “Infectious diseases transmitted by the mosquito *Aedes aegypti*, dengue, chikungunya and zika: a challenge for the health system. Supporting pharmacists to improve public health in the population of the Americas”

Montero, N. Informe final de ejecución de proyecto Las enfermedades infecciosas transmitidas por el mosquito *Aedes aegypti*, el dengue, el chikungunya y el zika: un reto para los sistemas de salud. Apoyando a los farmacéuticos para contribuir a mejorar la salud pública en la población de las Américas , 8 de marzo 2018

# 2.6 Educational campaigns



54

## Health professionals

- Technical documents: review of arboviruses
- Educational material for the pharmacy office

## Patients

- Patient interview: signs and symptoms
- Patient Follow up
- Patient education in public health topics

## General population

- General prevention measures
- Eliminate mosquito hatcheries
- Mosquito repellent use
- Vaccination

# 2.6 Educational campaigns PFA

55



Puesto de información y atención de consultas. Lanzamiento de la campaña *Farmacéuticos Unidos contra el Dengue, Chikungunya y Zika*. 76° Congreso Mundial de Farmacia y Ciencias Farmacéuticas de la Federación Internacional Farmacéutica y XXI Congreso Farmacéutico Argentino de la Confederación Farmacéutica Argentina. Buenos Aires, Argentina, 28 de agosto a 1° de setiembre de 2016.

Montero, N. Informe final de ejecución de proyecto Las enfermedades infecciosas transmitidas por el mosquito *Aedes aegypti*, el dengue, el chikungunya y el zika: un reto para los sistemas de salud. Apoyando a los farmacéuticos para contribuir a mejorar la salud pública en la población de las Américas, 8 de marzo 2018

# 2.6 Educational campaigns PFA



Figura 5. Obra de títeres y folleto informativo que se utiliza en la actividad que se realiza con alumnos de jardines de infantes y nivel primario de las escuelas de San Antonio de Arco y Ciudad de Buenos Aires, Argentina

Montero, N. Informe final de ejecución de proyecto Las enfermedades infecciosas transmitidas por el mosquito Aedes aegypti, el dengue, el chikungunya y el zika: un reto para los sistemas de salud. Apoyando a los farmacéuticos para contribuir a mejorar la salud pública en la población de las Américas , 8 de marzo 2018



# 2.6 Educational campaigns PFA



Actividad realizada por el Colegio Regional de Farmacia de Amazonas en una tribu indígena



Acciones realizadas por el Colegio Regional de Farmacia de Acre

Acciones realizadas por el Colegio Regional de Farmacia de Bahia

Montero, N. Informe final de ejecución de proyecto Las enfermedades infecciosas transmitidas por el mosquito Aedes aegypti, el dengue, el chikungunya y el zika: un reto para los sistemas de salud. Apoyando a los farmacéuticos para contribuir a mejorar la salud pública en la población de las Américas , 8 de marzo 2018

# Thank you

58

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