Dalmine, venerdì 31 maggio 2013

DEET ed OLI ESSENZIALI: campi di applicazione dell'industria tessile nei protocolli preventivi delle malattie infettive trasmesse da vettori

Fabio Foti, MD - CLINICAL MICROBIOLOGIST - DTM&H

OUTLINE

- ✓ *BACKGROUND*
- ✓ *DEET*
- ✓ *OLI ESSENZIALI*
- ✓ *APPLICAZIONI NEL TESSILE*
- ✓ *CONCLUSIONI*

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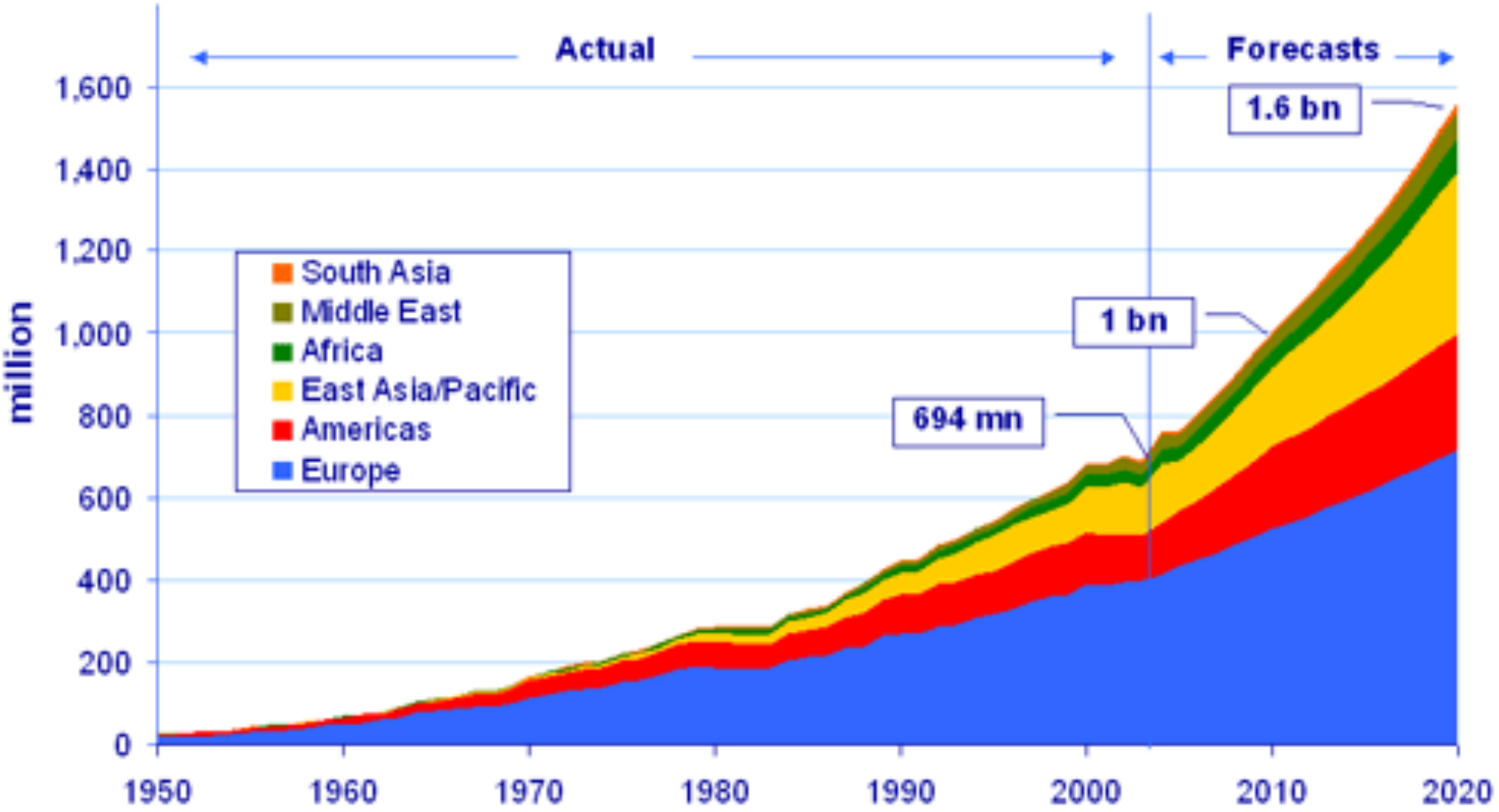
NUMERO DI VIAGGIATORI NEL MONDO (WTO)



Florida

Mosquito capital of the World

anopheles

aedes aegypti

culex

Important mosquito-borne pathogens that cause disease in humans

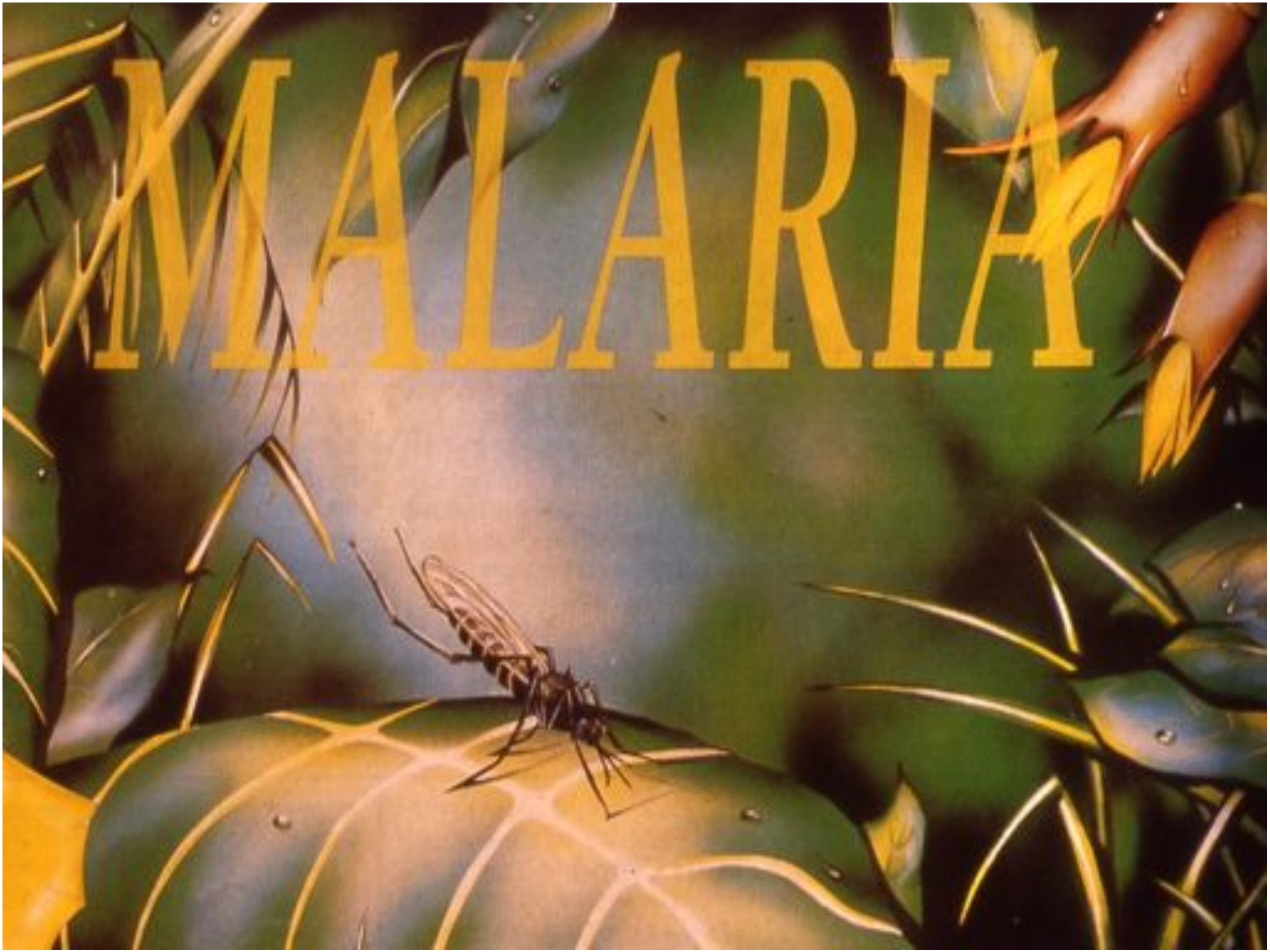
Pathogen	Disease	Case fatality rate (%)	Important vectors to human
***Togaviridae* arboviruses**			
Chikungunya	Febrile to severe illness	Very low	*Ae. aegypti, Ae. albopictus*
Eastern equine encephalitis	Encephalitis	50–75	*Coquillettidia perturbans, Ae. vexans*
Ross River	Febrile	0	*Culex annulirostris*
Sindbis	Febrile	0	*Ae. cinereus, Cx. pipiens*
Venezuelan equine encephalitis	Encephalitis	0.1–20	*Cx. pipiens*
Western equine encephalitis	Encephalitis	5–10	*Cx. tarsalis*
***Flaviviridae* arboviruses**			
Dengue 1-4	Febrile to haemorrhagic	3–12	*Ae. aegypti, Ae. albopictus*
West Nile	Febrile to encephalitis	3–15	*Culex spp. (Cx. pipiens, Cx. modestus)*
Japanese encephalitis	Encephalitis	30–40	*Cx. tritaeniorhynchus*
Murrey Valley encephalitis	Encephalitis	20–70	*Cx. annulirostris*
St. Louis encephalitis	Encephalitis	4–20	*Cx. pipiens, Cx. nigripalpus*
Yellow fever	Haemorrhagic	5–20	*Ae. aegypti, Ae. africanus, Haemagogus* spp.
***Bunyaviridae* arboviruses**			
La Crosse encephalitis	Encephalitis	<1	*Ae. triseriatus*
Rift Valley fever	Febrile	<1	*Aedes spp., Cx. pipiens*
***Plasmodium* protozoa**			
Malaria	Febrile to renal failure	1–7 (< 5 years)	*Anopheles* spp.

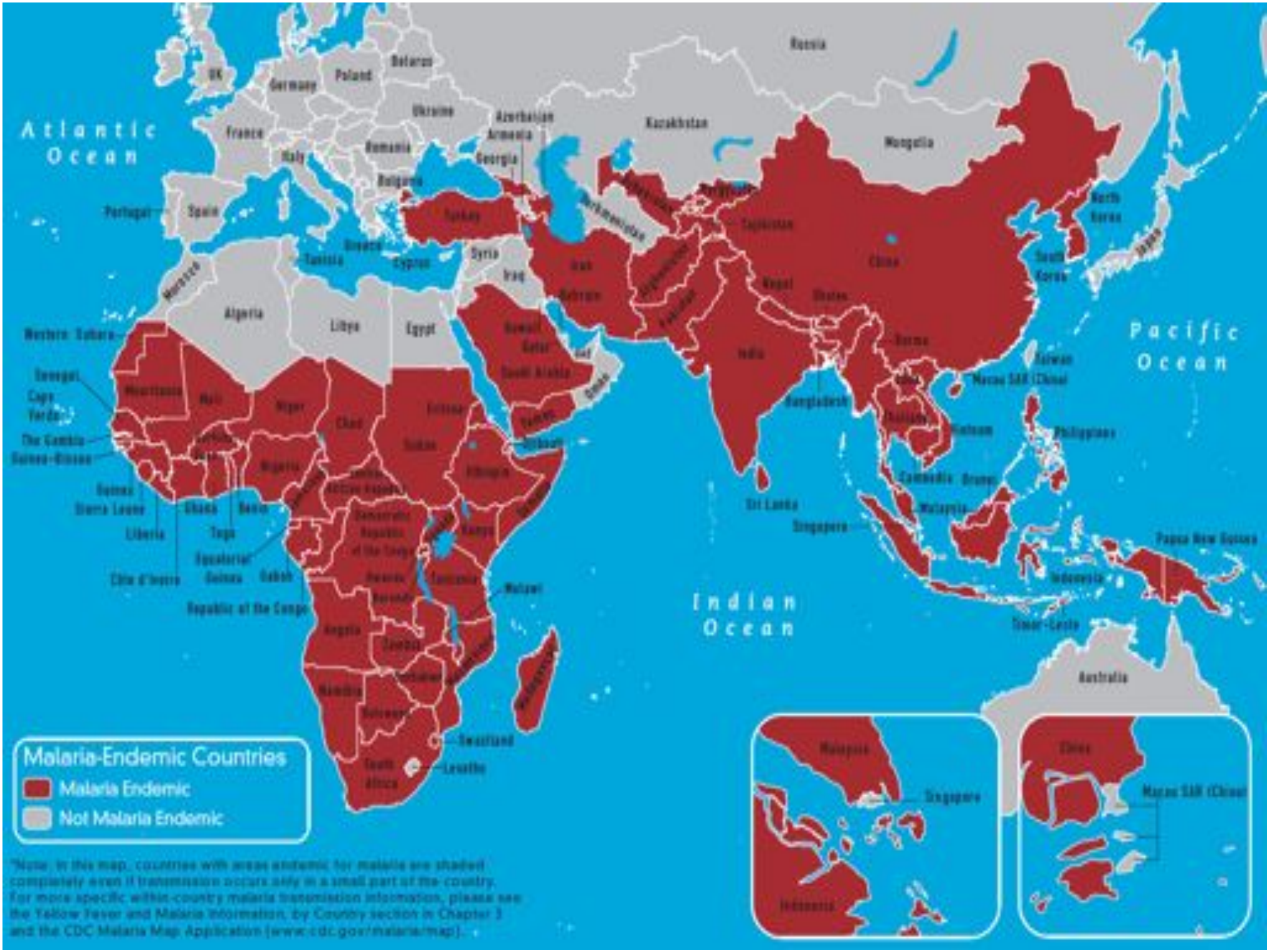
Source: Beaty & Marquardt 1996; Schaffner 2003

Important mosquito-borne pathogens that cause disease in humans

Pathogens and diseases	Transmission in Europe	Important vectors to human
Arboviruses		
Chikungunya	Italy 2007; France 2010	*Ae. aegypti, Ae. albopictus*
Dengue 1–4	Until early 20th century; Croatia and France 2010	*Ae. aegypti, Ae. albopictus*
Eastern equine encephalitis, La Crosse encephalitis, Rift Valley fever	–	*Aedes spp., Culex spp.*
Sindbis	Endemic in northern Europe	*Aedes cinereus, Cx. pipiens*
Japanese encephalitis, Murray Valley encephalitis, St Louis encephalitis, Ross River fever, Venezuelan equine encephalitis, Western equine encephalitis	–	*Culex spp.*
West Nile	Endemic in southern Europe	*Cx. pipiens, Cx. modestus*
Yellow fever	Until 19th century, in ports	*Ae. aegypti, Ae. africanus, Haemagogus spp.*
***Plasmodium* protozoa**		
Malaria	Endemic until mid-20th century; since then sporadic cases; epidemic in Greece 2011	*Anopheles spp.*

MALATTIA	VETTORI	AGENTI PATOGENI	SITUAZIONE IN ITALIA
Malaria	anopheles 	plasmodio 	Solo importazione. Unico caso autoctono nel 98 a Grosseto
Dengue e Chikungunyia	albopictus et al 	flavivirus 	Solo importazione. Epidemia Chik nel 2007 a Ravenna
Dirofilariasi		filarie 	Rara, accidentale in ambiente rurale
West Nile Disease	Culex et al 	flavivirus 	1998. Epidemia di encefalite equina in Toscana (14 casi). Nessun caso umano
Leishmaniosi Viscerale	flebotomi 	leishmania 	Endemica Soprattutto nel centro sud. Circa 200 casi/anno. Trend in salita
Meningite da virus Toscana		phlebovirus 	Endemica. Principalmente.in Toscana e Marche Alcune decine di casi/anno. Trend in salita
Febbre Bottonosa	zecche 	rickettsie 	Endemica. Soprattutto al centro sud 900 1000 casi/anno. Trend in discesa
Malattia di Lime		borrelie 	Endemica, soprattutto nelle regioni di nord-est. Alcune decine di casi/anno. Trend in salita
Encefalite da zecche		flavivirus 	Endemica, soprattutto nelle regioni di nord-est. <10 casi/anno. Trend in salita


MALARIA



*Note: In this map, countries with areas endemic for malaria are shaded completely even if transmission occurs only in a small part of the country. For more specific within-country malaria transmission information, please see the Yellow Fever and Malaria Information, by Country section in Chapter 3 and the CDC Malaria Map Application (www.cdc.gov/malaria/map).


United States
Bermuda
Atlantic Ocean
The Bahamas
Mexico
Cuba
Dominican Republic
Jamaica
Belize
Honduras
Haiti
Guatemala
El Salvador
Panama
Guyana
Nicaragua
Venezuela
French Guiana
Costa Rica
Suriname
Colombia
Ecuador
Brazil
Peru
Pacific Ocean
Bolivia
Paraguay
Argentina
Chile
Uruguay
Malaria-Endemic Countries
Malaria Endemic
Not Malaria Endemic

Indagini entomologiche realizzate dall'ISS in questi ultimi anni

Risultati : *Anopheles labranchiae*, è ancora molto comune nel nostro Paese, così come le altre specie potenziali vettori di malaria indicate in figura, tuttavia le trasformazioni ecologiche e sanitarie intervenute ci proteggono da un possibile ritorno di epidemie di malaria

Anopheles labranchiae

Altri culicidi zoofilici del complesso
Anopheles maculipennis

Anopheles superpictus

L'ISS partecipa al Progetto europeo Eden, di monitoraggio del rischio malaria nei Paesi che affacciano sul bacino del Mediterraneo

EDEN

EDEN Italy

Principi di prevenzione antimalarica

prevenzione primaria	contatto uomo-vettore
prevenzione secondaria	chemioprofilassi
prevenzione terziaria	autotrattamento

Malaria Bite Avoidance Measures — From Dusk till Dawn

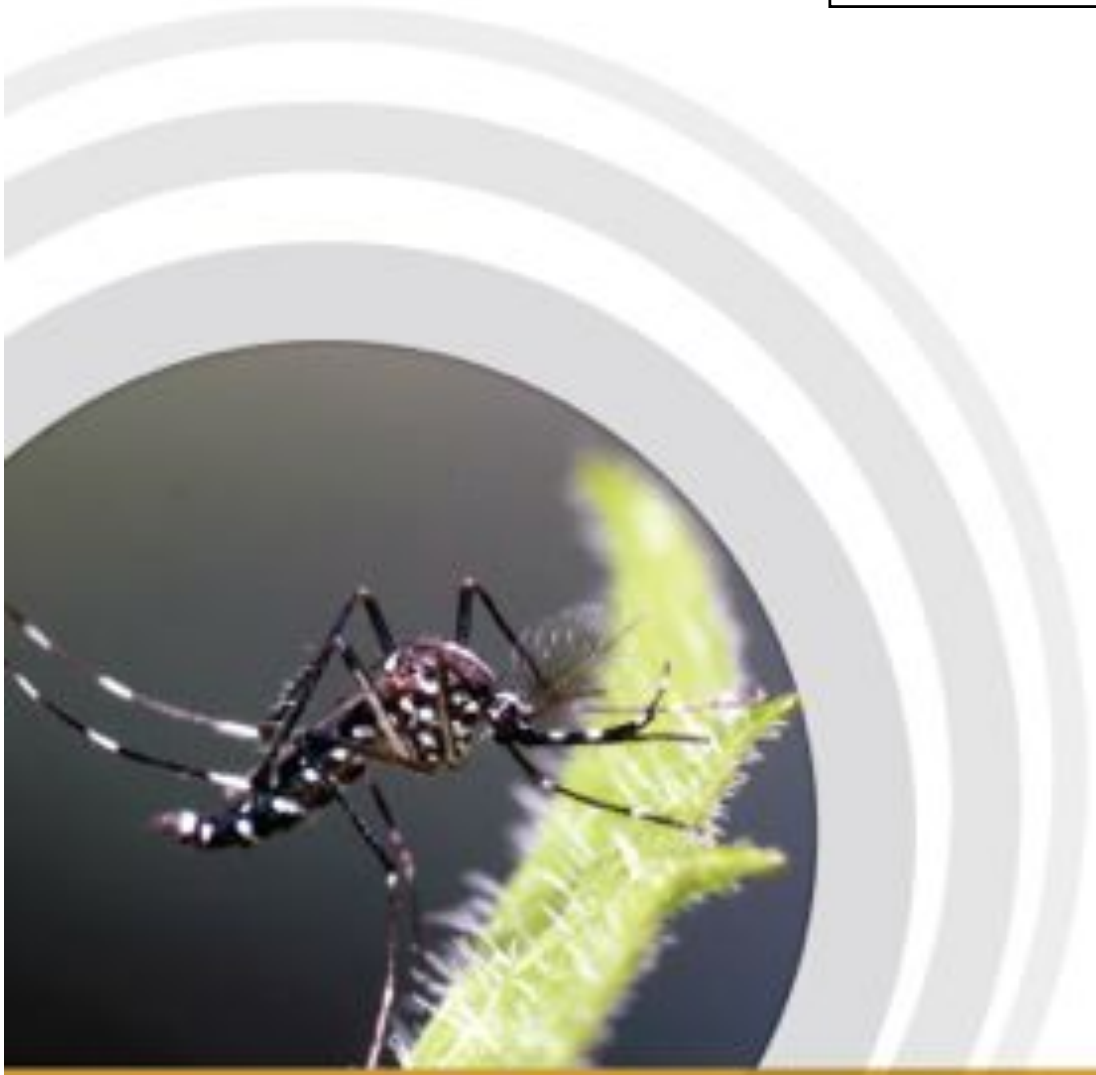
- Insect repellents – DEET-based or picaridin-based
- Protective clothing covering ankles, legs, arms
- Permethrin impregnation of clothing, bed nets, etc.
- Screened or air-conditioned accommodations
- Restrict outdoor activities at night


3M
ULTRATHON
INSECT
REPELLENT
2 FL. OZ. • 59 ml
Permethrin Solution
13.3%
WARNING
3M
ULTRATHON
2 FL. OZ. • 59 ml

PERMETRINA

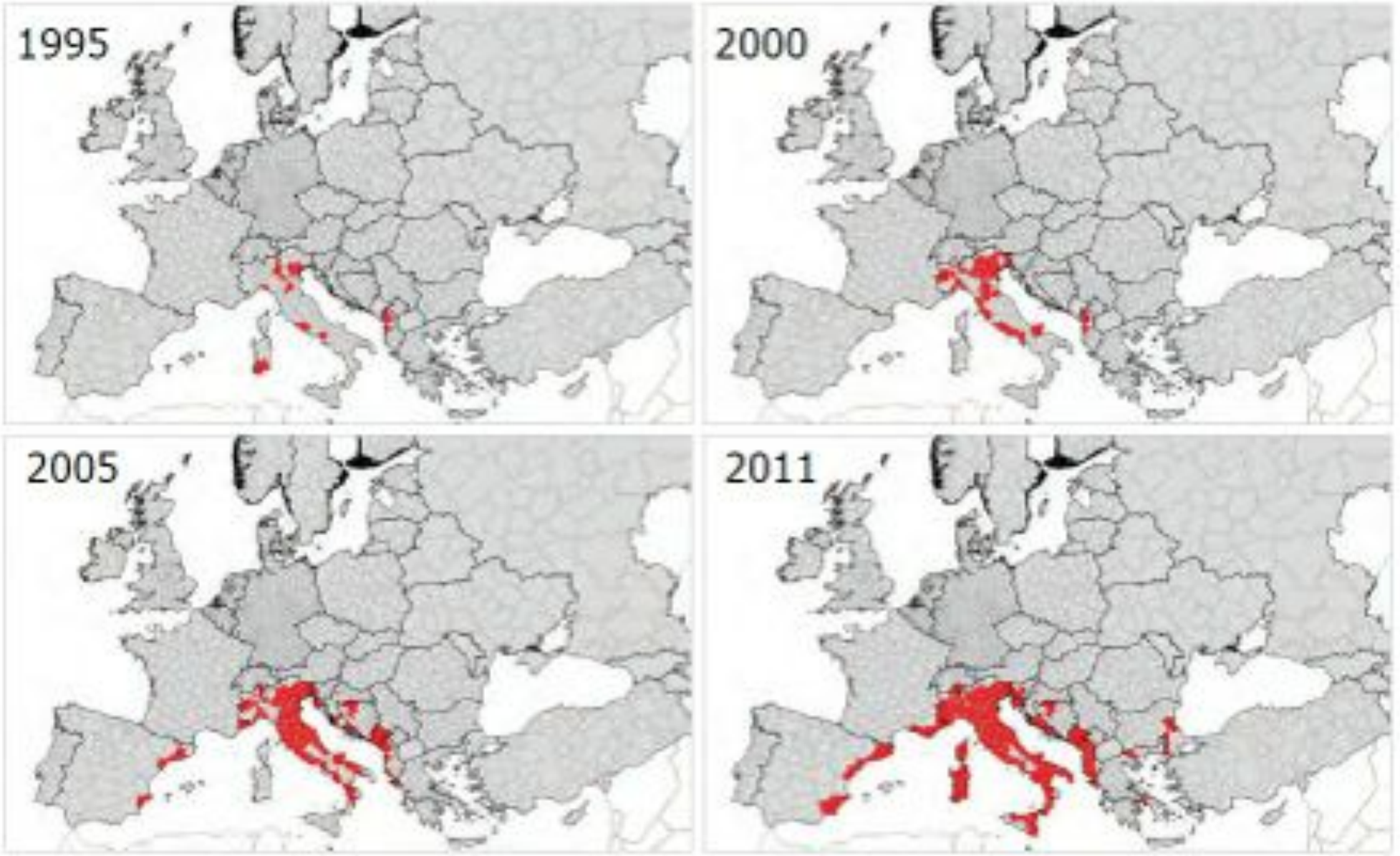
- La permetrina è un piretroide con una tossicità molto bassa per i mammiferi
- L'assorbimento attraverso la pelle è limitato
- E' usata per impregnare gli abiti e/o spruzzare le zanzariere
- E' solitamente disponibile in forma spray
- Applicata in modo appropriato resiste a diversi lavaggi (fini ad un massimo di 8 settimane)
- Le zanzariere devono essere trattate mensilmente per mantenere la loro efficacia
- Per una protezione totale, associarla al DEET (pelle)

DENGUE




Aedes aegypti
Current known distribution: December 2012
Established
Introduced
Absent
No Data
Unknown
Outermost regions
Azores (PT)
Canary Islands (ES)
Madeira (PT)
Svalbard/Jan Mayen (NO)
ECDC 2013/VBORNET

Spread of the Asian tiger mosquito *Ae. albopictus* in Europe, 1995–2011



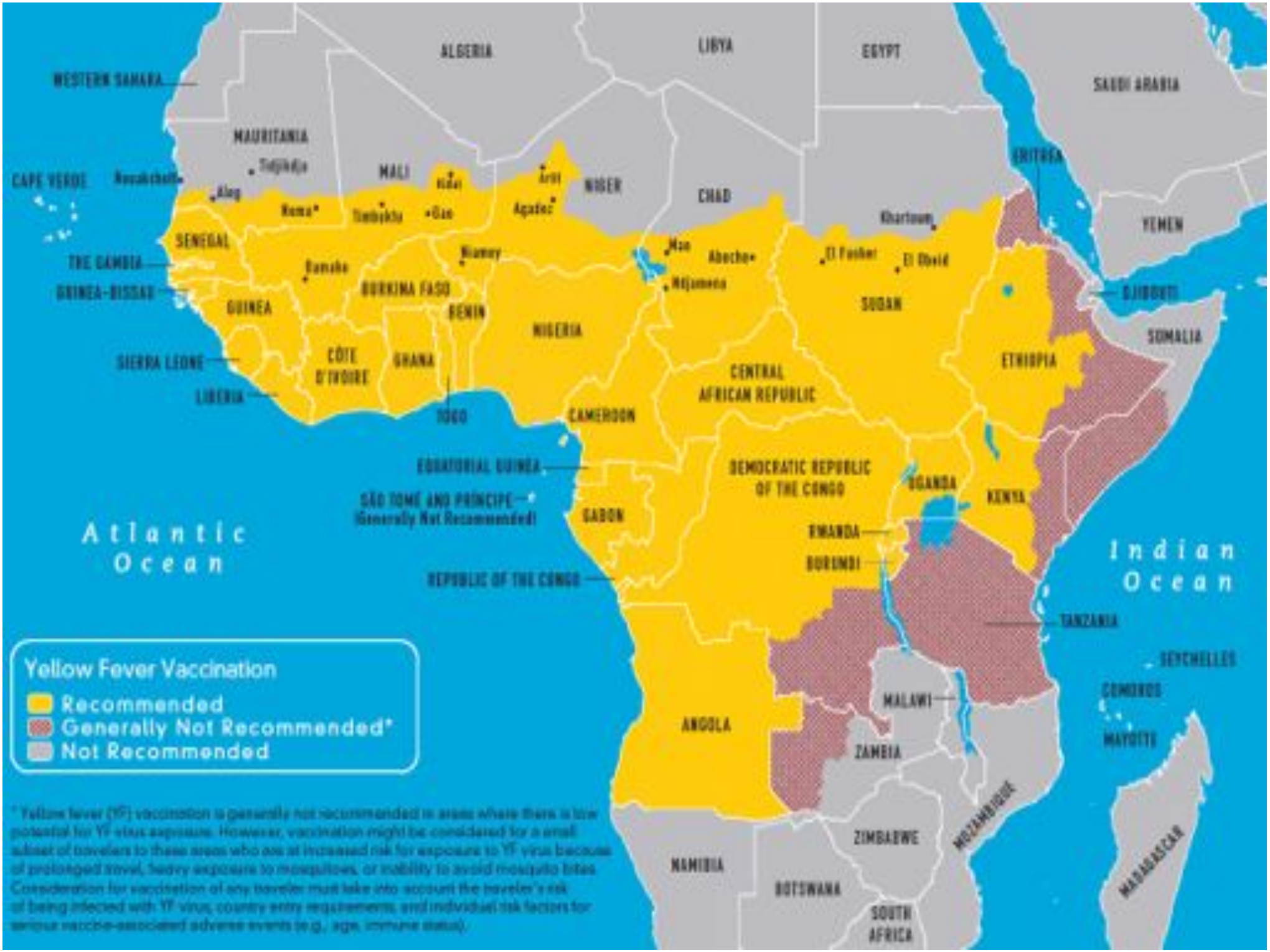
Red mapping units (NUTS 3) = presence; grey units = absence or no available information


Aedes albopictus
Current known distribution: December 2012
Established
Introduced
Absent
No Data
Unknown
Outermost regions
Azores (PT)
Canary Islands (ES)
Madeira (PT)
Svalbard/Jan Mayen (NO)
ECDC 2013/VBORNET


Atlantic Ocean
Indian Ocean
Pacific Ocean
Algeria
Libya
Egypt
Saudi Arabia
China
India
Nepal
Bhutan
Bangladesh
Sri Lanka
Mauritania
Mali
Niger
Chad
Nigeria
Sudan
Eritrea
Ethiopia
Somalia
Kenya
Uganda
Rwanda
Burundi
Tanzania
Malawi
Zambia
Angola
Namibia
Botswana
Zimbabwe
South Africa
Mozambique
Madagascar
Comoros
Mauritius
Cameroon
Central African Republic
Dem. Rep. of the Congo
Republic of the Congo
Gabon
Equatorial Guinea
Ghana
Côte d'Ivoire
Liberia
Sierra Leone
Guinea
Guinea-Bissau
Gambia
Senegal
Cape Verde
Burma
Thailand
Cambodia
Vietnam
Laos
Malaysia
Singapore
Indonesia
Brunei
Philippines
Taiwan
Hong Kong SAR (China)
Palau
Papua New Guinea
Timor-Leste
Solomon Islands
Australia
Cape Verde
Santa Lucia
Sal
Boa Vista
Fogo
Brava
Maio
Santiago
Dengue Risk Areas
Areas with No Known Dengue Risk

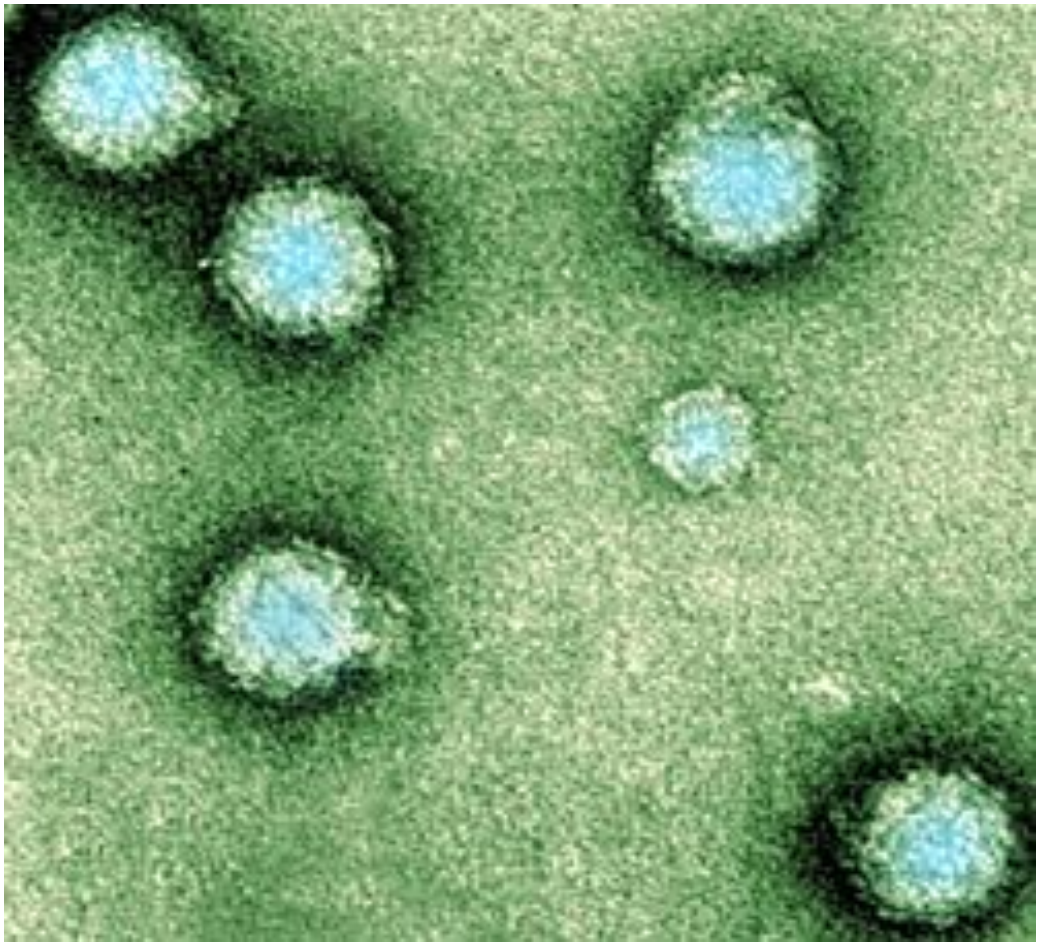

United States
Bermuda
The Bahamas
Cuba
Dominican Republic
Jamaica
Haiti
Mexico
Belize
Honduras
Nicaragua
Guatemala
El Salvador
Costa Rica
Panama
Aruba
Guyana
Suriname
French Guiana
Venezuela
Colombia
Ecuador
Galapagos Islands (Ecuador)
Peru
Brazil
Bolivia
Paraguay
Chile
Argentina
Uruguay
Atlantic Ocean
Pacific Ocean
Puerto Rico
Virgin Islands
Anguilla
Netherlands Antilles
Antigua and Barbuda
Montserrat
Guadeloupe
Dominica
Martinique
St. Lucia
St. Vincent and the Grenadines
Barbados
Grenada
Trinidad and Tobago
Venezuela
Dengue Risk Areas
Areas with No Known Dengue Risk

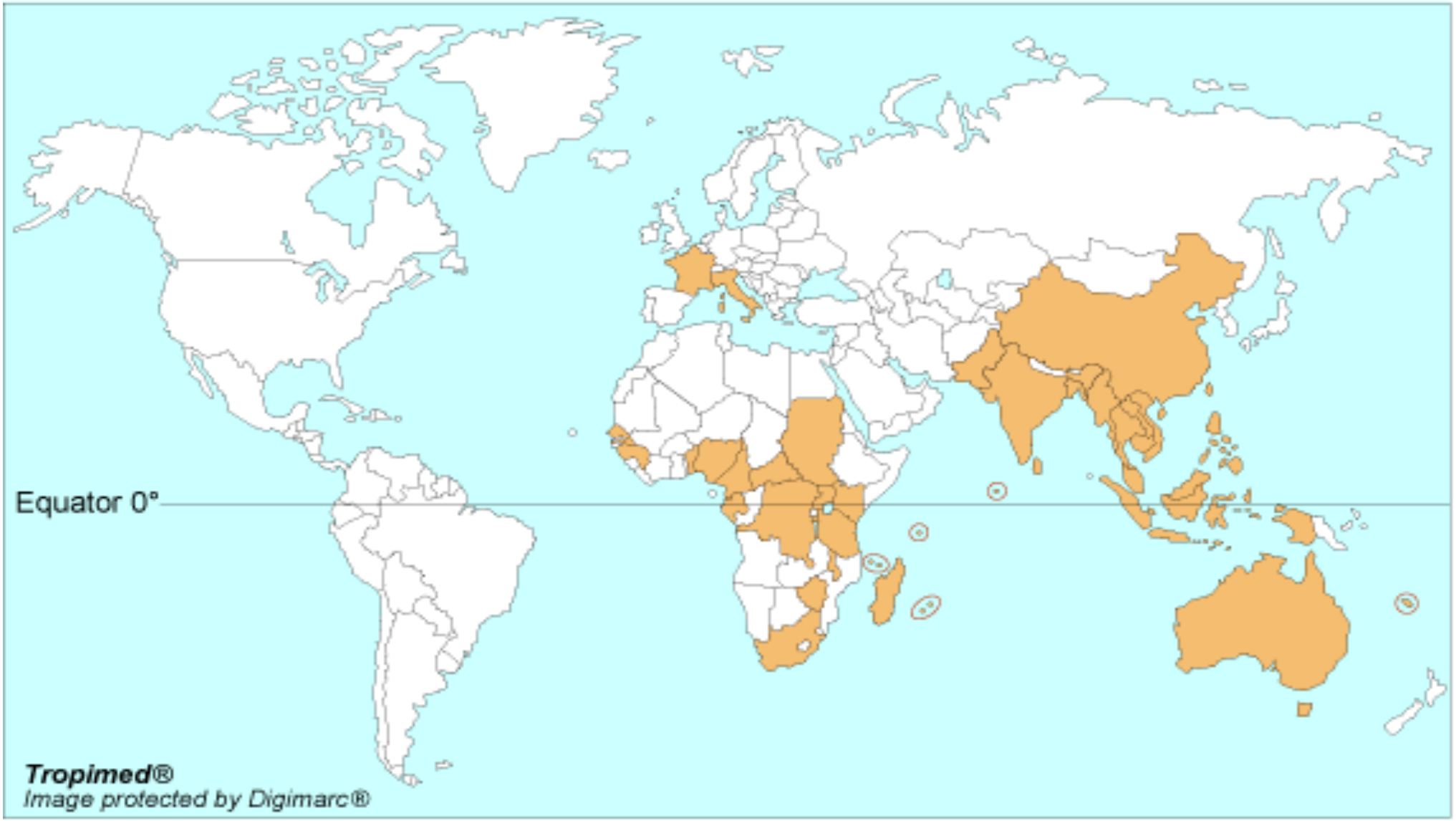
YELLOW FEVER


WESTERN SAHARA
ALGERIA
LIBYA
EGYPT
SAUDI ARABIA
MAURITANIA
Tidjikdja
MALI
Kidal
Arlit
NIGER
CHAD
ERITREA
YEMEN
CAPE VERDE
Nouakchott
Atar
Nema
Timbuktu
Gao
Agadez
Khartoum
SENEGAL
Mopti
Abeche
El Fasher
El Obeid
THE GAMBIA
Kaolack
Niamey
Nejamena
BURKINA FASO
SUDAN
DJIBOUTI
GUINEA-BISSAU
GUINEA
BENIN
NIGERIA
SOMALIA
SIERRA LEONE
CÔTE D'IVOIRE
GHANA
ETHIOPIA
CENTRAL AFRICAN REPUBLIC
LIBERIA
TOGO
CAMEROON
EQUATORIAL GUINEA
DEMOCRATIC REPUBLIC OF THE CONGO
UGANDA
KENYA
SÃO TOMÉ AND PRINCIPE (Generally Not Recommended)
GABON
RWANDA
BURUNDI
Atlantic Ocean
Indian Ocean
REPUBLIC OF THE CONGO
TANZANIA
SEYCHELLES
COMOROS
MALAWI
ANGOLA
MAYOTTE
ZAMBIA
ZIMBABWE
MOZAMBIQUE
NAMIBIA
BOTSWANA
MADAGASCAR
SOUTH AFRICA
Yellow Fever Vaccination
Recommended
Generally Not Recommended*
Not Recommended
* Yellow fever (YF) vaccination is generally not recommended in areas where there is low potential for YF virus exposure. However, vaccination might be considered for a small subset of travelers to these areas who are at increased risk for exposure to YF virus because of prolonged travel, heavy exposure to mosquitoes, or inability to avoid mosquito bites. Consideration for vaccination of any traveler must take into account the traveler's risk of being infected with YF virus, country entry requirements, and individual risk factors for serious vaccine-associated adverse events (e.g., age, immune status).

* Yellow fever (YF) vaccination is generally not recommended in areas where there is low potential for YF virus exposure. However, vaccination might be considered for a small subset of travelers to these areas who are at increased risk for exposure to YF virus because of prolonged travel, heavy exposure to mosquitoes, or inability to avoid mosquito bites. Consideration for vaccination of any traveler must take into account the traveler's risk of being infected with YF virus, country entry requirements, and individual risk factors for serious vaccine-associated adverse events (e.g., age, immune status).


Chikungunya





Chikungunya Virus

According to CDC

Approximate Global Distribution, by Country, 2012

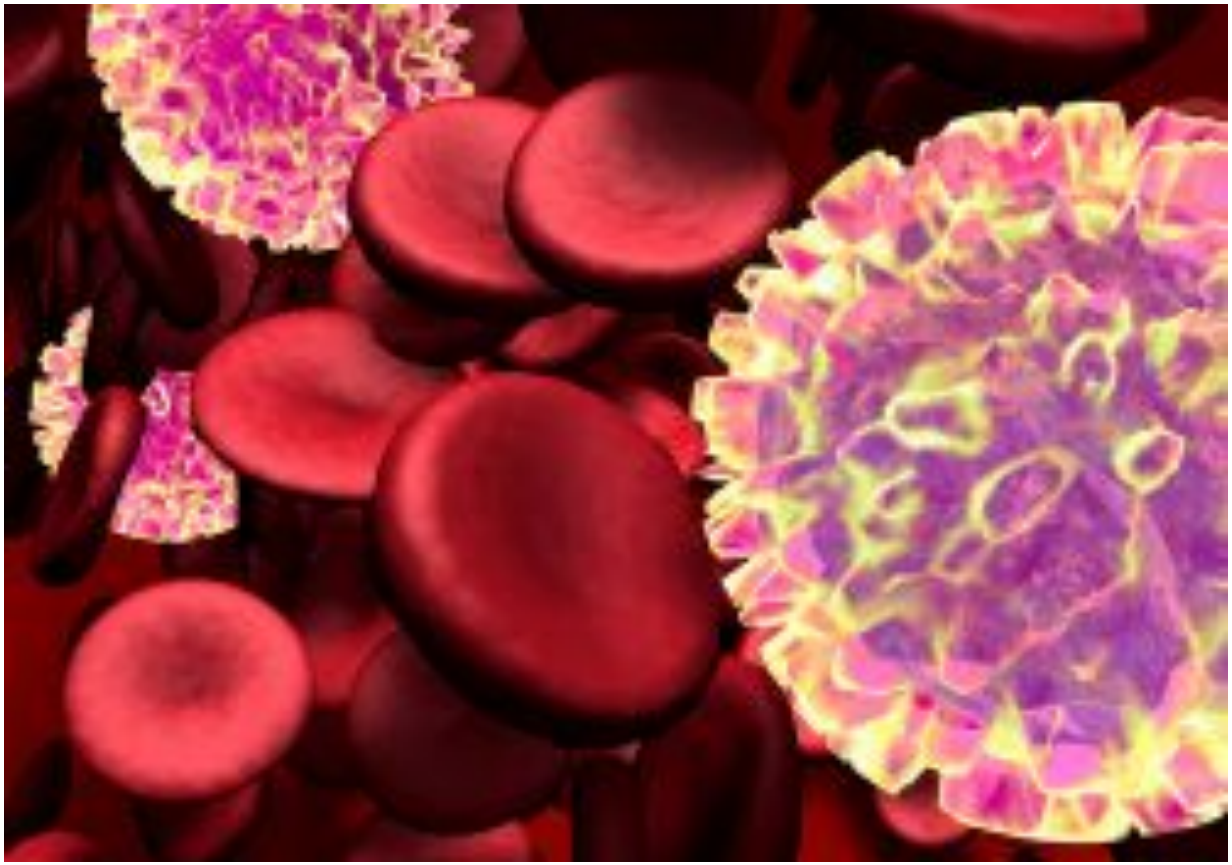
Countries where people have become infected with chikungunya virus, not including countries where only imported cases have been documented

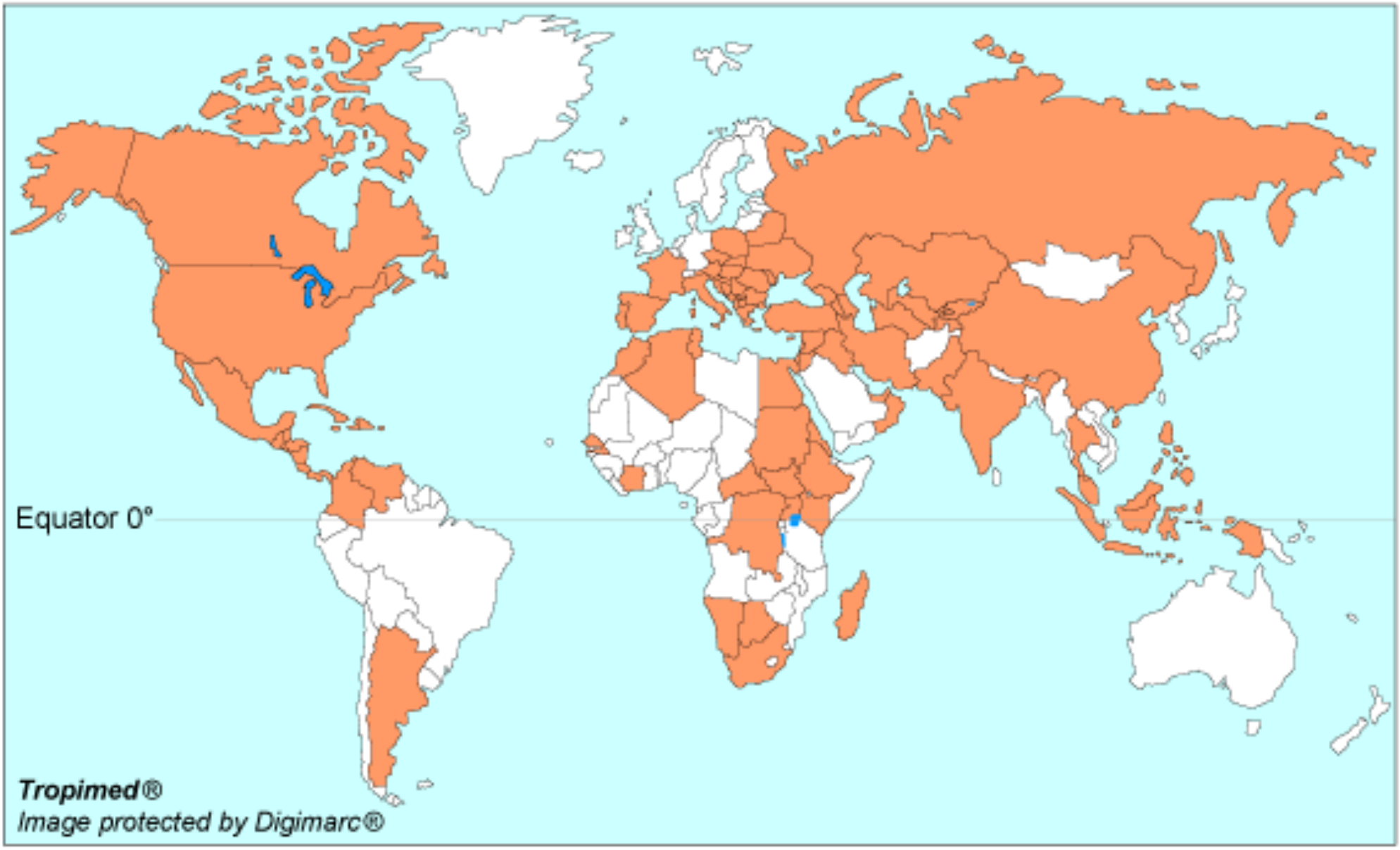
Focolaio di Chikungunya: Emilia Romagna, Settembre 2007

[Distribution of confirmed cases of chikungunya fever by locality of exposure, region of Emilia-Romagna, as of 21 September 2007 (n = 139)]

Mission Report | 17 – 21 September 2007
Joint ECDC/WHO
visit for a European risk assessment

WEST NILE FEVER



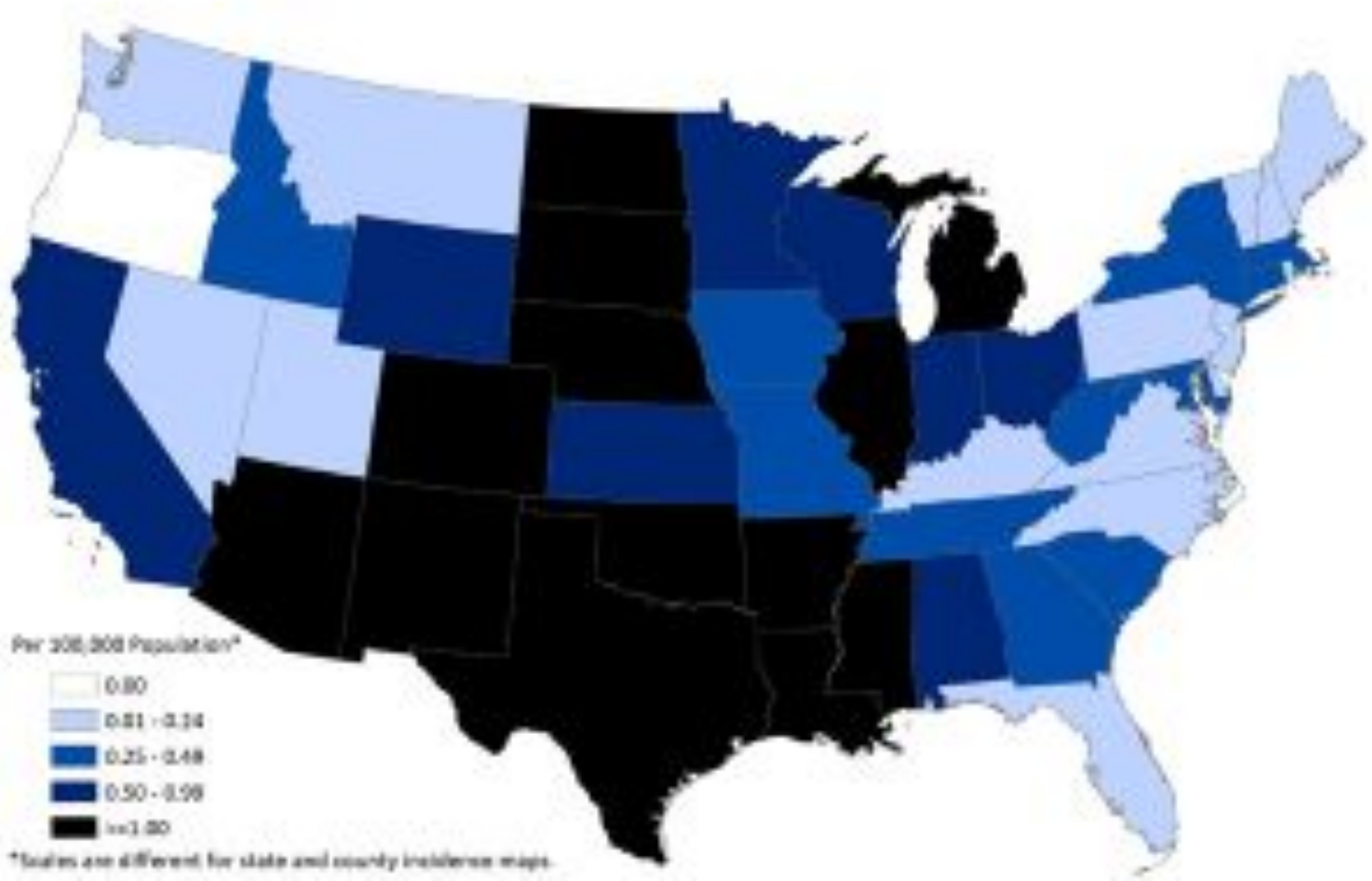


West Nile Fever

adapted 2012 (sources: various)

Presence worldwide

West Nile virus (WNV) Neuroinvasive Disease Incidence reported to ArboNET, by state, United States, 2012 (as of December 11, 2012)



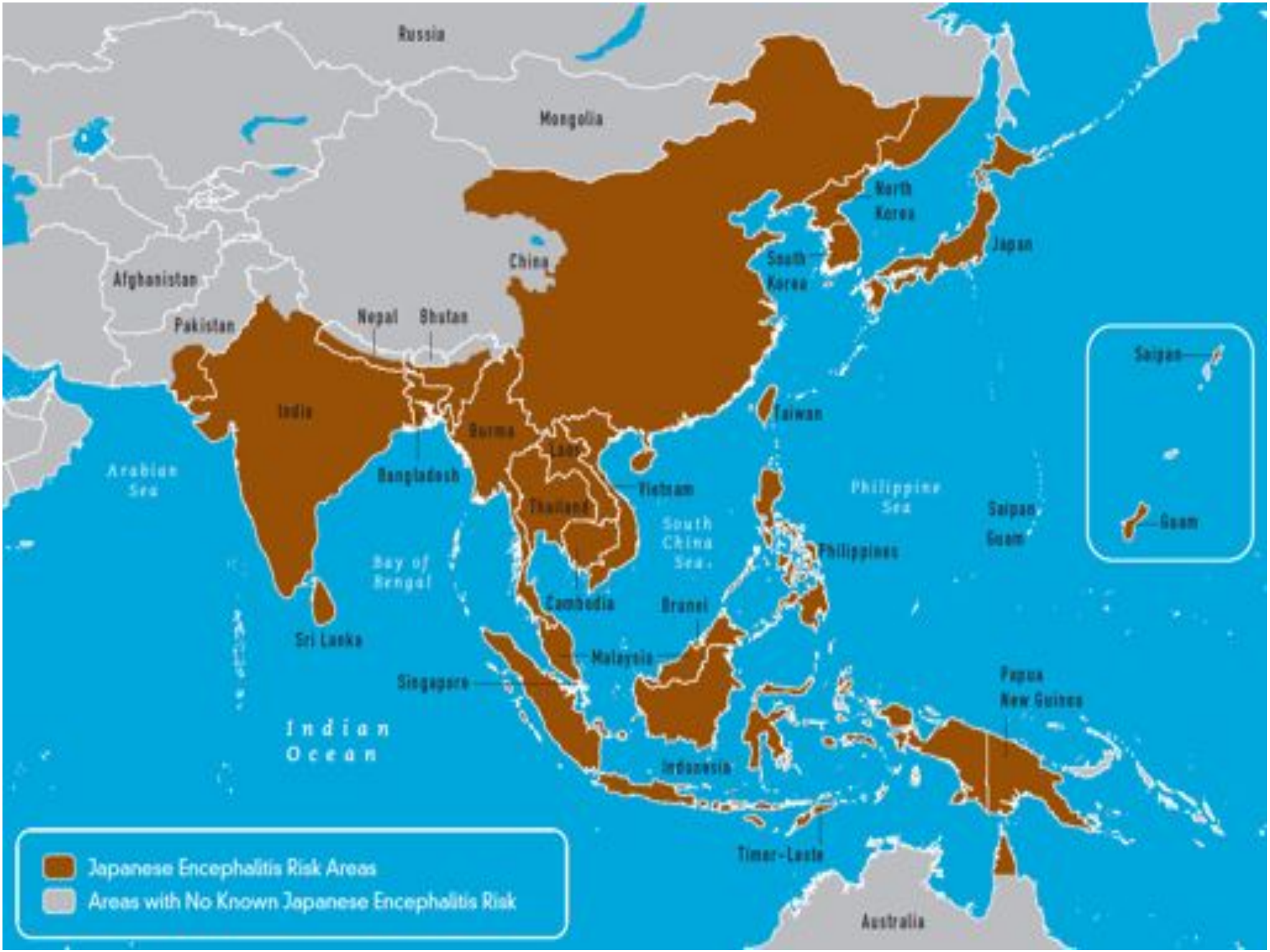
Reported cases of West Nile fever for the EU and neighbouring countries

Transmission season 2012; latest update: 30/11/2012

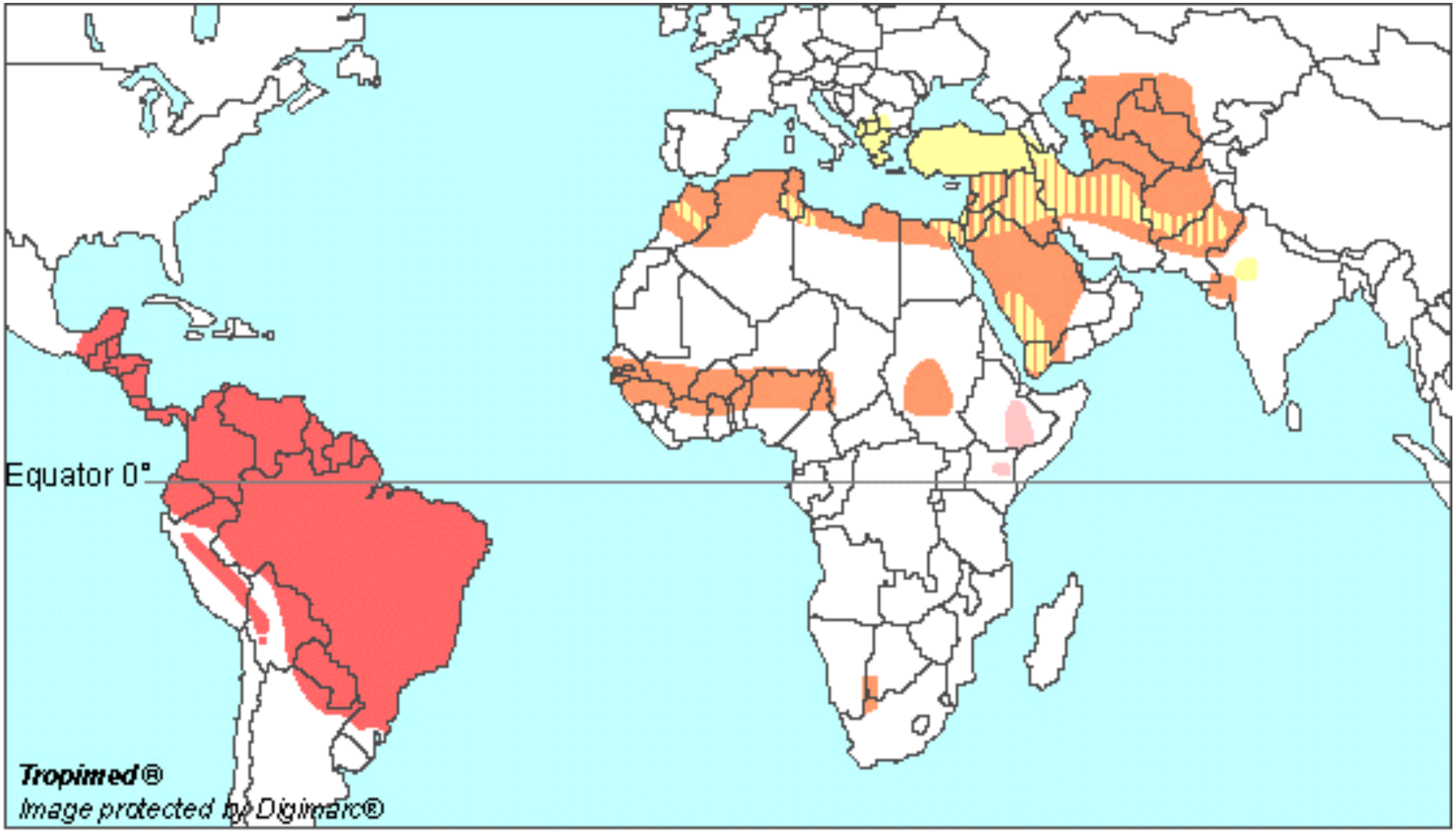
Japanese Encephalitis

Japanese B Encephalitis, Arbovirus B

the Center for Food Security & Public Health
Iowa State University


Russia
Mongolia
North Korea
Japan
China
South Korea
Afghanistan
Pakistan
Nepal
Bhutan
India
Burma
Laos
Taiwan
Arabian Sea
Bangladesh
Vietnam
Philippine Sea
Thailand
South China Sea
Saipan
Guam
Philippines
Bay of Bengal
Cambodia
Brunei
Sri Lanka
Malaysia
Singapore
Papua New Guinea
Indian Ocean
Indonesia
Timor-Leste
Australia
Japanese Encephalitis Risk Areas
Areas with No Known Japanese Encephalitis Risk

LEISHMANIASIS



Cutaneous leishmaniasis

L. tropica

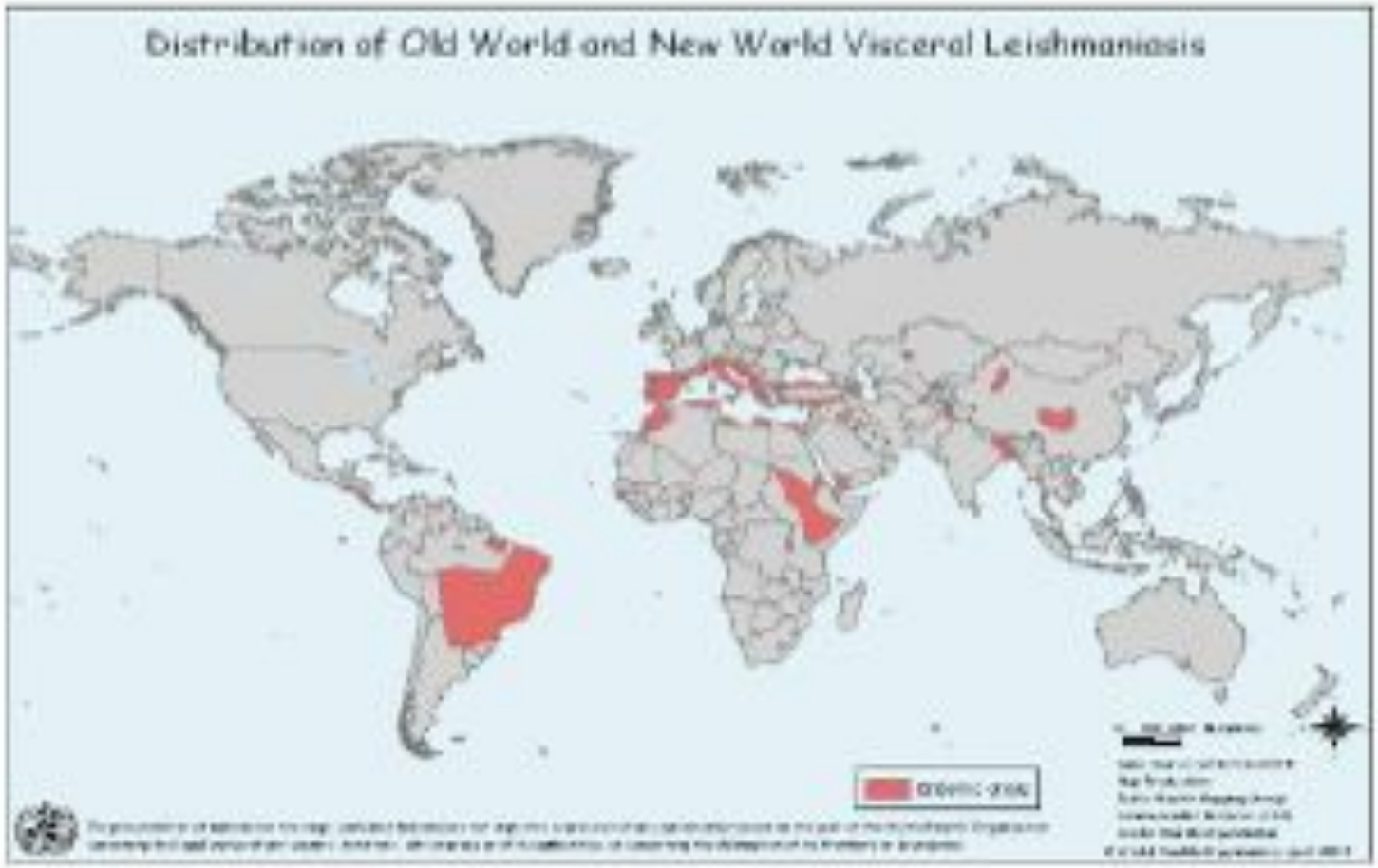
L. tropica / L. major

L. aethiopica

L. major

New World species

Leishmaniosi viscerale:
Nel mondo oltre 500.000 nuovi casi all'anno



WHO, 2003

TOSCANA VIRUS

TABLE

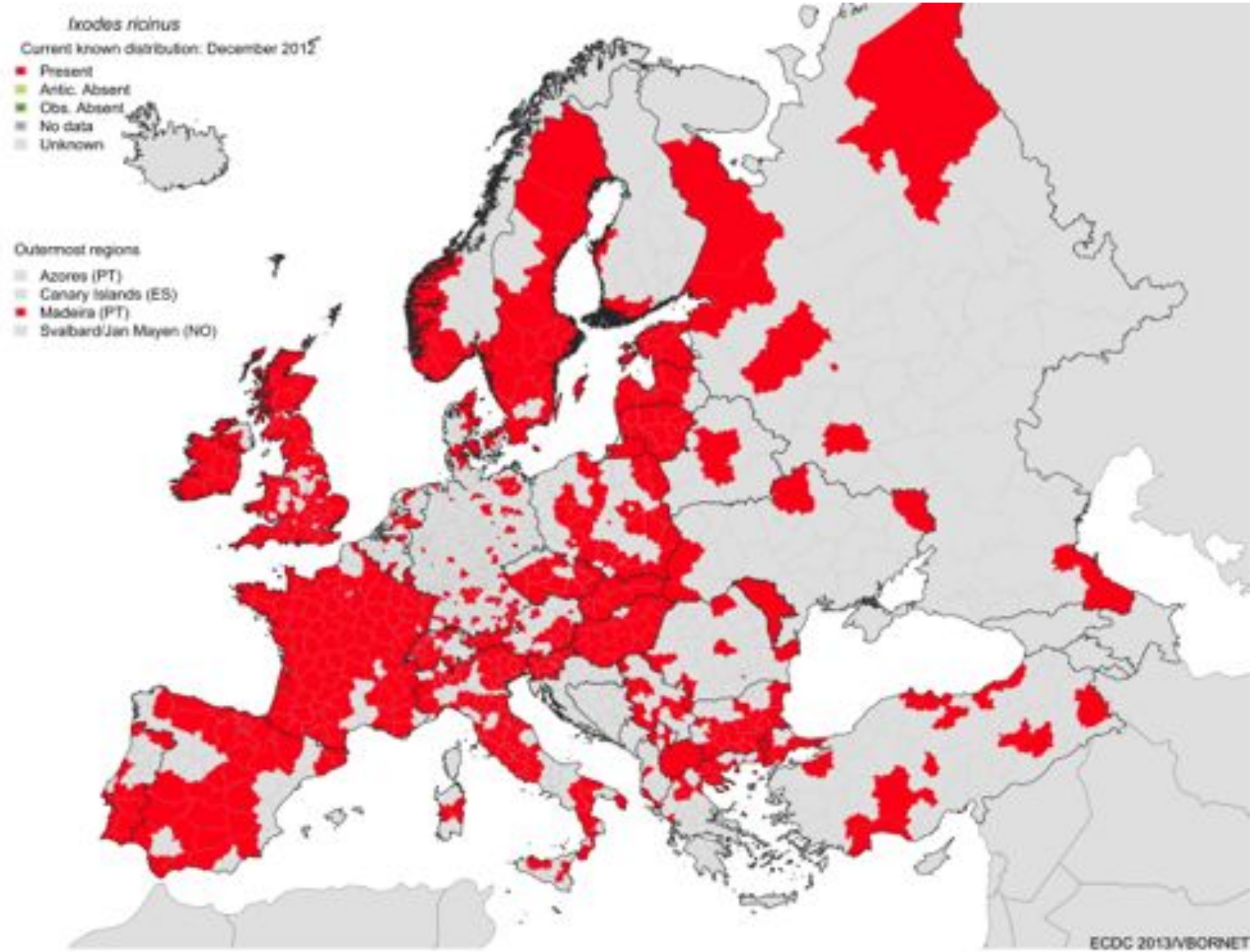
Diagnosis of aseptic meningitis by reverse transcription PCR in cerebrospinal fluid samples, Portugal, May-Sept 2002-2005 (pool of samples = 308)

PCR	No. of positive samples	No. of negative samples
Enterovirus	120	178
Herpes simplex virus	20	178
Epstein-Barr virus	5	173
Cytomegalovirus	3	175
West Nile virus	0	15
Toscana virus	6	100
Total no. of viral meningitis cases*	144 (47%)	

* positive for one of the six viruses analysed


Italy
Spain
Canary Islands

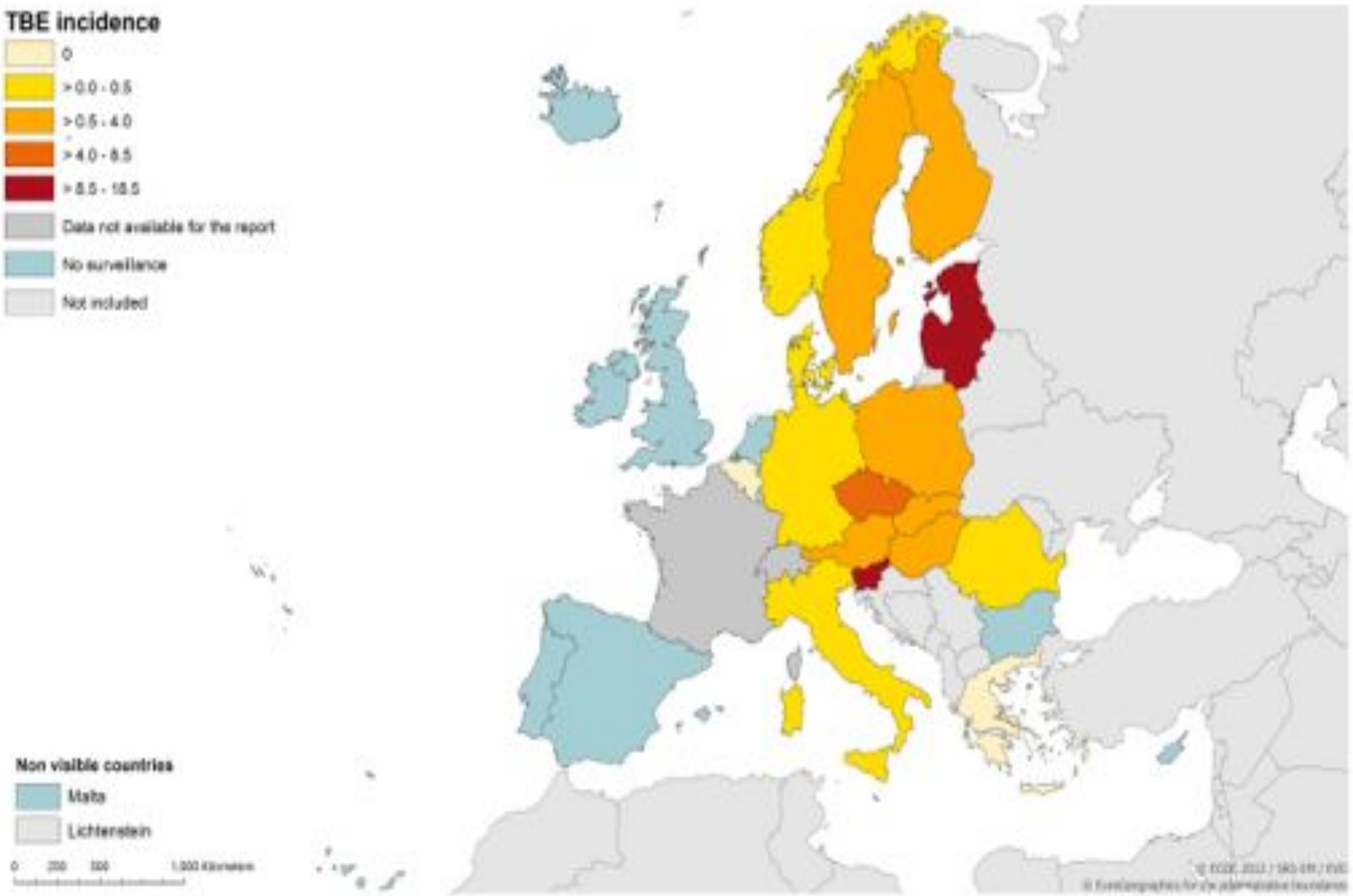
LYME DISEASE


Ixodes ricinus
Current known distribution: December 2012
Present
Antic. Absent
Obs. Absent
No data
Unknown
Outermost regions
Azores (PT)
Canary Islands (ES)
Madeira (PT)
Svalbard/Jan Mayen (NO)
ECDC 2013/VBORNET

Reported Cases of Lyme Disease -- United States, 2011

1 dot placed randomly within county of residence for each confirmed case

TICK-BORNE ENCHEPHALITIS


TBE incidence
0
>0.0 - 0.5
>0.5 - 4.0
>4.0 - 8.5
>8.5 - 18.5
Data not available for the report
No surveillance
Not included
Non visible countries
Malta
Lichtenstein
0 250 500 1,000 Kilometers

Protezione dagli insetti vettori

Riduzione del numero dei vettori negli ambienti di vita

- Porte e finestre schermate da zanzariere impregnate d'insetticida
- Diffusori d'insetticida (zampironi o diffusori elettrici)

Riduzione del numero delle punture dei vettori

- Sul letto zanzariera impregnata d'insetticida
- Abiti impregnati d'insetticida
- Repellenti sulle aree cutanee scoperte

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Contains
N,N-diethyl-m-toluamide
DEET


BugX
BugX


ULTRATHON
INSECT REPELLENT
12


ULTRATHON
INSECT REPELLENT
8 HOURS


Zanzarella
35
ULTRA PROTECTION

Zanzarella

DEET

- La DEET (dietil-meta-toluamide) è un repellente sintetico sviluppato dalle Forze Armate americane nel 1946 e registrato per l'uso pubblico a partire dal 1957
- Circa il 30% della popolazione americana lo usa oggigiorno correntemente
- Allo stato attuale, 230 prodotti commerciali contenenti DEET sono registrati presso la U.S. Environmental Protection Agency (EPA)

Selected - Mosquito Repellent

Available Formulations

DEET: is available in multiple formulations, including solutions, lotions, creams, gels, aerosol and pump sprays, and impregnated towelettes

Picaridin: Sprays, Pump, Lotion, Creams, Liquids
PMD: Spray and a Lotion
IR3535: Lotions, Creams, Gels, Sprays.
Permethrin Sprays (Only for Cloths)
Oil of Citronella: Sprays, Lotions,Creams,Arosoles

Selected - Mosquito Repellent

Available / Allowable Concentrations

DEET:	from 5-40% and 100%.
Picardine:	5-20%
PMD:	30-40 %
IR3535:	7.5-15%, and 20%
Permethrin:	4 to 70 %
Oil of Citronella:	0.1% to 10%

Selected - Mosquito Repellent

Protection Time

DEET: Depending on Concentration, 5-12 Hours

Picaridin: 2-8 hours,

PMD: 2-3 hours

IR3535: 2.7-4 hours

Permethrin To apply to clothing, spray each side of the fabric (outdoors) for 30-45 seconds. The clothing should then be allowed to dry for 2-4 hours before being worn. Its potency for at least 2 weeks

Oil of Citronella: 30-60 minutes.

Selected - Mosquito Repellent

Peadiatric Use

DEET: The American Academy of Pediatrics currently recommends that children older than 2 months can safely use DEET up to 30% concentration.

Picaridin: Can be used Safely
PMD: Can be used safely
IR3535: Can be used safely
Permethrin: Should not be used
Oil of Citronella: Should not use under 3 years children

Selected - Mosquito Repellent

Some Other Important Points

DEET - Contact with plastics (eg, watch crystals, eyeglass frames), rayon, spandex, and painted or varnished surfaces should be avoided because DEET can damage these surfaces.

Picaridin: The repellent is cosmetically pleasant and does not harm plastics or fabric.

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OLI ESSENZIALI

INSECT REPELLENT TEXTILES

- - Totally safe for Humans
- - No Insecticides (No Insects Killing)
- - Not affecting the biodiversity
- - No Pesticides
- - No Harmful Substances
- - None Energy Consumption
- - Low Cost. These Fabrics cost the same with similar (but not insect repellent) products
- - Repellant for all insects (flies, mosquitoes, spiders, scorpions, cockroaches etc.)

OLI ESSENZIALI ECO-COMPATIBILI

- ✓ Specie vegetali originarie: coriandolo (*coriandrum savitum*), ruta d'Aleppo (*Ruta chalepensis*) e *Hyptis suaveolens* (*Lamiaceae*)
- ✓ Dimostrazione, a parità di concentrazione, di una repellenza superiore a quella del DEET
- ✓ Promettenti perché: efficaci, poco tossici, ecologici, biodegradabili e poco costosi

Dott.ssa Barbara Conti (studio coordinato), Parasitology Research - maggio 2013

CORIANDOLO (*Coriandrum savitum*)

*Il nome della pianta deriva al greco "**koros**" che significa scarafaggio; infatti, quando è fresca emana un **odore sgradevole**; è ricca di **linalolo**.*

RUTA D’ ALEPPO (*Ruta chalepensis)*

Gli oli essenziali secreti nelle ghiandole presenti sulle foglie, sui fusti e nei fiori sono caratterizzati da un elevato contenuto di ***alcaloidi, furanocumarine, cumarine, flavonoidi, fenoli, aminoacidi*** *e* ***saponine****.*

HYPTIS SUAVEOLENS (*Lamiaceae)*

*Gli **estratti di acetato di etile** tengono lontano gli adulti di **Aedes aegypti** (Jaenson et al., 2006)*

OUTLINE

- ✓ *BACKGROUND*
- ✓ *DEET*
- ✓ *OLI ESSENZIALI*
- ✓ *APPLICAZIONI NEL TESSILE*
- ✓ *CONCLUSIONI*

AICTC
Associazione Italiana di
Chimica Tessile e Coloristica

AICTC
Italian Association of
Textile Chemists and Colourists

"il tessile tecnico sta crescendo in volumi ed in valore aggiunto nel mondo, ma anche in Italia"

"per realizzare tessuti tecnici bisogna padroneggiare campi scientifici diversi, solitamente slegati tra loro ed… "

"… integrare le conoscenze su nanotecnologie, biotecnologie, elettronica, sensoristica e trasmissione dati con un approccio multiculturale"

In several applications of professional textiles and clothes, mosquito repellency is an important issue

Three major problems arise:

1)repellents currently in use are harmful;

2) resistance to conventional repellents increases;

3) the lifetime of release systems is too short.

DURABLE MOSQUITO REPELLENTS FOR TEXTILES: MECHANISM OF ACTION

- **OLFACTORY MODE (TRANSPIRATION REPELLENCY)**
  *blocking the insects' **humidity-sensing holes**, which means they cannot locate humans*

- **TACTILE MODE (DIRECT-CONTACT REPELLENCY)**
  *drives insects off the processed surface before they can suck blood, even after they have touched the surface of the fabric; these repellent substance work on the insects' **peripheral nervous system** when contact is made, causing them to enter a confused state (knowdown and lethal action)*

Sistemi a rilascio controllato :

- MICROCAPSULE
- IMMOBILIZZAZIONE IN FIBRE
- COMPLESSAZIONE MOLECOLARE CON CICLODESTRINE

In order to repel mosquitoes causing infectious disease:

✓*Novel biorepellents*

✓*Two release systems (multilayer coating and textile bioaggregates)*

✓*Novel release concepts are multilayer coatings and in situ release of the active compounds*

✓*Targeted prototypes are textiles for health workers and bed nets*

Filato polipropilenico

- Fibra resa "attiva" con una tecnologia proprietaria denominata Built-in in grado di inglobare all'interno della fibra stessa principi attivi e sostanze chimiche
- Efficace contro zanzare, mosche e pulci
- Bassissima tossicità nei mammiferi
- Incorporazione di un insetticida rapido e potente
- L'elemento attivo, scarsamente assorbito dalla pelle, è reso inattivo dall'idrolisi
- Agisce per contatto (knockdown e poi morte dell'insetto), non come repellente

ITALIAN STYLE IN TICKING
STELLINI TEXTILE GROUP

OUTLINE

- ✓ *BACKGROUND*
- ✓ *DEET*
- ✓ *OLI ESSENZIALI*
- ✓ *APPLICAZIONI NEL TESSILE*
- ✓ *CONCLUSIONI*

Nel 2020 viaggeranno 1,6 miliardi di persone verso le più diverse destinazioni

Le malattie infettive trasmesse da artropodi vettori in tutto il mondo non hanno passaporto

L'ampliamento della gamma dei prodotti tessili multifunzionali impregnati con repellenti ecocompatibili per consumatori e mercati specializzati rappresenta una grande sfida per il futuro ed un incredibile potenziale nuovo business

Grazie

THANK YOU!