Is *Aedes albopictus* only a pest mosquito or also a vector of arboviruses in Brazil ?

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INTRODUCTION

Aedes albopictus is widely spread all over Southeast Asia where it is a primary vector of Dengue particularly in rural areas, and a secondary vector of Dengue in many other countries in this region together with *Aedes aegypti* (Hawley, 1988; Pal, 1989; Knudsen, 1986). No strain of dengue virus has been obtained yet from adult *Ae. albopictus* collected in nature in South America, but laboratory works have shown that this species is fully able to infect itself and to transmit by bite the four dengue serotypes (Miller & Ballinger, 1988; Rosen, 1988; Mitchell et al., 1987). Although Dengue virus has been transmitted vertically (Mitchell & Miller, 1990; Rosen et al., 1983; Shroyer, 1990; Boshell-Manrique et al., 1992) and venereally (Rosen, 1987) by this species, and despite the recent isolation of DEN 1 virus from larvae collected in nature in Brazil (Serufo et al., 1993), there is not enough evidence of vertical transmission in nature.

Since 1986, *Ae. albopictus* is established in the USA (Hawley, 1988; O'Meara et al., 1993) and in Brazil (Forattini, 1986), probably imported with used tires (Reiter & Sprenger, 1987) from temperate (Hawley et al., 1987) and tropical Asia, respectively (Craven et al., 1988; Hanson & Craig, 1994). Recently, it has been found naturally infected by a new virus (Francy et al., 1990). This new virus, pertaining to the Bunyamwera group, may be properly called "emerging" as it probably has been picked by *Ae. albopictus*, which can bite wild animals and man as well (Harrison et al., 1995). In 1991, Eastern Equine Encephalitis virus has been isolated from *Ae. albopictus* collected in Florida (Kline & Mann, 1993). This mosquito is thus becoming quickly a major problem in the epidemiology of arboviruses in the USA (Moore et al., 1988).

All the above facts stress the need to study the vector potential of *Ae. albopictus* for the so-called emerging arboviral diseases in Brazil. In the present work, we will examine the significance of available virological and biological data, in order to evaluate the potential of this species as a vector of arboviruses in Brazil

Those who are interested by other aspects of the biology and control of this mosquito, on a worldwide basis, would read the comprehensive revision of Estrada-Franco & Craig (1995).

The distribution of *Ae. albopictus* in Brazil

Since the first report of *Ae. albopictus* in Rio de Janeiro State (Forattini, 1986), and despite control operations, this vector has spread over the states of São Paulo (Chiaravalloti Neto et al., 1995; Pereira & Barbosa, 1995; Gomes & Marques, 1988; Brito *et al.*, 1986), Espirito Santo, Minas Gerais (Moreira & Almeida, 1994; Bicalho et al., 1995), Paraná (Natal et al., 1995), Ceará (Vasconcelos et al., 1989) and Goiás (Figure 1).

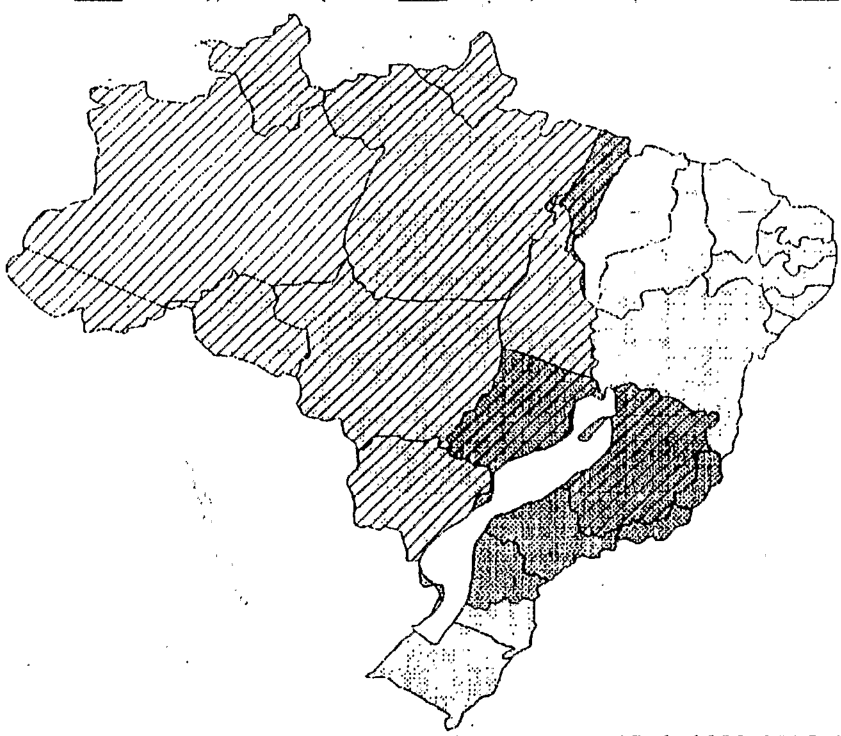

Fig. 1: States of Brazil in which cases of Yellow fever have been notified, 1982-1995 (hatched and white; endemic and epidemic areas, respectively), and in which the mosquitoes *Aedes aegypti* (light grey) and *Ae. albopictus* (heavy grey) are present, as notified by FNS (Brasilia) and SUCEN (São Paulo), 1995.

In São Paulo State, the entomological survey system developed by the "Superintendencia de Controle d Endemias" (SUCEN) of Health Department was able to observe the spreading pattern of *Ae. albopictus* during time. Buralli et al (1991), analyzing the reports of both *Ae. albopictus* and *Ae. aegypti*, and crossing these dat with meteorological one, have defined three areas in the state: with *Ae. albopictus* only, with *Ae. aegypti* only and with both species (Figure 2). At this time, the distribution of these species seems thus to be related with temperature and rainfall. The *Ae. albopictus*'area has july isothermal temperatures about 15 °C or less. *Ae. aegypti*'s area has july isothermal temperatures over 17 °C and the areas with both species are between 15 and 17 °C. *Ae. albopictus* appears to be comparatively the more cold resistant of the two species. At the same time the area with *Ae. albopictus* seems to be more rainy than the *Ae. aegypti* area.

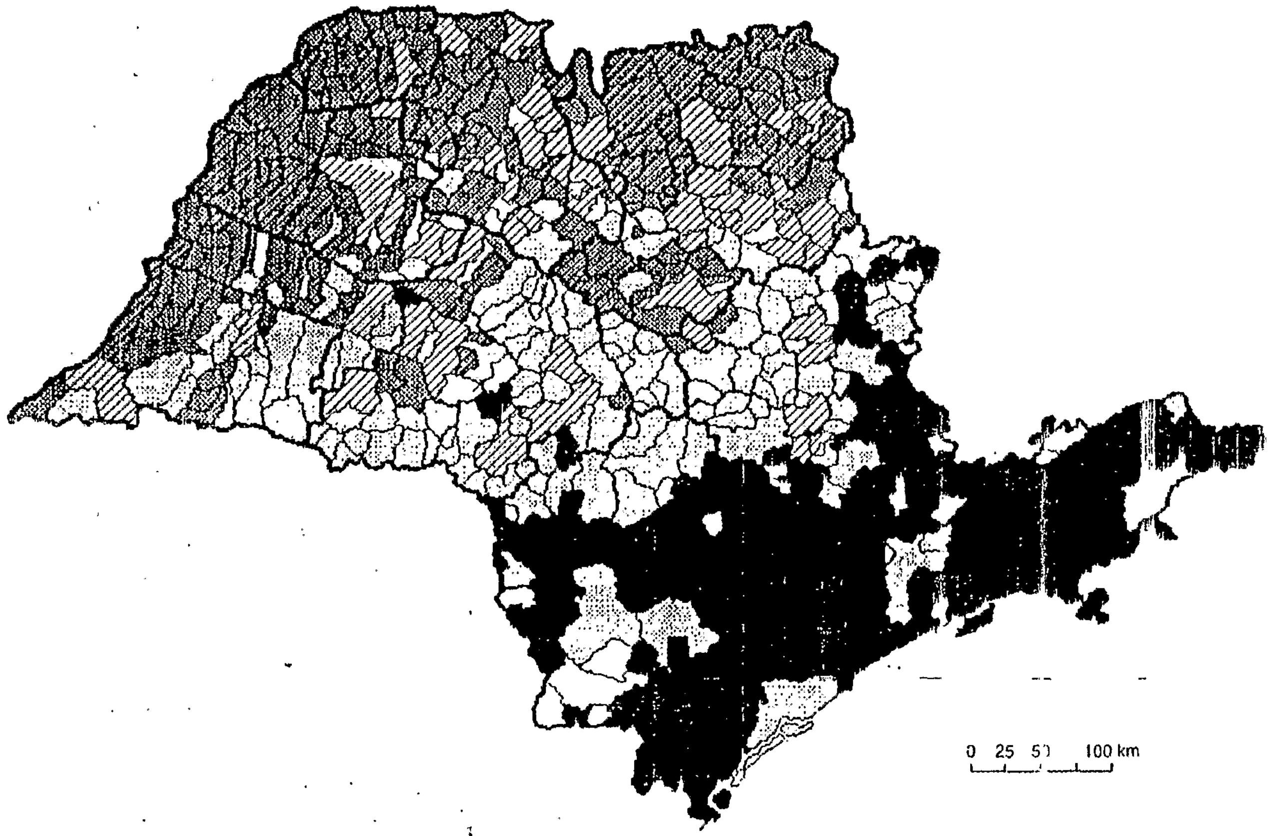

Fig. 2: Map of São Paulo State, with the distribution of Dengue (hatched) superimposed to that of the mosquitoes *Ae. albopictus* (heavy grey), *Ae. aegypti* (intermediate grey), and both species (light grey), as notified by FNS (Brasilia) and SUCEN (São Paulo), 1995.

Nowadays, *Ae. aegypti* is no longer expanding, with the contrary being observed for *Ae. albopictus* which is establishing all over the state. This may mean that meteorological factors are restrictive for the former but not for the latter.

The spreading and acclimatation of *Ae. albopictus* in São Paulo and Brazil has been carried over few years. This fact demonstrates the high ecological versatility of this species, mainly when we consider the colonization of natural environments where it competes with indigenous species of mosquitoes and despite the presence of predators and parasites (Duhrkopf & Benny, 1990; Black et al., 1988).

In the valley of River Paraiba, São Paulo State, *Ae. aegypti* was present years before the first report of *Ae. albopictus* in São Paulo and Brazil (Gomes & Marques, 1988). Once the latter infested this region, very few or no report of *Ae. aegypti* have been received. Conversely, reports about *Ae. albopictus* increased until the complete infestation in the region. In the region of Catanduva, SP, Cardoso Jr. et al (1994) showed that *Ae. albopictus* is reinvading slower than *Ae. aegypti* after erradication of both species from the area (5 *vs.* 2 months). Nevertheless, when we know that density is highly dependent on seasonal factors (Mogi et al., 1988) hypothesis about competitive displacement of one species by another have to be documented by data on population dynamics (Hawley, 1988; Edgerly et al., 1993). It was to be stated however that these two species have distinct breeding site preferences and may actually not compete.

The potential of *Ae. albopictus* as a vector of Dengue in Brazil

The situation of Dengue in Brazil

Since the 80's, many epidemics of Dengue have been reported in Brazil, with laboratory confirmed cases and virus isolations (Travassos da Rosa et al., 1982; Souza et al., 1988; Timbo, 1993; Pontes, 1993; Nogueira et al., 1993; Condino et al., 1995). In 1986, Brazil had the first large epidemic of Dengue in a big city (Rio de Janeiro) (Miagostovich et al., 1993; Schatzmayr et al., 1986), where 32,507 cases were officially reported. As shown later by Figueiredo et al. (1991), the actual number of cases was much above the reported one. Since then, many states are involved each year and Dengue fever may be considered as endemic (Araújo et al., 1995; Cordeiro et al., 1995; Cunha et al., 1995; Luz et al., 1995; Mello et al., 1995; Santos et al., 1995).

Three serotypes (DEN1, DEN2 and DEN4) have been isolated to date in Brazil and many cases of hemorrhagic fever have been characterized (Gonçalves et al., 1991; Zagne et al., 1992; Vasconcelos et al., 1995).

The distribution of Dengue fever and *Ae. albopictus* in São Paulo State

In São Paulo State the first outbreak happened in 1987 in a small municipality where only 46 cases were reported. Two years latter, in the summer of 1990/1991 a great epidemic took place in many cities in northwest of São Paulo where more than seven thousand cases were reported, probably all caused by serotype 1. Since that episode, dengue outbreaks are reported every year, but only in the northwest part of the state.

Figure 2 shows an interesting fact: imported cases have been noticed in all regions in São Paulo State and surrounding ones, but there has been no transmission (epidemics) in the region without *Ae. aegypti*. This may suggest that in the area where only *Ae. albopictus* is present, no transmission occurs. This fact induced studies on the vectorial capacity of this species.

The abundances of each vector in these regions are of the same order, as evidenciated by the Breteau Index.

In the regions where *Ae. albopictus* is the only potential vector of Dengue, SUCEN maintains a strong vectorial surveillance system to avoid risk of epidemics. As no autochtonous transmission has ever been reported in this area, it may be wise to ask oneselves if such a large amount of resources are not wasted inadequately.

Among the bioecological field works which were done on this species in Brazil (Marques & Miranda, 1992), some may give the cues to explain the non-implication of *Ae. albopictus* in Dengue transmission.

Pre-adult habitats and development of *Ae. albopictus* in Brazil

Gomes et al. (1992), in a transect study in urban, peri-urban, rural and sylvatic areas, have shown that *Ae. albopictus* is able to colonize all kinds of environments including treeholes in the forest, despite the prevailing of *Aedes terrens* in the latter place. However, *Ae. albopictus* is more abundant in peri-urban and rural areas and may use the natural habitats to spread to other environments (Araújo et al., 1994).

Gomes et al. (1995a) observed the larval development in natural, semi-natural and artificial environments.The mortality rate was lower for larvae in natural habitats when compared to those in semi-natural and/or artificial places. However, the mortality rate of the first instars was higher than that of pupal stage in natural environments, while it increased for first instars and pupa in semi-natural and artificial places. The overall mortality rate in natural habitats was lower than in semi-natural and artificial habitats.

In the same study the wing and femur length of adults were measured according to the origin of the mosquitoes. The results showed that the mosquitoes collected in natural habitats were bigger than those originated from semi-natural and artificial habitats. Suzuki et al. (1993) in Japan and Willis & Nasci (1994) in the USA have found a positive correlation between wing length and the parous rate of host-seeking *Ae. albopictus* females. We may thus believe that *Ae. albopictus* is not as well adapted to artificial habitats as to natural ones and therefore may not be as potentially a good vector in the urban habitats as in the natural habitats. However, such hypothesis may be tested with care because studies on other species showed uneven results. Some authors found a significant relation between size and survival (Haramis, 1983; Nasci 1986), others did not (Landry et al., 1988; Lorenz et al., 1990). In fact, in the study of brazilian *Ae. albopictus*, it is not known if the bigger mosquitoes had a higher survival rate.

It has been shown that *Ae. albopictus* oviposition is enhanced when larval and pupal extracts are additioned to the water in the containers (Marques & Miranda, 1992). This behaviour should be taken into account during sampling and control studies.

Diel biting pattern of *Ae. albopictus* in Brazil

Marques (1994), comparing mosquito landing on immobile and moving human bait in the Rio Paraiba's Valley, detected various patterns. During 25 collecting sessions, above 26 times more *Ae. albopictus* were collected on moving than non-moving bait (12.1 ex. / h versus 0.46 ex. / h). The anthropophilic behavior of this species appears fairly variable.

Trophic preferences of *Ae. albopictus* in Brazil

Gomes et al. (1995b), studying bloodmeal sources of this species, showed that *Ae. albopictus* is eclectic, feeding on humans, horses, cows, chicken, dogs and cats. This may contribute to its high adaptability in various environments. Similar data was recorded about the trophic preferences of *Ae. albopictus* in Minas Gerais State and the same opportunistic behavior has been noted for the species in the USA (Savage *et al.*, 1993).

Daily survival rate of *Ae. albopictus*

Very few data are available on the daily survival rate of *Ae. albopictus* in nature in Asia (Hawley, 1988) and no data is available for this mosquito in the Western Hemisphere. The estimates ranged from 0.77 to 0.88, based on ovary examination. Similarly, the duration of the gonotrophic cycle, another important parameter for assessing vectorial capacity, has been estimated only once in nature in Japan (Mori & Wada, 1977) and never in South America. This duration at a mean temperature of about 25°C was 5 days. Multiple feeding may also play a role in the transmission of diseases but field data are yet lacking.

Colonization of sylvatic habitats by *Ae. albopictus* and Dengue viruses in Brazil

The emergence of a sylvatic cycle for Dengue virus maintenance in South America has been occasionally discussed. In Trinidad, a feral *Aedes* species has been found a good candidate for such a shift in Dengue ecology (Gubler et al., 1985). In the USA, it has been shown that *Ae. albopictus* is able to establish successfully and coexist with *Ae. triseriatus* in treeholes (Livdahl & Willey, 1991).

On the vertebrate side, New World monkeys are susceptible to Dengue 1 and Dengue 2 infection, without developping severe illness (Rosen, 1958).

However, the susceptibility for Dengue virus infection of feral Brazilian mosquitoes remains to be tested

Winter survival potential of a brazilian strain of *Ae. albopictus*

Eggs of *Ae. albopictus* originated from Santa Tereza (Espirito Santo) have been unable to overwinter in Indiana, USA (Hawley et al., 1989).

Susceptibility of Brazilian strain of Ae. albopictus to insecticides in relation with arbovirus infection

In order to explore the possible variation in mosquito's susceptibility to insecticide, when infected by an arbovirus, Rawlins *et al.* (1988) have exposed a Brazilian strain of *Ae. albopictus* to malathion. No significant difference was observed between the infected (DEN 1 from Puerto Rico) and control mosquitoes.

The potential of *Ae. albopictus* as a vector of arboviruses other than Dengue in Brazil

Among the diseases, other than Dengue, which may be eventually transmitted by *Ae. albopictus* in Brazil are Yellow fever (YF), Mayaro (MAY), Oropouche (ORO) and various viruses causing encephalitis: Ilheus (ILH), Saint Louis Encephalitis (SLE), Eastern Equine Encephalitis (EEE), Western Equine Encephalitis (WEE) and Venezuelan Equine Encephalitis (VEE) complex.

Many other arboviruses were transmitted (orally and/or transovarially) by - or replicated experimentally in - this mosquito (Shroyer, 1986). Among them, Bujaru, Bussuquara, Icoaraci, Itaporanga, Pacui, Cocal, and Piry are known to occur in Brazil (Travassos da Rosa et al., 1986).

The potential of *Ae. albopictus* to serve as a linking-vector between the sylvatic cycles of these viruses and the sub-urban environment will be discuted in the present section.

Yellow fever (YF)

Ae. albopictus is able to transmit YF virus by bite (Miller & Ballinger, 1988; Mitchell et al., 1987; Miller et al., 1989). Fortunately, its present distribution is outside the areas of endemicity and/or emergence of YF

(Dégallier et al., 1992). However, its ability to colonize the Amazonian region of Brazil is non-remote as shown by an alert in Belém, Pará State (Araújo et al., 1988). On the other hand, the YF virus may be introduced by infected people in a free-of-virus and full-of-mosquitoes area.

Oropouche (ORO)

ORO virus may cause huge epidemics in the Amazonian region of Brazil (Pinheiro et al., 1976; Pinheiro et al., 198; Travassos da Rosa et al., 1995; Roberts et al., 1981) or its borderline (Vasconcelos et al., 1989) and has been involved in some meningitis cases (Pinheiro et al., 1982).

This arbovirus has been experimentally transmitted by *Ae. albopictus* (Smith & Francy, 1991). As the main urban and/or suburban vectors are *Culicoides* midges (Pinheiro et al., 1981b), this virus may thus be considered as a potentially emergent disease but the role of *Ae. albopictus* as a vector is remote (Mitchell, 1991).

Mayaro (MAY)

MAY virus may cause severe dengue-like illness and has been involved several times in epidemics in Brazil (LeDuc et al., 1981; Hoch et al., 1981; Pinheiro et al., 1981a; Zanini et al., 1991). As the main sylvatic mosquito vector of MAY virus is the same as that of YF virus, both viruses may be isolated during the same epidemic (Pinheiro et al., 1978). *Ae. albopictus* is experimentally susceptible to infection and able to transmit MAY virus, and its eventual role as a suburban vector may not be discarded (Smith & Francy, 1991).

Encephalitis viruses (EEE, SLE, ILH, WEE, VEE Complex)

As it has been shown experimentally, *Ae. albopictus* is able to transmit EEE virus from bird to bird (Scott et al., 1990; Mitchell et al., 1993). Furthermore, EEE virus has been isolated from naturally-infected *Ae. albopictus* in Florida (Mitchell et al., 1992). Therefore, its possible role as a missing link for the passage of EEE virus from a bird-*Culex* cycle to a man/horse -*Ae. albopictus* cycle in Brazil is possible, especially in urban and suburban areas where EEE virus is known to occur in the States of São Paulo (Pereira et al., 1962; Iversson et al., 1989), Mato Grosso (Iversson et al., 1993) and Ceara (Travassos da Rosa & Dégallier, 1985).

SLE virus represents also a risk of contamination for people living near big cities (as Rio de Janeiro) where *Ae. albopictus* is present (Pinheiro et al., 1975). Although this species is able to transmit SLE virus both orally, vertically (Hardy et al., 1980) and venereally (Shroyer, 1986), its low ornithophily and low susceptibility does not make it a good potential vector (Savage et al., 1994).

Conclusions

Ae. albopictus is an experimental vector of yellow fever and other arboviruses which can cause epidemics and has been found naturally infected by some arboviruses in Asia and North America. It can colonize either artificial or natural water containers and therefore may serve as the link between urban and jungle environments for (i) sylvatic arboviruses yet unknown in urban habitats and (ii) Dengue viruses which, at least in South America, are yet transmitted only in urban environments. It seems to be genetically as highly variable in the western hemisphere (Duhrkopf & Benny, 1990) as in its native habitats (Black et al., 1988) and as such, highly prone to colonize any free ecological niche. It may coexist in treeholes with native species and may compete with *Ae. aegypti* for inseminating the female of the latter (Nasci et al., 1989).

However, some unidentified factor(s) prevent(s) *Ae. albopictus* from naturally transmitting Dengue in the Western Hemisphere. Among the candidates for explaining this failure may be its lower anthropophily (when compared to that of *Ae. aegypti*) and lower density in urban habitats, where the human population is concentrated and Dengue introduced more often. In the State of São Paulo, in the areas where this species is predominant, a cooler weather may be another limiting factor preventing this species from becoming infectant with Dengue viruses.

Bioecological studies are needed on *Ae. albopictus* in order to assess (i) its potential as a vector of Dengue and other arboviruses in Brazil, (ii) the key factors of its apparent lack of vectorial capacity, and (iii) the main biological and physiological factors which are playing when it competes with *Ae. aegypti* and native species, in artificial and natural habitats respectively.

Acknowlegments

The present work has beneficiated of the financial support of SUCEN (São Paulo, Brazil) and ORSTOM (France). We are especially indebted to Dr. Geraldo M. Buralli (*in memoriam*) who idealized the "*Aedes* control program" in São Paulo State. The figures were prepared from original data by Mr. Pierre Lopez and Mrs. Michele Saint-Léger from ORSTOM. Dr. Paulo de Tarso Vilarinhos suggested many additions and corrections which improved the manuscript.

REFERENCES

ARAÚJO AAL, SOUZA PEFP, LEÃO MJS, SOUZA JC - 1988 - Primeira tentativa da introdução do *Aedes albopictus* no porto da cidade de Belém. In: Ed. Sociedade Brasileira de Medicina Tropical. : *XXIV Congresso da Sociedade Brasileira de Medicina Tropical, 28 de fevereiro à 03 de março de 1988. Programa e resumos*, Instituto de Medicina Tropical, Manaus: 74.

ARAÚJO ESM, LUZ DC, SANTOS FB, MIAGOSTOVICH MP, SCHATZMAYR HG, NOGUEIRA RMR - 1995 - Dengue virus type 2 epidemic in the State of Rio de Janeiro, 1995. In: *5° Virológica 95. Encontro de Virologia, 26 a 29 de novembro 1995, Ribeirão Preto*, Sociedade Brasileira de Virologia, Ribeirão Preto: A-37.

ARAÚJO HS, BUSEK SCU, OLIVEIRA MA - 1994 - Identificação de culicideos (Diptera: Culicidae) encontrado em criadouros artificiais no Campus da PUC; Belo Horizonte; Minas Gerais. *Rev. Soc. Brasil. Med. trop.*, 27 (supl.): 354.

BICALHO RS, SILVA SRM, SANTIAGO R, OLIVEIRA MA, CONSOLI RAGB - 1995 - Levantamento da fauna domiciliar e peridomiciliar de culicídeos da região de Timóteo-MG. In: *XIV Congresso Brasileiro de Parasitologia 1° a 04/agosto/95 Universidade Federal de Goiás, Goiânia - GO [Rev. Pat. l. trop. (supl.), 23(2)]*, Sociedade Brasileira de Parasitologia, Goiânia: 315.

BLACK WC, HAWLEY WA, RAI KS, CRAIG Jr GB - 1988 - Breeding structure of a colonizing species: *Aedes albopictus* (Skuse) in peninsular Malaysia and Borneo. *Heredity, 61*: 439-446.

BOSHELL-MANRIQUE J, THOMAS RE, GRIMSTAD PR, RAI KS - 1992 - Variation in the efficiency of vertical transmission of dengue-1 virus by strains of *Aedes albopictus* (Diptera: Culicidae). *J Med Entomol, 29* (6): 985-989.

BRITO M, MARQUES GRAM, MARQUES CCA, TUBAKI RM - 1986 - Primeiro encontro de *Aedes (Stegomyia) albopictus* (Skuse) no Estado de São Paulo (Brasil). *Rev Saúde públ, 20*: 489.

BURALLI GM, MARQUES GRAM, GEROLA Jr O - 1991 - Distribuição geográfica de *Aedes aegypti* e *Aedes albopictus* no Estado de São Paulo. *Rev Soc Brasil Med trop, 24* (supl. II): 182

CARDOSO JR RP, ERNADES S, MELO NV, BOTTI MV, SCANDAR SA, NASCIMENTO EMM - 1994 - Detecção de *Aedes aegypti* e *Aedes albopictus* no município de Catanduva-SP, após epidemia de Dengue. *Rev Soc Brasil Med trop, 27* (supl.): 364.

CHIARAVALLOTI NETO F, COSTA AIP, CARDOSO JR RP, SCANDAR SAS, SOARES MRD - 1995 - Descrição da colonização de *Aedes albopictus* (Diptera: Culicidae) na região São José do Rio Preto, SP, no período de 1991 à 1994. In: Ed. Sociedade Brasileira de Medicina Tropical, : *XXXI Congresso da Sociedade Brasileira de Medicina Tropical, 27 a 31 de março de 1995. Centro de Convenções Rebouças - SP. Livro dos resumos*, São Paulo: 208.

CONDINO MLF, PERPÉTUO SM, FERREIRA LFH - 1995 - Surto de dengue no município de Presidente Prudente - Estado de São Paulo, 1994. In: Ed. Sociedade Brasileira de Medicina Tropical, : *XXXI Congresso da Sociedade Brasileira de Medicina Tropical, 27 a 31 de março de 1995, Centro de Convenções Rebouças - SP. Livro dos resumos*, São Paulo: 206.

CORDEIRO MT, OLIVEIRA MJC, CALVACANTI AMS, DANTAS MCS, MELO MMM, FERREIRA MV, TRAVASSOS RC, MORAIS JGM - 1995 - Dengue outbreak in the State of Pernambuco Brazil, 1995; preliminary analysis. In: *5° Virológica 95. Encontro de Virologia, 26 a 29 de novembro 1995, Ribeirão Preto,* Sociedade Brasileira de Virologia, Ribeirão Preto: A-40.

CRAVEN RB, ELIASON DA, FRANCY DB, REITER P, CAMPOS EG, JAKOB WL, SMITH GC, BOZZI CJ, MOORE CG, MAUPIN GO, MONATH TP - 1988 - Importation of *Aedes albopictus* and other exotic mosquito species into the United States in used tires from Asia. *J Am Mosq Cont Assoc, 4* (2): 138-142.

CUNHA RV, MASPERO RC, ARAÚJO ESM, FILHO JC, SCHATZMAYR HG, NOGUEIRA RMR, MIAGOSTOVICH MP - 1995 - Serological survey of Dengue infection in Paracambi, State of Rio de Janeiro, 1994. In: *5° Virológica 95. Encontro de Virologia, 26 a 29 de novembro 1995, Ribeirão Preto,* Sociedade Brasileira de Virologia, Ribeirão Preto: A-39.

DUHRKOPF RE, BENNY H - 1990 - Differences in the larval alarm reaction in populations of *Aedes aegypti* and *Aedes albopictus*. *J Am Mosq Cont Assoc*, *6*(3): 411-414.

DÉGALLIER N, TRAVASSOS DA ROSA APA, HERVÉ J-P, TRAVASSOS DA ROSA JFS, VASCONCELOS PFC, MANGABEIRA DA SILVA CJ, BARROS VLRS, DIAS LB, TRAVASSOS DA ROSA ES, RODRIGUES SG - 1992 - A comparative study of yellow fever in Africa and South America. *Ciência e Cultura (J Braz Assoc Advanc Sci)*, *44* (2/3): 143-151.

EDGERLY JS, WILLEY MS, LIVDAHL TP - 1993 - The community ecology of *Aedes* egg hatching: implications for a mosquito invasion. *Ecolog Entomol*, *18*(2): 123-128.

ESTRADA-FRANCO JG, CRAIG JR GB - 1995 - Biología, relaciones com enfermedades y control de *Aedes albopictus*. Cuaderno técnico N°42, *Organización Panamericana de la Salud, Washington DC*, *51p*.

FIGUEIREDO LTM, CAVALCANTE SMB, SIMÕES MC - 1991 - Encuesta serologica sobre el Dengue entre escolares de Rio de Janeiro, Brasil, 1986 y 1987. *Bol Of sanit Panam*, *111*(6): 525-532.

FORATTINI OP - 1986 - Identificação de *Aedes* (*Stegomyia*) *albopictus* (Skuse) no Brasil. *Rev Saúde públ*, *20*(3): 244-245.

FRANCY DB, KARABATSOS N, WESSON DM, MOORE CG, LAZUICK JS, NIEBYLSKI ML, TSAI TF, CRAIG GB - 1990 - A new arbovirus from *Aedes albopictus*, an Asian mosquito established in the United States. *Science*, *250*(4988): 1738-1740.

GOMES AC, FORATTINI OP, KAKITANI I, MARQUES GRAM, MARQUES CCA, MARUCCI D, BRITO M - 1992 - Microhabitats de *Aedes albopictus* (Skuse) na região do Vale do Paraiba, Estado de São Paulo, Brasil. *Rev Saude publ*, *26*(2): 108-118.

GOMES AC, MARQUES GRAM - 1988 - Encontro de criadouro natural de *Aedes* (*Stegomyia*) *albopictus* (Skuse), Estado de São Paulo, Brasil. *Rev Saude publ*, *22*(3): 245.

GOMES AC, GOTLIEB SLD, MARQUES CCA, PAULA MB, MARQUES GRAM - 1995a - Duration of larval and pupal development stages of *Aedes albopictus* in natural and artificial containers. *Rev Saúde púb*, *29*(1): 15-19.

GOMES AC, SANTOS JLF, MARQUES GRAM, PAULA MB, MARUCCI D - 1995b - Aplicação do "feeding index" para *Aedes albopictus* (Skuse). In: *XIV Congresso Brasileiro de Parasitologia 1° a 04 agosto'95 Universidade Federal de Goiás, Goiânia - GO [Rev. Patol. trop. (supl.), 23(2)]*, Sociedade Brasileira de Parasitologia, Goiânia: 222.

GONÇALVES AJR, CUNHA RQ, CARDOSO FL, NETO ECJ, ROSEMBAUM R, TERRA GF, CRUZ MLS, MACHADO EM, MIRANDA MV, LIMA MMM, BORGES VM, SPINELLI JM, RIBEIRO FM - 1991 - Nova epidemia de Dengue clássico observada no Rio de Janeiro e grande Rio. Primeira epidemia de Dengue hemorrágico na região. Observações iniciais no hospital dos servidores do Estado Rio de Janeiro. *Rev Soc Brasil Med trop*, *24* (supl.II): 115.

GUBLER DJ, NOVAK RJ, VERGNE E, COLON NA, VELEZ M, FOWLER J - 1985 - *Aedes* (*Gymnometopa*) *mediovittatus* (Diptera: Culicidae), a potential maintenance vector of Dengue viruses in Puerto Rico. *J Med Ent*, *22*(5): 469-475.

HANSON SM, CRAIG GB - 1994 - Cold acclimation, diapause, and geographic origin affect cold hardiness in eggs of *Aedes albopictus* (Diptera: Culicidae). *J Med Ent*, *31*(2): 192-201.

HARAMIS LD - 1983 - Increased adult size correlated with parity in *Aedes triseriatus*. *Mosq News*, *43*(1): 77-79.

HARDY JL, ROSEN L, KRAMER LD, PRESSER SB, SHROYER DA, TURELL MJ - 1980. Effect of rearing temperature on transovarial transmission of St. Louis Encephalitis virus in mosquitoes. *Am J Trop Med Hyg*, *29* (5): 963-968.

HARRISON BA, MITCHELL CJ, APPERSON CS, SMITH GC, KARABATSOS N, ENGBER BR, NEWTON NH - 1995 - Isolation of Potosi virus from *Aedes albopictus* in North Carolina. *J Am Mosq Contr Assn*, *11* (2): 225-229.

HAWLEY WA, 1988. The biology of *Aedes albopictus*. *J Am Mosq Cont Assoc*, *4* (suppl.1): 1-40.

HAWLEY WA, PUMPUNI CB, BRADY RH, CRAIG GB - 1989 - Overwintering survival of *Aedes albopictus* (Diptera: Culicidae) eggs in Indiana. *J Med Ent*, *26*(2): 122-129.

HAWLEY WA, REITER P, COPELAND RS, PUMPUNI CB, CRAIG GB - 1987 - *Aedes albopictus* in North America: probable introduction in used tires from Northern Asia. *Science*, *236*: 1114-1116.

HOCH AL, PETERSON NE, LEDUC JW, PINHEIRO FP - 1981 - An outbreak of Mayaro virus disease in Belterra, Brazil. III. Entomological end ecological studies. *Am J Trop Med Hyg*, *30*(3): 689-698.

IVERSSON LB, SILVA RAMS, TRAVASSOS DA ROSA APA, BARROS VLRS - 1993 - Circulation of Eastern Equine Encephalitis, Western Equine Encephalitis, Ilheus, Maguari and Tacaiuma viruses in equines of the brazilian Pantanal, South America. *Rev Inst Med trop São Paulo*, *35*(4): 355-359.

IVERSSON LB, TRAVASSOS DA ROSA APA, TRAVASSOS DA ROSA JFS - 1989 - Alta prevalência de infecção humana por sub-tipo I da encefalomielite eqüina venezuelana na região do vale do Ribeira, São Paulo. In: Ed. Sociedade Brasileira de Medicina Tropical. : *XXV Congresso da Sociedade Brasileira de Medicina tropical, 26 de fevereiro a 02 de março de 1989 Florianópolis SC, Resumos, Temas livres Posters*, Univ. Fed. Santa Catarina, Florianopolis: 59.

KLINE DL, MANN MO - 1993 - Current state of knowledge and research activities on Eastern Equine Encephalitis in Florida, USA. In: Eds. Uren, M. F. & Kay, B. H.: *Arbovirus Research in Australia. Proceedings Sixth Symposium, 7-11 December, 1993, Brisbane, Australia*, CSIRO, Brisbane: 232-239.

KNUDSEN AB - 1986 - The significance of the introduction of *Aedes albopictus* into the southeastern United States with implications for the Caribbean, and perspectives of the Pan American Health Organization. *J Am Mosq Cont Ass*, *2*(4): 420-423.

LANDRY SV, DEFOLIART GR, HOGG DB - 1988 - Adult body size and survivorship in a field population of *Aedes triseriatus*. *J Am Mosq Cont Assoc*, *4* (2): 121-128.

LEDUC JW, PINHEIRO FP, TRAVASSOS DA ROSA APA - 1981 - An outbreak of Mayaro virus disease in Belterra, Brazil. II. Epidemiology. *Am J Trop Med Hyg*, *30*(3): 682-688.

LIVDAHL TP, WILLEY MS - 1991 - Prospects for an invasion: competition between *Aedes albopictus* and native *Aedes triseriatus*. *Science*, *253*(5016): 189-191.

LORENZ LH, SCOTT TW, ANDERSON RA, EDMAN JD, CRANS WJ, COSTA SD - 1990 - The relationship between size and parity status of field collected *Culiseta melanura*. *J Am Mosq Contl Ass*, *6*(3): 433-440.

LUZ DC, ARAÚJO ESM, MORAIS GC, CARDOSO FMA, MIAGOSTOVICH MP, CERQUEIRA VL, SCHATZMAYR HG, NOGUEIRA RMR - 1995 - Dengue type 2 epidemic in south of the State of Bahia, Brazil. In: *5° Virológica 95. Encontro de Virologia, 26 a 29 de novembro 1995, Ribeirão Preto*. Sociedade Brasileira de Virologia, Ribeirão Preto: A-36.

MARQUES CCA, MIRANDA C - 1992 - Influência de extratos de formas evolutivas sobre atividades de oviposição de fêmeas de *Aedes (S.) albopictus* (Skuse). *Revista de Saude Publica*, *26*(4): 269-271.

MARQUES GRAM - 1994 - Comportamento antropofílico de culicídeos da Região do Vale do Paraíba, Estado de São Paulo, com especial referência a *Aedes albopictus* (Skuse). Dissertação apresentada à Faculdade de Saúde Pública da Universidade de São Paulo, Departamento de Epidemiologia, para obtenção do título de Mestre em Saúde Pública: 1-73.

MELLO LP, MONTENEGRO F, ARAÚJO A, NOGUEIRA RMR - 1995 - Dengue activity in the State of Ceará, 1994. In: *5° Virológica 95. Encontro de Virologia, 26 a 29 de novembro 1995, Ribeirão Preto*. Sociedade Brasileira de Virologia, Ribeirão Preto: A-42.

MIAGOSTOVICH MP, NOGUEIRA RMR, CALVACANTI SMB, MARZOCHI KBF, SCHATZMAYR HG - 1993 - Dengue epidemic in the State of Rio de Janeiro, Brazil: virological and epidemiological aspects. *Rev Inst Med trop São Paulo*, *35*(2):149-154.

MILLER BR, BALLINGER ME - 1988 - *Aedes albopictus* mosquitoes introduced into Brazil: vector competence for yellow fever and dengue viruses. *Trans R Soc trop Med Hyg*, *82*(3): 476-477.

MILLER BR, MITCHELL CJ, BALLINGER ME - 1989 - Replication, tissue tropisms and transmission of yellow fever virus in *Aedes albopictus*. *Trans R Soc trop Med Hyg*, *83*: 252-255.

MITCHELL CJ - 1991 - Vector competence of North and South American strains of *Aedes albopictus* for certain arboviruses: a review. *J Am Mosq Cont Ass*, 7(3): 446-451.

MITCHELL CJ, MCLEAN RG, NASCI RS, CRANS WJ, SMITH GC, CACCAMISE DI - 1993 - Susceptibility parameters of *Aedes albopictus* to per oral infection with Eastern Equine Encephalitis virus. *J Med Ent*, *30*(1): 233-235.

MITCHELL CJ, MILLER BR - 1990 - Vertical transmission of Dengue viruses by strains of *Aedes albopictus* recently introduced into Brazil. *J Am Mosq Cont Ass*, *6*(2): 251-253.

MITCHELL CJ, MILLER BR, GUBLER DJ - 1987 - Vector competence of *Aedes albopictus* from Houston Texas, for dengue serotypes 1 to 4, yellow fever and Ross River virus. *J Am Mosq Cont Ass*, 3(3): 460-465.

MITCHELL CJ, NIEBYLSKI ML, SMITH GC, KARABATSOS N, MARTIN D, MUTEBI JP, CRAIG GB, MAHLER MJ - 1992 - Isolation of Eastern Equine Encephalitis virus from *Aedes albopictus* in Florida. *Science*, *257* (5069): 526-527.

MOGI M, KHAMBOONRUANG C, CHOOCHOTE W, SUWANPANIT P - 1988 - Ovitrap surveys of dengue vector mosquitoes in Chiang Mai, northern Thailand: seasonal shifts in relative abundance of *Aedes albopictus* and *Ae. aegypti*. *Med vet Ent*, *2*(4): 319-324.

MOORE CG, FRANCY DB, ELIASON DA, MONATH TP - 1988 - *Aedes albopictus* in the United States rapid spread of a potential disease vector. *J Am Mosq Cont Ass*, *4* (3): 356-361.

MOREIRA TMS, ALMEIDA MCM - 1994 - Indices de infestação predial de *A. aegypti* e *A. albopictus* em Minas Gerais, 1993. *Rev Soc Brasil Med trop*, *27* (supl.): 363.

MORI A, WADA Y - 1977. The gonotrophic cycle of *Aedes albopictus* in the field. *Trop Med*, *19* (3-4): 141-146.

NASCI RS, 1986. The size of emerging and host-seeking *Aedes aegypti* and the relation of size to blood feeding success in the field. *J Am Mosq Contr Ass*, *2*(1): 61-62.

NASCI RS, HARE SG, WILLIS FS - 1989 - Interspecific mating between Louisiana strains of *Aedes albopictus* and *Aedes aegypti* in the field and laboratory. *J Am Mosq Contr Ass*, *5*(3): 416-421.

NATAL D, BARANOWSKI-SMITH LL, URBINATTI PR - 1995 - Estudo da fauna de mosquitos (Diptera: Culicidae) da Bacia do Rio Paranapanema, em área de implantação de hidrelétrica. In: *XIV Congresso Brasileiro de Parasitologia 1° a 04/agosto/95 Universidade Federal de Goiás, Goiânia GO [Rev Patol. trop. (supl.), 23(2)]*, Sociedade Brasileira de Parasitologia, Goiânia: 313.

NOGUEIRA RMR, MIAGOSTOVICH MP, LAMPE E, SOUZA RW, ZAGNE SMO, SCHATZMAYR HG - 1993 - Dengue epidemic in the state of Rio de Janeiro, Brazil, 1990-1: co-circulation of dengue 1 and dengue 2 serotypes. *Epidemiol Infect*, *111*(1): 163-170.

O'MEARA GF, GETTMAN AD, EVANS LF, CURTIS GA - 1993 - The spread of *Aedes albopictus* in Florida. *Am Ent*, 39(3): 163-172.

PAL TK - 1989 - Observations on bionomics of *Aedes albopictus* (Skuse) (Diptera: Culicidae) in Calcutta area, West Bengal. *Uttar Pradesh J Zool*, *9*(1): 99-106.

PEREIRA M, BARBOSA GL - 1995 - Pesquisa larvária e positividade de recipientes com *Aedes aegypti* e *Aedes albopictus* no Estado de São Paulo. In: Ed. Sociedade Brasileira de Medicina Tropical, : *XXXI Congresso da Sociedade Brasileira de Medicina Tropical, 27 a 31 de março de 1995, Centro de Convenções Rebouças - SP. Livro dos resumos*, São Paulo: 207.

PEREIRA OA, MOREIRA LP, ROJAS E - 1962 - Encefalomielite Equina em conchas, São Paulo, Brasil: incidencia de anticorpos inibidores da hemaglutinação no homen e em equideos. *Rev Inst Med trop São Paulo*, *4*(3): 149-151.

PINHEIRO FP, FREITAS RB, TRAVASSOS DA ROSA JFS, GABBAY YB, MELLO WA, LEDUC JW - 1981a - An outbreak of Mayaro virus disease in Belterra, Brazil. I. Clinical and virological findings. *Am J Trop Med Hyg*, *30*(3): 674-681.

PINHEIRO FP, HOCH AL, GOMES MLC, ROBERTS DR - 1981b - Oropouche virus. IV Laboratory transmission by *Culicoides paraensis*. *Am J Trop Med Hyg*, *30*(1): 172-176.

PINHEIRO FP, ROCHA AG, FREITAS RB, OHANA BA, TRAVASSOS DA ROSA APA, ROGÉRIO JS, LINHARES AC - 1982 - Meningite associada as infecções por virus Oropouche. *Rev Inst Med trop São Paulo, 24* (4): 246-251.

PINHEIRO FP, SCHATZMAYR HG, TRAVASSOS DA ROSA APA, HOMMA A, BENSABATH G - 1975 - Arbovirus antibodies in children of rural Guanabara, Brazil. *Intervirology, 5*: 93-96.

PINHEIRO FP, TRAVASSOS DA ROSA APA, TRAVASSOS DA ROSA JFS, BENSABATH G - 1976 - An outbreak of Oropouche virus disease in the vicinity of Santarem, Para, Brazil. *Tropen Med Parasitol, 27*(2): 213-223.

PINHEIRO FP, TRAVASSOS DA ROSA APA, TRAVASSOS DA ROSA JFS, FREITAS RB, MELLO WA - 1978 - Epidemias simultâneas de Mayaro e Febre Amarela em Belterra, Para. *Bol Epidemiol MS, 16*(31/32): 146-159.

PINHEIRO FP, TRAVASSOS DA ROSA APA, TRAVASSOS DA ROSA JFS, ISHAK R, FREITAS RB, GOMES MLC, LEDUC JW, OLIVA OFP - 1981c - Oropouche virus. I. A review of clinical, epidemiological and ecological findings. *Am J Trop Med Hyg, 30* (1): 149-160.

PONTES RJS, 1993. Epidemia de Dengue em Ribeirão Preto - SP. In: *XXIX Congresso da Sociedade Brasileira de Medicina tropical, 7 a 11 de março de 1993*, Fortaleza - Ceara.: 88.

RAWLINS SC, ELIASON DA, MOORE CG, CAMPOS EG - 1988 - Effects of Dengue-1 infection in *Aedes albopictus* on its susceptibility to malathion. *J Am Mosq Contr Ass, 4*(3): 372-373.

REITER P, SPRENGER D - 1987 - The used tire trade: a mechanism for the worldwide dispersal of container breeding mosquitoes. *J Am Mosq Contr Ass, 3*(3): 494-501.

ROBERTS DR, HOCH AL, DIXON KE, LLEWELLYN CH - 1981 - Oropouche virus. III. Entomological observations from three epidemics in Pará, Brazil, 1975. *Am J Trop Med Hyg, 30*(1): 165-171.

ROSEN L - 1958 - Experimental infection of new world monkeys with Dengue and Yellow fever viruses *Am J Trop Med Hyg, 7*(4): 406-410.

ROSEN L - 1987 - Sexual transmission of Dengue viruses by Aedes albopictus. *Am J Trop Med Hyg, 3?*(2): 398-402.

ROSEN L - 1988 - Further observations on the mechanism of vertical transmission of flaviviruses by *Aedes* mosquitoes. *Am J Trop Med Hyg, 39*(1): 123-126.

ROSEN L, SHROYER DA, TESH RB, FREIER JE, LIEN JC - 1983 - Transovarial transmission of Dengue viruses by mosquitoes: *Aedes albopictus* and *Aedes aegypti*. *Am J Trop Med Hyg, 32*(5): 1108-1119.

SANTOS FB, ARAÚJO ESM, MIAGOSTOVICH MP, PAIVA AC, VENTURINI MH, SCHATZMAYR HG, NOGUEIRA RMR - 1995 - Dengue virus type 2 epidemic in the State of Espirito Santo. In *5° Virológica 95. Encontro de Virologia, 26 a 29 de novembro 1995, Ribeirão Preto*, Sociedade Brasileira de Virologia, Ribeirão Preto: A-38.

SAVAGE HM, NIEBYLSKI ML, SMITH GC, MITCHELL CJ, CRAIG GB - 1993 - Host-feeding patterns of *Aedes albopictus* (Diptera: Culicidae) at a temperate North American site. *J Med Ent, 30*(1): 27 34.

SAVAGE HM, SMITH GC, MITCHELL CJ, MCLEAN RG, MEISCH MV - 1994 - Vector competence of *Aedes albopictus* from Pine Bluff, Arkansas, for a St. Louis Encephalitis virus strain isolated during the 1991 epidemic. *J Am Mosq Contr Ass, 10*(4): 501-506.

SCHATZMAYR HG, NOGUEIRA MR, TRAVASSOS DA ROSA APA - 1986 - An outbreak of Dengue virus at Rio de Janeiro - 1986. *Mem Inst Oswaldo Cruz, 81*(2): 245-246.

SCOTT TW, LORENZ LH, WEAVER SC - 1990 - Susceptibility of *Aedes albopictus* to infection with Eastern Equine encephalomyelitis virus. *J Am Mosq Contr Ass, 6* (2): 274-278.

SERUFO JC, OCA HM, TAVARES VA, SOUZA AM, ROSA RV, JAMAL MC, LEMOS JR, OLIVEIRA MA, NOGUEIRA RMR, SCHATZMAYR HG - 1993 - Isolation of Dengue virus type 1 from larvae of *Aedes albopictus* in Campos Altos city, State of Minas Gerais, Brazil. *Mem Inst Oswaldo Cruz, 88*(3): 503-504.

SHROYER DA - 1986 - Aedes albopictus and arboviruses: a concise review of the literature. *J Am Mosq Cont Ass, 2*(4): 424-428.

SHROYER DA - 1990 - Vertical maintenance of dengue-1 virus in sequential generations of Aedes albopictus. *J. Amer. Mosq. Cont. Ass.*, 6(2): 312-314.

SMITH GC FRANCY DB - 1991 - Laboratory studies of a brazilian strain of *Aedes albopictus* as a potential vector of Mayaro and Oropouche viruses. *J Am Mosq Cont Ass*, 7(1): 89-93.

SOUZA LTM, PEREIRA LE, KATZ G, ANDRADE JCR, CORTAS MC, OLIVEIRA M. BRASIL MTLRF - 1988 - Dengue in Ribeiro do Vale: the first autochtonous cases in São Paulo State In: Ed. Sociedade Brasileira de Virologia, : *Resumos do 4° Encontro Nacional de Virologia 26-30 de Outubro de 1988, Hotel Primus, São Lourenço MG*, 41.

SUZUKI A, TSUDA Y, TAKAGI M, WADA Y - 1993 - Seasonal observation on some population attributes of *Aedes albopictus* females in Nagasaki, Japan, with emphasis on the relation between the body size and the survival. *Trop Med. 35*(3): 91-99.

TIMBÓ MJM - 1993 - Situação atual do Dengue no Ceará - 1986-1992. In: *XXIX Congresso da Sociedade Brasileira de Medicina tropical, 7 a 11 de março de 1993*, Fortaleza - CE:

TRAVASSOS DA ROSA APA, DÉGALLIER N - 1985 - Relatorio final das pesquisas realizadas sobre os arbovirus e seus vetores em Fortaleza, Ceara. *Seçao de Virus, setor de Arbovirus - Instituto Evandro Chagas, Fundaçao S.E.S.P., Ministério da Saúde*, multigr.: 1-7

TRAVASSOS DA ROSA APA, NAKAUTH C, SALAÜN JJ, TRAVASSOS DA ROSA JFS, HERVÉ J-P - 1982 - Surto de Dengue em Boa Vista, Território de Roraima, Brasil. *Bol epidemiol, 14*(9): 93-100.

TRAVASSOS DA ROSA APA, RODRIGUES SG, NUNES MRT, MAGALHÃES MTF, TRAVASSOS DA ROSA JFS, VASCONCELOS PFC - 1995 - Epidemia de febre do Oropouche em Serra Pelada, município de Curionópolis, Pará, 1994. In: Ed. Sociedade Brasileira de Medicina Tropical, : *XXXI Congresso da Sociedade Brasileira de Medicina Tropical, 27 a 31 de março de 1995, Centro de Convenções Rebouças - SP. Livro dos resumos*, São Paulo: 204.

TRAVASSOS DA ROSA APA, SHOPE RE, TRAVASSOS DA ROSA JFS, NAKAUTH C, VASCONCELOS PFC - 1986 - Aspectos virológicos. In: *Instituto Evandro Chagas; 50 anos de contribuição às ciências biológicas e à medicina tropical, vol. 1*, FSESP, Belém: 365-373.

VASCONCELOS AW, CAVALCANTE JS, TIMBO MJM, SLEIGH A - 1989 - Dengue in Ceara, Brazil 1985-1989. Impact and prospects. In: Eds. Uren, M. F., Blok, J. & Manderson, L. H.: *Arbovirus Research in Australia. Proceedings Fifth Symposium, August 28 - September 1, 1989. Brisbane, Australia*, CSIRO Brisbane: 86-90.

VASCONCELOS PFC, MENEZES DB, MELO LP, PESSOA ETFP, RODRIGUES SG, TRAVASSOS DA ROSA ES, TIMBÓ MJ, COELHO ICB, MONTENEGRO F, TRAVASSOS DA ROSA JFS, ANDRADE FMO, TRAVASSOS DA ROSA APA - 1995 - A large epidemic of dengue fever with dengue hemorragic cases in Ceará State, Brazil, 1994. *Rev Inst Med trop São Paulo, 37* (2):253-255.

VASCONCELOS PFC, TRAVASSOS DA ROSA JFS, GUERREIRO SC, DÉGALLIER N, TRAVASSOS DA ROSA APA - 1989 - Primeiro registro de epidemias causadas pelo vírus Oropouche nos Estados do Maranhão e Goiás, Brasil. *Rev Inst Med trop São Paulo, 31*(4): 271-278.

WILLIS FS, NASCI RS - 1994 - *Aedes albopictus* (Diptera: Culicidae) population density and structure in southwest Louisiana. *J Med Ent, 31*(4): 594-599.

ZAGNE SMO, ALVES VGF, NOGUEIRA RM, LAMPE E - 1992 - Dengue hemorrágico - Estudo clínico de 187 pacientes internados no hospital Orêncio de Freitas, no Município de Niteroí - RJ - Brasil, no período de janeiro a junho de 1991. In: Ed. Dourado, H.: *XXVIII Congresso da Sociedade Brasileira de Medicina Tropical, 23 a 27 de fevereiro de 1992. Programa e resumos*, Universidade Federal do Pará, Belém, Pará: 121.

ZANINI LA, SILVA NA, ARAÚJO ESO, TRAVASSOS DA ROSA APA - 1991 - Doença por vírus Mayaro. aspectos epidemiológicos e clínicos de uma epidemia ocorrida em Goiás. In: Ed. Sociedade Brasileira de Medicina Tropical, : *XXIV Congresso da Sociedade Brasileira de Medicina Tropical, 28 de fevereiro à 03 de março de 1988. Programa e resumos*, Instituto de Medicina Tropical, Manaus: 72.

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1998