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MALARIA IN THE THAR DESERT : A CRITICAL REVIEW

Due to its xeric character, the Thar desert in Rajasthan has always been regarded as an area hypoendemic for malaria, though variable, endemicities and potential for sporadic outbreaks of the disease in epidemic form exist¹⁻³. However, the scenario of both disease morbidity and mortality seems to have altered a great deal during the past decade which is attributable to ecological and physiological changes in the Thar region due mainly to the construction of three major canal systems in the desert, the Gang canal, Bhakra-Sirhind Feeder canal and Indira Gandhi canal. These canal systems, running over 8000 km, have not only changed the soil composition, landscape, potential for water retention and climate but have also increased the water table. As a consequence, some areas especially those in the vicinity of canalised irrigation have become marshy with the seepage of water from these canals and turned into a veritable paradise for perennial breeding of certain vector species, including *Anopheles culicifacies*, which has apparently invaded the desert rather recently^{4,5}. *An. stephensi*, which is chronologically the oldest vector in the Thar desert is best adapted to survive and transmit malaria in the interior areas where there is a great scarcity of water.⁶ Since 1983, the Thar has experienced several outbreaks of malaria, mainly due to *Plasmodium falciparum*, claiming several hundreds of lives. Under the constantly changing Thar physiography and ecology, if concrete vector as well as disease control measures are not taken, it is feared that epidemics may

continue to recur unabated in the future too. The dynamics of both vector biology and disease prevalence in the wake of ecological oscillations in the Thar desert region require a thorough analysis. Therefore, it was considered opportune to review the malaria situation to help comprehend that the vicissitudinous Thar desert is a region with potential for severe epidemics, particularly if the newly formed breeding conditions conducive to vector preponderance are not taken care of urgently.

The Thar: Topography and Climate

The Great Indian Thar desert lies approximately between 24-30° latitude North and 68-78° longitude East. In the Rajasthan State, it spans over 75,000 sq.km. (62% of the State area) and harbours 12.8 million people (39% of the State population). It is organized into eleven notified desert districts (recently a twelfth district, Hanumangarh, was carved out from Sri Ganganagar district, but due to nonavailability of authentic geographic, demographic and malariometric details, it is, for convenience of description, included in its original district). The eastern flank of the desert is bordered by the Aravalli range of mountains, while the seasonal Luni river intersects the landscape into two parts; in the north a vast stretch of sand dunes or levcas and in the south an expansive bowl rimmed by flat topped hills of sandstones and limestones.

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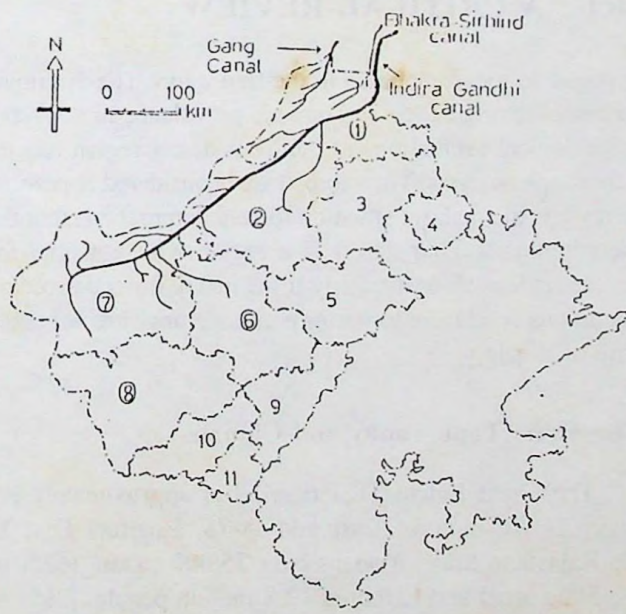
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The Thar desert has extremes of ambient temperature, often below -0°C during the brief winter season and close to 50°C during the hot and sultry summer months. The annual average precipitation, which until recently was about 250 mm., has since 1990 been about 350-400mm.

Canal Systems in the Thar Desert Region

As shown in the Figure three major canal systems exist in the Thar desert region'. The Gang canal (114 km) was the first to be built and become fully operative in 1928, with its 1251 km long distribution system in Sri Ganganagar district. Along with the Bikaner feeder, it provides water to the extent of culturable common area (CCA) of 3,07,692 ha with 65 per cent intensity. The Bhakra-Sirhind canal project, with its 1219 km long distribution system, was started in 1955 to utilize the CCA of 3,72,469 ha of land.



Encircled numbers represent districts with malaria epidemics

District No.	District	Years of Epidemic	API for 1994
1	Sri Ganganagar	1983, 1984	1.9
2	Bikaner	1990, 1992, 1994	10.4
6	Jodhpur	1990, 1992, 1994	5.7
7	Jaisalmer	1990, 1992, 1994	55.2
8	Barmer	1990, 1994	26.7

Source : Reference 11

However, the most important of all these systems is the Indira Gandhi Nahar Pariyojana (IGNP). The project started in 1958 but irrigation in part of the area was initiated only in 1961. The project when completed will include a 649 km long main canal (of which 445 km is in the Thar region) and over 9000 km of distributaries. Although only two of the three stages envisaged in the IGNP project are completed, the main canal including the feeder and 5500 km of distributaries is already irrigating 0.7 million ha of land. While several irrigation-intensive crops, such as sugarcane, mustard, groundnut, etc., have been established in some of the canalized desert districts, the production of paddy in Sri Ganganagar, the most irrigated among all the desert districts, has topped the list in the whole State. Extensive paddy cultivation is often associated with the breeding of certain malaria vectors, including *An. culicifacies*.

Physiographic Changes Brought About by Extensive Canalization

Extensive canalization and the resultant new irrigational avenues in the desert have clearly reorganized the whole desert region into three physiographically distinct zones: The IGNP command area (ie, irrigated areas including Sri Ganganagar, Bikaner, Jodhpur and Jaisalmer districts), the IGNP non-command area (ie, areas which are not covered by the project including Churu, Jhunjunu, Nagaur, Pali, Jalore and Sirohi districts) and the monsoon flood-prone areas (ie. Barmer district) which are to be covered in the IGNP III Stage. The IGNP command area is characterized by development of vast areas perennially inundated with seepage water from the canals. In addition, surplus flood water from the seasonal Ghaggar river, whose flow is more or less parallel to that of the Indira Gandhi Canal, has been let into low-lying "escape" lands where it stagnates over large areas. According to an estimate a total of 8600 ha of land is permanently inundated under the IGNP Stage I by the Ghaggar flood water while 1000 ha area is converted into marshy land due to water logging and excessive seepage from the canal in Stage II⁸.

Several decades' supply of canal water in the desert region has resulted in a rise of water table, water-holding potential of the soil and plentiful growth of vegetation particularly hydrophytic weeds. Such extensive breeding grounds are the preferred sites for *An. culicifacies*, the most serious vector of malaria in the whole Indian subcontinent⁹.

Changing Pattern of Malaria Prevalence

The situation of endemic malaria in the desert has changed a great deal over the past nearly one decade. *P. falciparum* has invaded almost the whole of the region and caused immense misery including loss of human lives. This can be substantiated by comparing the malariometric data of Rajasthan State (1961-1994) with respect to that of desert districts alone^{1,10-11}. Between 1961 and 1994 the overall number of positive cases in the State has increase 27 times from 8494 cases in 1961 to 229772 cases in 1994, whereas the targetted population increased only 2.5 times during the same period. Various indices also point towards this drift. While the slide positive rate (SPR) had significantly increased from 1.43 in 1961 to 5.7 (3.5 fold increase) in 1994, the slide falciparum rate has also augmented as much from 0.55 to 2.2. The annual parasite incidence (API), too, showed a steady increase from 0.48 to 5.2 (Table I).

Table I. Malariometric indices for 1961-1991, with five yearly intervals, and for 1994

Year	Population (in thousands)	BSE	SPR	SFR	API
1961	17562	669202	1.43	0.55	0.48
1966	22454	1863401	0.52	0.03	0.48
1971	25850	2184134	5.05	0.37	4.25
1976	28031	3578216	11.55	0.68	14.73
1981	32492	3992445	2.52	0.37	3.10
1986	34670	2941659	1.80	0.40	1.50
1991	43880	3139925	2.43	0.51	1.76
1994	43880	4525430	5.70	2.20	5.20

BSE = Blood Slides Examined; SPR = Slide Positivity Rate, SFR = Slide Falciparum Rate; API = Annual Parasite Incidence
Source : Reference 1, 10 and 11

Before epidemics began to occur regularly in the desert region from the mid-eighties, most of the positive cases in the State were reported from the hyperendemic hilly and forested terrain of Udaipur zone in the southern part of Rajasthan State¹⁰. Therefore, it is of interest to note that in Rajasthan while in 1986 the Udaipur zone had contributed 44.15 per cent positive cases and 67.74 per cent *P. falciparum* cases against 24.37 per cent positives and 11.65 per cent *P. falciparum* cases reported from the desert region, in 1994 the situation was reversed so that only 14.15 per cent

positives (*P. falciparum* 26.61%) were from the Udaipur zone as against 53.27 per cent positives (*P.falciparum* 62.5 per cent) from the desert districts. Presently, amongst all the desert districts, Barmer is the most malarious, contributing 31.29 per cent positive cases and 35.78 per cent *P.falciparum* cases.

In the Thar region, Jodhpur and Bikaner zones together have nine of the eleven desert districts. It is noted that during 1981-1991 both SPR and percentage *P. falciparum* had appreciably increased in both these zones. In the Sri Ganganagar district (1976-1986) the data show that the SPR initially declined from 13.48 in 1976 to 0.84 in 1982 during the non-epidemic period, but thereafter following an epidemic it peaked to 4.91 in 1984. Similarly, the percentage of *P. falciparum* infections also increased from 2.49 in 1976 to 6.83 in 1986. The Jodhpur zone comprising six districts, viz., Jodhpur, Sirohi, Pali, Jaisalmer, Barmer and Jalore, truly represents the desert region. When the data on SPR and percentage *P. falciparum* infections in the Jodhpur zone districts were pooled at five yearly intervals for the period 1981-1991 and compared with those of Sri Ganganagar district and the State, it becomes evident that *P. falciparum* has emerged significantly in the desert districts, in particular (Table II).

Outbreaks of Malaria Epidemics in the Thar Desert

Out of the three physiographic zones described, the IGNP command area zone was responsible for the flare up in *P. falciparum* infection in the desert. Four major outbreaks with markedly high representation of *P. falciparum* being seen, Sri Ganganagar district, the first of the desert districts to receive canalized water for irrigation, experienced malaria epidemic in 1983 during which period 4925 positive cases (*P. falciparum* 43.4%) were seen, which was much higher than in the preceding years. Two primary health centres (PHCs), viz. Sangaria and Pilibanga, which were most severely affected, had jointly contributed 72.2 per cent of the total number of positive cases in the district during the epidemic.

District Barmer bore the brunt of the 1990 epidemic which broke out following unprecedented heavy monsoon rains (>960 mm). A total of 19322 positive cases (*P. falciparum* 66%), which was 2.5 times higher than the positive cases in the preceding year, were recorded with several death¹².

Table II. Malarionometric data in Jodhpur zone during 1981, 1986 and 1991 as compared with that of Sri Ganganagar district and the State of Rajasthan

Jodhpur zone districts	Population (in thousands)	1981			1986			1991		
		BSE	Positive (SPR)	Pf (%)	BSE	Positive (SPR)	Pf (%)	BSE	Positive (SPR)	Pf (%)
Jodhpur	1654	160280	271	95 (9.7)	102314	1034	112 (10.8)	110099	6374	1042 (16.3)
Barmer	909	112881	362	35 (9.6)	77317	566	56 (9.8)	103042	11033	1221 (11.0)
Jaisalmer	166	18545	101	7 (6.9)	14300	152	1 (0.6)	21579	301	79 (26.2)
Sirohi	559	60157	748	58 (7.7)	35152	268	31 (11.5)	48768	3540	600 (16.9)
Pali	1379	180805	2376	163 (6.8)	23940	1979	265 (13.8)	134850	9746	1316 (13.5)
Jalore	905	79373	255	13 (5.0)	38043	314	37 (11.5)	74632	2409	316 (13.1)
Pooled for Jodhpur zonal districts	5572	612041	4813 (0.8)	371 (7.7)	291066	4313 (11.5)	502 (11.6)	492970	33403 (6.7)	4573 (13.6)
Sri Ganganagar district	2618	247920	2088 (0.8)	55 (2.6)	191014	4240 (2.2)	290 (6.8)	158710	218 (0.1)	12 (5.5)
Rajasthan State	45880	3992445	100645 (2.5)	14752 (14.6)	2941659	54618 (1.8)	14006 (25.6)	3179925	77573 (2.4)	16305 (21.0)

Pf = *Plasmodium falciparum*

Source: References 1, 10 and 11 and personal communication from office of the Joint Director (Malaria), Jodhpur.

During late 1992 and early 1993 an epidemic broke out simultaneously in several districts, *ie* Bikaner (Bajju, Kolayat PHCs), Jodhpur (Baap, Phalodi PHCs) and Jaisalmer (Pokaran, Nachna PHCs). In a study carried out in two desert villages in vicinity of the Indira Gandhi canal, *viz.*, Madassar and Awai during and after the epidemic in early 1993, the SPR was recorded as high as 85 per cent and *P. falciparum* incidence was recorded as 88 per cent¹³. In Jaisalmer district alone a total of 2128 positive cases (*P. falciparum* 73.6%) were reported in the period of the epidemic during 1992 as against a combined total of 1809 cases (*P. falciparum* 27.6%) during the two preceding years of 1990 and 1991. Occasionally some instances of *P. falciparum* related hepatitis were also reported in the desert region¹⁴.

In mid 1994, once again malaria in epidemic form broke out in Barmer, Jaisalmer and Jodhpur districts. This was by far the worst in the history of malaria in the Thar desert, and took a toll of 361 (79.86%) humans out of a total of 452 deaths recorded in the State. *P. falciparum* contributed to about 60 per cent cases in the desert and was considered as the main cause of death during the epidemic (Table III)¹⁵.

Table III. Malaria incidence and deaths in the six zones of Rajasthan State during 1994

Zone	BSE	Total positives	Pf	Deaths
Ajmer	725847	46851	12980	54
Jaipur	1046728	20256	5025	16
Bikaner	416668	23179	5299	98
Jodhpur	1110355	91611	47610	256
Kota	548803	15343	5636	27
Udaipur	677029	32532	11751	1

Pf = *Plasmodium falciparum*; BSE = Blood Slide Examined

Taking cognizance of the chronological development of various epidemics since 1983 as well as their foci in the desert region, it can be surmised that *P. falciparum* dominated malaria epidemics have advanced from the northern most Sri Ganganagar district to the west-southwardly districts in the interior of the Thar desert, more or less along the course of the Indira Gandhi canal. The epidemic outbreak in Barmer, however, seems to be correlated with heavy monsoon rains when *An. culicifacies* begins to breed copiously, increasing the possibility of transmitting the malarial parasite.

Development of Chloroquine Resistance in *P. falciparum*

There is very little information available on the development of resistance in *P. falciparum* against chloroquine in the desert region. Earlier investigations carried out between 1981-1984 indicated 100 per cent parasite susceptibility to chloroquine (600 mg base). Recently, in 1994 in a small sample of 12 patients studied at both Barmer and Jaisalmer, 100 per cent susceptibility was observed in the latter while 66.6 per cent susceptibility and 33.3 per cent R₁ level of resistance were obtained in the former desert district¹¹.

Concentration of Labour Force from Neighbouring Endemic States at the Site of Construction of the Indira Gandhi Canal

The migration labour from some of the malaria hyperendemic neighbouring States in the country to the site of the Indira Gandhi Canal could perhaps be one possible means of transportation of the *P. falciparum* to the desert region. Many of these labourers have permanently settled near the site of work and provided a source of the parasite which did not occur prodigiously in the local population earlier.

Vectors in the Thar Desert

The first systematic entomological investigation was carried out in the Sri Ganganagar district by the Desert Medicine Research Centre (DMRC) Jodhpur¹⁶. It was found that *An. stephensi* has adapted to the desert climate and bred characteristically in the household *tanka* or *beri* whereas *An. culicifacies*, which bred in a variety of habitats, increased its distribution more or less parallel to the extent of canalized irrigation. Between the two major vector species, *An. culicifacies* was more preponderant in the areas under impact of irrigation. The dominance of *An. stephensi* in highly xeric situation was subsequently confirmed in a study carried out in ten desert villages of north-western Jodhpur district¹⁷. In such villages where no canal water was available, the occurrence of *An. culicifacies* was insignificant. While *An. stephensi* was incriminated in the desert villages of Jodhpur district, *An. culicifacies* was confirmed as a vector in Sri Ganganagar district. In yet another study carried out in the villages in the vicinity of the Indira Gandhi canal in Jaisalmer district, it was observed that *An. culifacies* thrived with *An. stephensi*¹⁸. The canalized irrigation intensive crops and stagnant seepage water collections have led to the breeding of many other species along with *An. culicifacies* (eg. *An. nigerrimus* *An. splendidus*

and *An. annularis*). The physiographic changes in the Thar desert must have been enormous since even *An. d'thali*, earlier known only from a single record from western Kashmir, has now been recorded from the IGNP command area in Jaisalmer district.

Distribution of Vectors in the Thar Desert

Until the mid-sixties a total of 16 species of mosquitoes were reported from Rajasthan State¹⁹. Most of these taxa were restricted to Udaipur zone in southern Rajasthan, and only seven species (43.7%) were inventorized from five of the eleven desert districts²⁰. Three more taxa have since been added to the list, viz. *An. nigerrimus* from Sri Ganganagar district, and *An. d'thali* and *An. splendidus* from Jaisalmer district, raising the total to ten (59%)¹⁷. In as far as the desert is concerned both *An. culicifacies* and *An. stephensi* have been incriminated as vectors of malaria¹⁸. *An. culicifacies*, a species widely recognised as a major malaria vector in India, is rampant in the plains as well as desert areas currently under extensive irrigation-based developmental activities. *An. stephensi* has been recently introduced in the desert region with canalized irrigation. *An. stephensi* is chronologically identified as a desert species²¹, which breeds in well-like earthen pits called *tanka* and *beri*²². Two different forms have been suggested for *An. stephensi* in the desert²³.

Insecticide Susceptibility Status of the Vectors

Both *An. stephensi* and *An. culicifacies* have exhibited an increasing trend of tolerance against DDT, the most commonly used insecticide in the malaria control programme. Initial reports of DDT and dieldrin resistance against *An. culicifacies* were from Pali (1962), followed by Sirohi (1963), Jodhpur (1964), Sri Ganganagar (1967) and Bikaner (1976). As for *An. stephensi*, the first instance of resistance development against DDT was reported from the non-desert Alwar and Kota districts in the eastern Rajasthan. All vector species have been found absolutely susceptible against malathion since inception of its use in 1980.

A number of significant short-comings have been observed in the spraying of insecticide. In the desert region, barring a few border areas where HCH is sprayed, DDT has been in use since the past several years. Technical and operational inadequacies in spraying the insecticide were enhanced by the non-availability of trained spray squads and the use instead of unskilled labourers on daily wages who did not have proper knowledge of spraying methodology resulting in wastage of money, material and manpower. The

insufficient dosage of the insecticide helps the vector species evolve tolerance against it rather early.

Warning Systems for Epidemics

The Thar desert is a highly complex ecosystem which is under the constant stress of change. The history of malaria in the Thar region indicates that until the early eighties, malaria prevalence in any desert district had seldom taken the form of an epidemic, irrespective of the excessive rains during many a year since 1901^{24,25}. However, it was recently argued that the epidemics in the Thar desert region have been influenced by the excessive rains triggered by the El Nino Southern Oscillation (ENSO)²⁶. This hypothesis does not seem to hold good at least as far as the Thar desert in north-western India is concerned due primarily to the facts that (i) a large area in the desert, which is extensively irrigated and covered with seepage water, has perennially become conducive to copious vector breeding, particularly *An. culicifacies*, beyond established critical densities, causing more number of bites on human host and increasing thereby the possibility of transmitting the malaria parasite amongst the less immune population, and (ii) of the four major epidemics, Barmer district, which is highly monsoon-flood prone and is yet to be covered by the IGNP, experienced outbreaks of malaria only twice (1990 and 1994), whereas the IGNP command area in the Thar desert had all epidemics between 1983 and 1994. Sri Ganganagar district, however, had epidemics of malaria only in 1983 and 1984.

It appears that malaria epidemics in the desert region had started occurring only after canalized irrigation was well established. Inadvertently, seepage from these irrigation canals perennially converted vast areas into breeding sites for even those vector species which were so far unknown in the interior of the Thar desert (eg, *An. culicifacies*). There is substantial evidence that while *An. stephensi*, traditionally prevalent in the Thar desert, was able to transmit malaria at a low pace, the introduction of *An. culicifacies* with a very high density following the monsoon seems to have been the cause behind the high-level transmission and epidemics. The susceptibility of both these vector species to *P. falciparum* is also well documented. It is for this reason that while in the IGNP command areas malaria epidemics are a combined effect of *An. culicifacies* and *An. stephensi*, in the non-IGNP or truly desertic areas characterized by the presence of *tanka* and *beri* it is effected more or less completely by *An. stephensi*. In the monsoon flood prone Barmer district yet to be covered under the IGNP command area, *An. culicifacies* is the main vector of malaria.

References:

1. Sharma, G.K. *Malaria and Its Control in India*. Part III. Directorate of National Malaria Eradication Programme, Delhi, p. 617, 1986.
2. Sharma, G.K. *Malaria and Its Control in India*. Part I. Directorate of National Malaria Eradication Programme, Delhi, p.347, 1986.
3. Tyagi, B.K. Distribution of arthropod vector-borne communicable diseases and control of their vectors in India. *Indian Rev Life Sci* 14: 223, 1994.
4. Sharma, V.P. and Mehrotra, K.N.. Malaria resurgence in India: A critical study. *Soc Sci Med* 22: 835, 1986.
5. Tyagi, B.K., Chaudhary, R.C and Yadav, S.P. Epidemic malaria in Thar desert, India. *Lancet* 346: 634, 1995.
6. Tyagi, B.K. Control of malaria vectors in India. *Indian Rev Life Sci* 12: 211, 1992.
7. Moghe, V.B., Nahar, K.R., Parmar, A.K. and Verma, P.C. *Resource Atlas of Rajasthan*. Department of Science and Technology, Government of Rajasthan, Jaipur, p. 231, 1994.
8. Anonymous. *Profile of Indira Gandhi Nahar Project*. Government of Rajasthan, Indira Gandhi Nahar Board, Jaipur, p. 38, 1992.
9. Tyagi, B.K. and Yadav, S.P. Malariological significance of "Tanka" and "Beri" in the Thar desert, western Rajasthan (India). *J Arid Environ* (in press), 1996.
10. Anonymous. *Rajasthan: The Health Scenario*. Indian Institute of Health Management Research, Jaipur, p. 197, 1987.
11. Anonymous. *Report of an Expert Committee on Malaria*. Medical and Health Department, Government of Rajasthan, Jaipur, p.132, 1995.
12. Mathur, K.K., Harpalani, G., Kalra, N.L., Murthy, G.G.K. and Narasimham, M.V.V.L. Epidemic of Malaria in Barmer (Thar desert) Rajasthan during 1990. *Indian J Malariol* 29: 1, 1992.
13. Tyagi, B.K., Verma, V.S., Bansal, S.K. and Yadav, S.P. Malaria epidemic in some villages of north-western desert of Rajasthan. *J Appl Zool Res* 5: 152, 1994.
14. Gupta, U.C. and Kataria, M.L. *Plasmodium falciparum* hepatitis during malaria epidemic. *J Assoc Phys* 41: 292, 1993.
15. Anonymous. Annual Report. Medical, Health and Family Planning Services, Government of Rajasthan (1994-1995). p. 56, 1995.
16. Tyagi, B.K. and Verma, K.V.S. Anopheline mosquitoes of Sri Ganganagar district (Rajasthan) transmitting malarial parasite. *J Appl Zool Res* 2: 85, 1991.
17. Annual Report, Desert Medicine Research Centre, Jodhpur, 1992-93, 1993.
18. Annual Report, Desert Medicine Research Centre, Jodhpur, 1993-94, 1994.
19. Puri, I.M. The distribution of anopheline mosquitoes in India. *Health Bulletin No. 17*; Malaria Bureau 7, Government of India Press, Calcutta, p. 58, 1955.
20. Puri, I.M. Synoptic tables for the identification of the full-grown Indian anopheline mosquitoes. *Health Bull.* 16, Malaria Bureau 7. Government. of India Press, Calcutta, p. 104, 1960.
21. Zahar, A.R. Vector bionomics in the epidemiology and control of malaria. Part II. The WHO European Region and The WHO Eastern Mediterranean Region (Vol. II). Applied Field Studies. *WHO/VBC/90.1*, p.90, 1990.
22. Tyagi, B.K. Thanatosis as an adaptive defence mechanism in *Anopheles stephensi* larvae breeding in "tanka" and "beri" in the desert villages of Rajasthan, *Geobios New Rep* 13: 132, 1994.
23. Tyagi, B.K., Bansal, S.K. and Verma, K.V.S. Intraspecific morphological variations in two ecotypes of *Anopheles stephensi* Liston in north-western Rajasthan (Diptera: Culicidae). *Ann Entomol* 9: 85, 1991.
24. Gupta, R.K. The landscape and land forms. In: *Environmental Analysis of the Thar Desert*. Eds. R.K. Gupta and I. Prakash. English Book Depot, Dehradun. p. 484, 1975.
25. Anonymous. *Climate of Rajasthan State*. Controller of Publications, Government of India, Delhi, p. 137, 1988.
26. Bouma, M.J. and Van Der Kaay H.J. Epidemic malaria in India and the El Nino Southern Oscillation. *Lancet* 344: 1638, 1994.

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ABSTRACTS

Some Research Projects Completed Recently

Evaluation of some serological procedures for detection of antigens and antibodies in invasive candidiasis.

The study was carried out for evaluation of various serological procedures for detection of mannan and

cytoplasmic antigens as also antibodies for diagnosis of invasive candidiasis.

Mannan and cytoplasmic antigens were prepared from the blastospores and mycelial phases of *Candida albicans*

serotype A strain ATCC-1065 maintained on Sabourauds dextrose agar. Cytoplasmic antigens were purified from mannan fraction by affinity chromatography. Antisera were raised in rabbits against these antigens for antigen detection by latex agglutination test (by coating latex particles with hyperimmune IgG fraction) and countercurrent immunoelectrophoresis (CIEP). Cytoplasmic antigen fractions were also screened for immunodominant antigens by immunoblot procedure using sera from five patients with histopathologically proven invasive candidiasis. A 47 kDa protein was found to be the most immunodominant fraction. One hundred patients (confirmed invasive candidiasis-29, suspected invasive candidiasis-30, superficial candidal colonisation and without any deep seated candida infection-41) were screened for antigen and antibody.

Amongst different candida antibody detection procedures (like immunodiffusion test, CIEP, whole cell agglutination, and immunoblotting assay), immunoblot test for detection of antibody against 47 kDa protein fraction was found to be the most ideal procedure with a sensitivity of 79.3 per cent, specificity of 85.4 per cent, positive predictive value of 79.3 per cent, negative predictive value of 85.4 per cent, and efficacy 82.9 per cent. This procedure could detect antibody in patients with immunodeficiency. Amongst antigen detection procedures, latex agglutination test for detection of mannan or cytoplasmic antigen was found to be better than CIEP. However, this procedure requires to be evaluated in patients with other fungal infections.

Candida specific precipitating antibody detection by gel diffusion or CIEP was of high specificity but lacked sensitivity. Candida whole cell agglutination for detection of antibody was found to be a good sensitive (75.9%) procedure but the specificity was very low (31.7%). There was no significant difference observed in results using either of the phases of Candida — blastospores and mycelial.

It may be concluded that detection of specific 47 kDa fraction antigen in serum seems to be a better procedure compared to the antigen detection tests in use currently.

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Screening for early detection of asymptomatic renal disease in school children.

Urine samples of 17391 asymptomatic school children (9580 boys and 7811 girls) aged 5-14 years were analysed for detection of proteinuria, haematuria, pyuria and aminoaciduria. Attempts were also made to detect asymptomatic renal disease through ultrasonography, urine culture, etc. Children who had proteinuria, haematuria, pyuria, etc. in the first urine analysis were evaluated at monthly interval for 2 successive months.

The general incidence of asymptomatic proteinuria was 4.2 per cent on first test, 1.77 per cent on the second and 1.61 per cent on the third examination; the incidence in boys and girls being 3.57, 1.45, 1.39 and 4.97, 2.16 and 1.88 per cent respectively on first, second and third examination. Proteinuria was more than traces in 0.99, 0.46 and 0.58 per cent of boys and 1.81, 0.93 and 0.70 per cent of girls in each test respectively. The degree of proteinuria was more in older age group children. The urinary protein/creatinine ratio showed significant proteinuria in 150 (53.57%) and massive proteinuria in 5 (1.79%) of proteinuric children. Seventeen children showed significant pyuria on the first and 3 each on the second and third examinations. Urine culture was found positive in 4 of the 17391 children; of these three were positive for *Escherichia coli* and one for *Klebsiella*.

Five children had microscopic haematuria on the first, one on the second and two on the third examinations. Two children were found positive for alkaptonuria.

Renal ultrasonography showed abnormality in 11.41 per cent of asymptomatic proteinuric children. The abnormalities were renal parenchymal changes in 3, hydronephrosis in 4, calycial dilation in 10, renal calculi in 2, renal cyst in 1, duplex kidney in 1, mega pelvis in 2 and foetal lobulation was seen in 5 children. Two children had a contracted kidney with posterior urethral valve and multiple renal calculi and bilateral parenchymal changes in one each.

It is concluded that screening for asymptomatic renal disorders is easy and cost-benefit ratio is very high. It can thus be included as a routine test for all school children during their annual medical test.

B. Sanjeev Rai
Kasturba Medical College
Manipal.

ICMR NEWS

The following meetings of various technical groups/committees of the Council were held:

Meetings of the Scientific Advisory Groups (SAGs)/Scientific Advisory Committees (SACs)/Project Advisory Committees (PACs)/Project Review Committees (PRCs) held:

SAG of the Division of Reproductive Health and Nutrition	August 16-17, 1995 (at NewDelhi)
PAC of the International Chlamydia Reference Laboratory	August 21, 1995 (at New Delhi)
PRC on Biochemistry and Molecular Biology	August 21, 1995 (at New Delhi)
PRC for Projects on Non-Communicable Diseases	September 6, 1995 (at New Delhi)
SAC of the Centre for Advanced Research on Health Consequences of Earthquake Disaster with Special Reference to Mental Health, Pune	September 14, 1995 (at Pune)

Participation of ICMR Scientists in Scientific Events:

Dr. K. Madhavan Nair, Research Officer, National Institute of Nutrition, Hyderabad, participated in the

International Symposium on Iron Nutrition in Health and Diseases at Stockholm (August 24-27, 1995).

Dr. B.K. Tyagi, Assistant Director, Desert Medicine Research Centre, Jodhpur, participated in the IX European Meeting of the Society for Vector Ecology, at Prague (September 4-7, 1995).

Dr. Swarup Sarkar, Assistant Director, ICMR Unit for Research on AIDS in North-Eastern States of India, Calcutta, participated in a WHO Meeting on Implementation of a Proposed Multicentric Study on Drug Injecting Behaviour and HIV Infection, at Bangkok (September 11-15, 1995).

Dr. Kalyan Banerjee, Director, National Institute of Virology, Pune; Dr. J.J. Rodrigues, Director-in-Charge, Dr. S.M. Mehendale, Dr. A.R. Risbud, Asstt. Directors and Dr. Nita Mawar and Dr. A. Divekar, Sr. Research Officers, National AIDS Research Institute, Pune; Dr. Swarup Sarkar, Asstt. Director from Calcutta; and Dr. M.A. Khan, Sr. Research Officer, Central Jalma Institute for Leprosy, Agra, participated in the III International Conference on AIDS in Asia and Pacific at Chiang Mai (September 17-21, 1995).

Hindi Day Celebrations:

As part of Hindi Day Celebrations by the ICMR Headquarters, a popular lecture (in Hindi) on 'Heart Diseases: Causes and Treatment' was delivered on September 13, 1995 by Dr. H.S. Wasir, Professor and Head, Department of Cardiology, All India Institute of Medical Sciences, New Delhi.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/COURSES/CONFERENCES

Symposium/Seminar/Workshop/ Course/Conference	Date & Place	Contact Address
International Symposium on Human Stones, Free Radical and Trace Metals and VIII National Conference of Urolithiasis Society of India 1995.	September 14-16, 1995; (at Udaipur)	Dr. P.P. Singh, Organising Secretary, Department of Biochemistry, R.N.T. Medical Collège, Udaipur.
National Seminar on Public Health Aspects of Fixed Duration Treatment (FDT) in Leprosy.	September 22, 1995; (at Bombay)	Dr. C.R. Revankar, Organising Secretary, Bombay Leprosy Project, Vidnyon Bhawan, Sion- Chunabhatti, Bombay.
Symposium on Prevention and Control of Goitre Endemism in Tribal Population through Education and Mass Communication.	October 2-3, 1995: (at Bhopal)	Dr. D.K. Belsare, Director, Institute for Natural Resources and Human Environment, Bhopal.

Symposium/Seminar/Workshop/ Course/Conference	Date & Place	Contact Address
Cytology Update - 1995.	October 14-15, 1995; (at Chandigarh)	Dr. A. Rajwanshi, Organising Secretary of Update, Department of Cytology and Gynaecologic Pathology, Postgraduate Institute of Medical Education and Research, Chandigarh.
XXVI Annual Conference of the Endocrine Society of India.	December 1-3, 1995; (at Ahmedabad)	Dr. J.M. Bhatavdekar, Organising Secretary, ESICON - 1995, Division of Molecular Endocrinology, The Gujarat Cancer Society, Ahmedabad.
International Symposium on Radiomodifiers in Human Health.	December 28-31, 1995; (at Manipal)	Prof. P. Uma Devi, Convenor, ISRHH, Department of Radiobiology, Kasturba Medical College, Manipal.

COUNCIL'S TRAINING PROGRAMMES

Reproductive Biology

At the Institute for Research in Reproduction, Bombay:

- Training Course on Techniques in Immunology, Cell Biology and Molecular Biology (November 5-25, 1995).
- Training Course on Techniques in Neuroendocrine Research (February 6-10, 1996).

Endocrinology

At the National Institute of Nutrition, Hyderabad:

- Annual Training Course on Endocrinological Techniques and their Application (August/September, 1995).

Nutrition

At the National Institute of Nutrition, Hyderabad:

- Annual Training Course in Nutrition (December 1, 1995 - February 28, 1996).

Oncology

At the Institute of Cytology and Preventive Oncology, New Delhi:

- Workshop on Molecular Biology of Viruses and Cancer alongwith Oligo DNA Synthesis and Polymerase Chain Reaction (September 18-22, 1995).

Occupational Health

At the National Institute of Occupational Health, Ahmedabad:

- Orientation Course on Occupational Health for Industrial Medical Officers (November 13-24, 1995).
- Training Course on Air Pollution Monitoring and Risk Assessment (December 13-19, 1995).

Laboratory Animal Technology

At the Laboratory Animal Information Services Centre, National Institute of Nutrition, Hyderabad:

- Training Course for Laboratory Animal Supervisors (September 4 - November 30, 1995).

Haematology

At the Institute of Immunohaematology, Bombay:

- Training Course in Advanced Haematology and Immunohaematology (September 11-29, 1995).

ICMR PUBLICATIONS

	Price (Rs.)
Nutritive Value of Indian Foods (1985), by C. Gopalan, B.V. Ramasastri and S.C. Balasubramaniam, Revised and Updated (1989), by B.S. Narasinga Rao, K.C. Pant and Y.G. Deosthale (Reprinted 1995)	25.00
Growth & Physical Development of Indian Infants and Children (1972, Reprinted 1989)	10.00
Studies on Weaning & Supplementary Foods (1974, Reprinted 1986)	6.00
Studies on Pre-School Children (1974, Reprinted 1984)	6.00
A Manual of Nutrition (Second Edition 1974, Reprinted 1992)	4.50
Low Cost Nutritious Supplements (Second Edition 1975, Reprinted 1994)	4.00
Menus for Low Cost Balanced Diets and School Lunch Programmes Suitable for South India (Third Edition 1977, Reprinted 1991)	4.50
Menus for Low Cost Balanced Diets and School Lunch Programmes Suitable for North India (Second Edition 1977, Reprinted 1994)	4.50
Some Common Indian Recipes and their Nutritive Value (Fourth Edition 1977, Reprinted 1991) by Swaran Pasricha & L.M. Rebello	10.00
Nutrition for Mother & Child (Third Edition 1978, Reprinted 1991) by P.S. Venkatachalam & L.M. Rebello	9.00
Japanese Encephalitis in India (Revised Edition 1980)	5.00
Some Therapeutic Diets (Fourth Edition 1988, Reprinted 1995) by Swaran Pasricha	4.50
Nutrient Requirements & Recommended Dietary Allowances for Indians (1990, Reprinted 1994)	14.00
Fruits (1983, Reprinted 1992) by Indira Gopalan & M. Mohan Ram	7.00
Count What You Eat (1989, Reprinted 1991) by Swaran Pasricha	9.00
Diet & Diabetes (Second Edition 1993) by T.C. Raghuram, Swaran Pasricha & R.D. Sharma	18.00
Dietary Tips for the Elderly (1992) by Swaran Pasricha & B.V.S. Thimmayamma	3.50
Diet and Heart Disease (1994) by Ghafoorunissa and Kamala Krishnaswamy	26.00

*Depressive Disease (1986) by A. Venkoba Rao	58.00
**Medicinal Plants of India Vol.2 (1987)	136.00
**The Anophelines of India (Revised Edition 1984) by T. Ramachandra Rao	150.00

*10 per cent discount allowed to individuals.

**25 per cent discount allowed to individuals.

These publications are available on prepayment of cost by cheque, bank draft or postal order (bank and postal charges will be extra) in favour of the Director-General, Indian Council of Medical Research, New Delhi. Money orders are not acceptable. All correspondence in this regard should be addressed to the Chief, Division of Publication and Information, Indian Council of Medical Research, Post Box No.4911, Ansari Nagar, New Delhi-110029 (India).

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