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PROSPECTS OF USING MONOMOLECULAR SURFACE FILMS IN MOSQUITO CONTROL

The appearance of acquired resistance in larvae of vector mosquitoes to most conventional larvicides stimulated a search for finding alternative methods of mosquito control¹. One such method is to physically kill mosquito immatures by suffocating them and prevent ovipositing females from laying eggs on the water surface. Studies during the last decade yielded new group of compounds called monomolecular organic surface films. These surface film forming agents bring about changes in the surface tension of water thereby disrupting the normal development and behaviour of immature stages of mosquitoes². Since they kill mosquito larve and pupae physically, chances of resistant development in mosquitoes are remote^{3,4}. Various forms of monolayer surface films have been proposed as potentially useful in the control of mosquitoes^{2,5-11}.

In the past, attempts were made to combine the positive aspects of surface active films, biocides and insecticides for vector control¹¹⁻¹⁵ (VCRC unpublished data). In the present article an attempt has been made to review the role of monomolecular surface films alone or in combination with other larvicides and biocides in vector control.

Physical and Biocontrol Properties of Monomolecular Surface Films against Mosquitoes

Aliphatic alcohols

Long chain fatty alcohols (C12-C20 chain length) when sprayed over the water surface, form a monomolecular

layer¹⁶. Continuous surface layer of lauryl alcohol interfered with respiration and led to asphyxia and a 100 per cent inhibition in adult emergence in *Culex quinquefasciatus*¹⁷. Monolayer formed by long carbon chain aliphatic alcohols such as 1-decanol, 1-undecanol and 1-dodecanol caused cent per cent mortality in the immatures of *Aedes aegypti* and *Ae. scutellaris* at the dosages of 5-7 l/hectare¹⁸. Monolayers of certain synthetic surfactants have been reported to kill anopheline larvae within 24 h^{2,3,19}.

Initially, long chain aliphatic alcohols act as an irritant and finally cause death of the larvae by breaking down lipid composition of the cellular structures. The critical properties that determine the body penetrating capabilities of these alcohols are lipophilicity, molecular geometry and dehydrating properties²⁰.

Lower carbon chain alcohols (benzyl alcohol and 2-octanol) were found to be ineffective due to volatility. They tend to evaporate before they have a chance to cause damage to the tissues of the mosquitoes. On the other hand, very long carbon chain alcohols (1-tetra decanol, 1-hexa decanol and 1-octa decanol) were effective only at very high dosages and were therefore not suitable. These are most solid, wax-like substances at room temperature requiring solvent (hexane) before application. However, blending of 1-didecanol and 1-tetra decanol was found to be effective against all stages of mosquitoes^{17,21}.

Table I. Effect of monomolecular surface films on mosquito immatures.

Species	Habitat	Dosage (l/ha)	Source
POE(4)LE, POE(2)LE & SMO 75/2EB			
<i>An. quadrimaculatus</i>	Laboratory and simulated field conditions	0.41 ^a	White & Garrett (1977) ² White <i>et al</i> (1978) ¹⁹
Arosurf [®] MSF			
<i>Cx. quinquefasciatus</i> <i>Cx. nigripalpus</i>	Ponds of sewage treatment system	3.3 ^a	Levy <i>et al</i> (1980) ⁴
<i>Ae. taeniorhynchus</i>	Salt marsh	3.0-4.5 ^a	Levy <i>et al</i> (1981) ⁷
<i>Pso. columbia</i> ^A <i>Pso. ciliata</i> ^B <i>Cx. quinquefasciatus</i> <i>Cx. nigripalpus</i>	Ponds of sewage treatment system and rain water pools	2.0-4.5 ^a	Levy <i>et al</i> (1982) ⁹
<i>An. quadrimaculatus</i> <i>An. crucians</i>	Standing paludal ponds	3.0-4.0 ^a	Levy <i>et al</i> (1982) ¹⁰
<i>Cx. tarsalis</i> <i>Cx. pens</i>	Clear non vegetated ponds and dairy waste water lagoons	6.9-9.43 ^b	Mulla <i>et al</i> (1983) ¹
<i>Ae. nigromaculis</i> <i>Ae. melanimon</i> <i>Cx. tarsalis</i> <i>Cx. quinquefasciatus</i>	Experimental plots	2.5-10.0 ^a	Takahashi <i>et al</i> (1984) ⁴
<i>Cx. quinquefasciatus</i> <i>Ae. aegypti</i> <i>An. stephensi</i>	Stagnant water bodies	11.2 ^c	Das <i>et al</i> (1986) ²⁵
<i>Co. perturbans</i> ^C	Cattail marsh	4.67 ^d	Kenny & Ruber (1992) ²⁶

Effective duration*: (a) three days; (b) 14 days; (c) two to 12 weeks; (d) seven days.

* - > 90% mortality of larvae, pupae and emerging adults.

A-*Psorophora columbia*; B-*Psorophora ciliata*; C-*Coquillattidia perturbans*.

Superscripts numbers are the sl. nos. in the reference list.

Arosurf[®] MSF

The usefulness of Arosurf[®]MSF (ISA-20E, Arosurf[®] 66-E2) [polyoxyethylene (2) isostearys ether (2 mole ethoxylate of isostearyl alcohol)], a non-ionic monomolecular organic surface film as mosquito control agent was first proposed by Garrett and White³. Since then, this compound had been successfully tested against various species of mosquitoes belonging to genera *Culex*, *Anopheles*, *Aedes*, *Psorophora* and *Uranotaenia* both in the laboratory and field^{1,2,4-7,9-11,19,22-26} (Table 1). The persistence of this compound is reported to range between 2 and 10 days at normal

application rate of 4.67 l/hectare and application at fortnightly intervals prevented emergence of adult mosquitoes²⁷. When tested under simulated field conditions and in the field, Arosurf[®]MSF was found to be effective for 2-12 weeks at the application rate of 11.2 l/hectare²⁵. Physical evaluation of persistence of Arosurf[®]MSF have indicated that it is feasible to use Arosurf[®]MSF or Arosurf[®]MSF-alcohol formulations to control mosquito larvae and pupae at low ambient temperatures¹².

Arosurf[®]MSF can disrupt the normal orientation of immature mosquitoes at the air-water interface by reducing

the water tension to less than 29 dynes/cm. This physical process can kill larvae and pupae by increasing the wetting of tracheal structures and subsequently causing anoxia (suffocation)^{5,7,28}. Also it can adversely affect the emergence of adult mosquitoes^{3,7,22}. It can also be used to entrap and drown ovipositing females and resting males as well as sink and inhibit the eclosion of floating eggs and egg rafts^{3,9}.

Fourth instar larvae and pupae were significantly more sensitive than earlier instars to the monomolecular surface films^{1,5,7,9,22,25,29}. Work on the comparative sensitivity of second and fourth instar larvae of *Anopheles stephensi* to low dissolved oxygen levels suggested that size differences (surface to volume ratio) are relatively important in determining the survival time of submerged larvae³⁰. Cuticular respiration and air storage within the tracheal system enable larvae to survive to the effect of the film. The factor responsible for comparatively high sensitivity of pupae to ISA-20E was the inability of the pupae to carry on cuticular respiration^{5,31}. Fourth instar larvae of *An. stephensi* were more susceptible to monofilms than the fourth instars of *Cx. quinquefasciatus* and *Ae. aegypti*²⁵. There were high daily mortality of the fourth instar larvae of *An. arabiensis* with no adult emergence from Arosurf[®]MSF treated plots in rice fields compared to lower mortality and continued adult emergence from untreated plots, indicating the potential of the monolayer for controlling adult emergence of anophelines²⁹. Fourth instar larvae of *Culex spp.* were able to obtain oxygen from the water for extended periods without contact with the water surface. On the other hand, *Anopheles* larvae were more sensitive to reduced surface tension of the water. This might be due to the structural differences between *Culex* and *Anopheles*. In *Anopheles* larvae, the dorsal palmate and filamentous setae are larger, more numerous, situated in different locations and differentially arranged¹⁰. The high mortality of fourth instars rather than the earlier instars is advantageous in preventing over compensation in such a habitat where natural mortality may be density dependent as reported by Service³².

Besides physical action, Arosurf[®]MSF was found to cause morphogenetic abnormalities in the treated larvae and pupae. The effect was well marked in fourth instar larvae and pupae. Dead pupae from larvae treated with Arosurf[®]MSF as well as the late instar larvae treated in earlier stages were often found to be deformed and dechitinized. The morphogenetically abnormal pupae were generally found stretched out exhibiting anomalous postures. Emerging adults from surviving pupae were mostly trapped in different phases on the water surface and finally

drowned. The most common abnormality noticed was that of a partly enclosed adult with its legs, wings and the distal half of the abdomen trapped in the pupal skin^{25,31,33}. Arosurf[®]MSF was also found to affect the ovipositional behaviour of the female mosquitoes. It was reported that all females which attempted to deposit eggs on the water surface treated with Arosurf[®]MSF were invariably trapped before they were able to lay the eggs. These females could not remain buoyant any longer and were eventually drowned. This phenomenon continued uninterruptedly for 14 days²⁵.

Monox C1-FCM

Monox C1-FCM (15% w/v suspension of insoluble surfactant in water) is a monomolecular layer forming agent. Successful control of larvae and pupae of *Cx. quinquefasciatus* was obtained with this compound when applied at the application rate of 1.89 l/m² of 1 per cent solution. The efficacy of this compound was more pronounced in septic tanks than cesspits due to the transient nature of the pits³⁴.

Xanthan gum

Xanthan gum, a product of plant origin is a potential mosquito control agent. It was tested against *Aedes atropalpus* pupae. The EI₅₀ and LT₅₀ were 6.18 g/m² and 14.2 min. respectively. When Xanthan gum was applied at the rate of 22.47 g/m², water depth had no effect on the rate of pupal mortality. The surface layer created by Xanthan gum prevented pupae to access the air-water interface. It did not significantly decrease the levels of dissolved oxygen in the test pans³⁵.

Arosurf[®]MSF and larvicide/biocide mixtures

Levy *et al*¹¹⁻¹³ and Burgess *et al*¹⁴ have indicated that formulations of Arosurf[®]MSF and commercial preparations of *Bacillus thuringiensis* var *israelensis* or Abate[®] 4-E (Temephos) could significantly improve the mosquito controlling efficacy when compared to the formulation components mainly because of delayed larvicidal and rapid pupicidal actions of the monomolecular surface film and its persistence at recommended application rates for 2-10 days post-treatment. Arosurf[®]MSF could be used along with *Gambusia affinis* as a joint chemical-biological control system and it was compatible with *B. thuringiensis* var *israelensis* and *B. sphaericus*^{13,24}. High mortality in all the stages of *An. albimanus* and *An. stephensi* resulted when

Arosurf[®]MSF and Teknar were blended¹⁵. The studies of Levy *et al*^{5,12} have indicated that the incorporation of alcohol solvents with Arosurf[®]MSF resulted in significant increase in larvicidal activity in 24 hours when compared to Arosurf[®]MSF alone. Successful control of *Culex nigripalpus*, *Psorophora columbia* Dyar and Knab and *Aedes taeniorhynchus* Wiedemann breeding in roadside ditches and flooded fields was resulted when Arosurf[®]MSF and Abate 4-E mixture was applied at the rate of 5-6 gal/acre indicated that the Arosurf[®]MSF induced surface spreading of Abate 4-E throughout the habitat prior to solubilization¹².

Table II. Efficacy of water-base mixture of Arosurf MSF and IGRs against *Culex quinquefasciatus* in different breeding habitats.

Water base mixture	Application rate		Effective duration	
	Arosurf (l/ha)	IGR [Kg(ai)/ha]	(days) Mixture IGR	
Cesspits				
Arosurf+ OMS 3009	5.6	0.2	9	6
Arosurf+ OMS 3013	5.6	0.2	9	3
Arosurf+ OMS 2015	5.6	0.2	8	2
Arosurf+ S 21149	5.6	0.2	5	2
Arosurf+ Diflubenzuron	5.6	0.2	3	4
Arosurf+ Methoprene	5.6	0.2	23	6
Cement tanks				
Arosurf+ OMS 3009	5.6	0.2	17	7
Arosurf+ OMS 3013	5.6	0.2	43	45
Arosurf+ OMS 2015	5.6	0.2	9	11
Arosurf+ S 21149	5.6	0.2	13	14
Arosurf+ Diflubenzuron	5.6	0.2	18	20
Arosurf+ Methoprene	5.6	0.2	17	7

VCRC unpublished data

IGRs — insect growth regulators

Results of the field trials of mixture of Arosurf[®]MSF and insect growth regulators (IGRs) against immatures of *Cx. quinquefasciatus* indicated that Arosurf[®]MSF-methoprene mixture gave 80-100 per cent reduction in adult emergence for 23 and 17 days in cesspits and cement tanks respectively; whereas methoprene alone was effective for only one week in both cesspits and cement tanks. Similarly, significant increase in the efficacy of OMS 3009, OMS 3013, OMS 2015 and S 21149 was obtained in cesspits when combined with Arosurf[®]MSF. With respect to OMS 3013, OMS 2015, S-21149 and diflubenzuron, Arosurf[®]MSF has not shown any significant impact in cement tanks (Table II) (VCRC unpublished data).

Resistant Development in Target Organisms to Monomolecular Layers

Continuous challenges tests against laboratory reared *Cx. quinquefasciatus* Say with ISA-20E for 15 generations did not result in decrease in susceptibility to this surface film. It should also be noted that more than two years of continuous selection pressure did not induce resistance in *Cx. quinquefasciatus* to three types of petroleum hydrocarbons³⁶. Since ISA-20E resists oxidative rancidity, storage or shelflife at typical ambient temperature (21-49°C) encountered in many tropical and subtropical areas will not pose any problem³⁶.

Effect on Non-Target Organisms and Environment

Arosurf[®]MSF applied on an operational basis at recommended application rate was not found to be detrimental to a majority of the non-target organisms^{1-5,7,10,23,24,26,29} (Table III). Field and laboratory tests indicated that predation and asexual reproduction of the mosquito planarian *Dugesia dorotocephala* and the infectivity and development of the mosquito nematode *Romnomermis culicivorax* Ross and Smith were not affected by ISA-20E at surface dosage of 3-4.5 l/hectare. This compound was also compatible with *G. affinis*. Adult dragon flies were observed to oviposit in water treated with ISA-20E⁷. Takahashi *et al*⁴ found no adverse effect of ISA-20E on may fly naiads (*Callibaetis* spp.), chironomid larvae and copepods at dosage of 2.5-10 l/hectare. However, they reported mortality in corixids (*Corisella* spp.), notonectids (*Notonecta unifasciata*), clam shrimp (*Eulimnadia* spp.), and beetle adults (*Tropisternus lateralis*). Frogs and fishes survived⁴ when ISA-20E was applied at 0.68 ml/m². Arosurf[®]MSF when applied at the maximum recommended dosage of 4.67 l/hectare²⁷ did not

affect the population of zooplanktons²⁶. However, these studies did not consider all aquatic insects/organisms. Since these compounds kill by physical chocking, they might have killed many other organisms of the food chain; especially those which rely on air-water interface for respiration.

Table III. List of non-target organisms on which the monomolecular surface film ISA-20E showed no detrimental effect at the recommended application rates.

Species	Application rate(l/ha)	Source
Frogs, gerrids, nymphs of Odonata, Ephemeroptera, aquatic species of Coleoptera	0.41	White & Garrett (1977) ²
Copepods, ostracods, may fly naiads (<i>Callibaetis pacificus</i>), diving beetle adult (<i>Berosus metallliceus</i>)	6.9-9.43	Mulla <i>et al</i> (1983) ¹
Green tree frog (<i>Hyla cinerea</i>), fresh water fishes (<i>Gambusia affinis</i> , <i>Hypostomus plecostomus</i>), saline water fishes (<i>Fundulus confluentus</i> , <i>F. grandis</i> , <i>Cyprinodon variegatus</i> , <i>Poecilia latipinna</i> , <i>Dormitator maculatus</i>)	6.4	Webber & Cochran (1984) ²⁴
May fly naiads (<i>Callibaetis</i> spp.), chironomid larve, copepods	2.5-10	Takahashi <i>et al</i> (1984) ⁴
Zooplanktons	4.7	Kenny & Ruber (1992) ²⁶

Superscript numbers refer to the sl.no. in the reference list

It had been reported that ISA-20E was not phytotoxic and did not affect wildlife. The mammalian toxicity appeared to be low (acute oral LD₅₀ for rats was 20,000 mg/kg) and the agent was nonirritating to eyes and skin^{5,7,10}. However, recent studies indicated that a number of alkyl phenolic compounds that are derivatives of non-ionic surfactants exhibited estrogenic activity³⁷. These exogenous estrogens are known to affect development and sexual maturation of vertebrates and are implicated as cancer promoters³⁸⁻⁴¹.

Conclusion

Monomolecular surface films are promising control agents against mosquito immatures. When applied along

with insecticides and insect pathogens, they increase their persistence on the water surface thereby reduce their faster solubilization and degradation. There is a remote chance of resistant development in target species owing to their physical action. However, since non-ionic surfactants with bioactivity similar to endogenous estrogen, are known to affect development and sexual maturation of vertebrates and are implicated as cancer promoters, these non-ionic monofilms should be evaluated for estrogenity before their large-scale⁴² use in the control of vector mosquitoes.

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ABSTRACTS

Some Research Projects Completed Recently

Oncogenic viruses associated with human premalignant and malignant conditions of uterine cervix.

The study was carried out to screen cervical smears for human papillomavirus (HPV) using *in situ* hybridization and detection of viral genes in premalignant and malignant cervical tissues by dot-blot and Southern blot techniques.

Tissue samples from uterine cervical cancers (135) and normal cervix (50) studied immunohistochemically by peroxidase-antiperoxidase staining revealed HPV structural antigens in 73 (54.07%) of the cervical cancer samples and 4 (8%) normal cervix samples. The antigen distribution was focal and uniform or in diffuse patches.

Both dot-blot and Southern blot hybridization analyses were employed for detection of HPV-16 and HPV-18 DNA sequences in the DNA samples extracted from normal uterine cervix tissue, cervical cancer tissue and cervical dysplasia samples. In dot-blot hybridization, 44 of 80 (55.5%) cervical cancer samples, 6 of 21 (28.6%) cervical dysplasia samples and 3 of 30 (10.0%) normal samples were positive for HPV-16 DNA. But only 3 of 50 (6%) cervix cancer samples and none of the dysplasia and normal samples showed the presence of HPV-18 DNA.

By Southern blot hybridization, HPV-16 DNA was detected in 47 of 80 (58.7%) DNA samples from cervical cancer, 7 of 20 (35.0%) dysplasia samples and 3 of 30 (10.0%) normal samples. HPV-18 DNA was detected in 3 of 65 (4.6%) cervical cancer samples. Characteristic Bam HI (8 kb) and Pst I (2.8 kb, 1.9 kb, 1.6 kb, 1.0 kb and 0.5 kb) bands were observed in the autoradiographs of HPV-16 DNA positive samples. The results suggest that there is an association between HPV-16 and cervical cancer in women from Kerala.

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Expression of c-erbB-2 oncoprotein as a prognostic indicator in breast carcinoma.

The study was carried out on tissues from 50 patients with histologically identified carcinomas of the breast to evaluate newer prognostic factors viz. AgNOR (Silver binding nuclear organising regions), amplification and expression of proto-oncogene c-erbB-2, and vimentin expression along with estrogen and progesterone receptors (ER and PR).

A total of 27 (54%) neoplasms showed positivity for c-erbB-2 oncoprotein with variable degrees of staining; staining

for vimentin were noted in 21 (42%) of the neoplasms. Twenty (40%) and 11 (22%) of the neoplasms were positive for ER and PR respectively, while 5 (10%) were positive for both. The mean AgNOR count for malignant neoplasms was 10.46 with a range from 5.1 to 15.10. AgNORs in these lesions frequently exhibited large clusters, small dots and small clusters arranged around the nuclear membrane and often dispersed throughout the nucleus.

Poorly differentiated tumours (grade III) had evidence of intense membranous staining (70%) than well differentiated (grade I - 54.5%) or moderately differentiated tumours (grade II - 44.4%). When subjected to AgNOR counting, these showed a range between 10.23 (grade I), through 11.70 (grade II) to 12.45 (grade III) mean dots/nucleus. Statistically the histological grade and c-erbB-2 oncoprotein over expression were significantly correlated but not the histological grade and AgNOR count.

Of the 27 c-erbB-2 positive neoplasms, 21 were negative for ER, 18 for PR, and 17 for both ER and PR of which 7 were grade III tumours. c-erbB-2 oncoprotein over expression was found to be significantly correlated to ER and PR negativity. Staining for vimentin showed positivity in 21 of 50 (42%) invasive ductal carcinomas. A total of 16 tumours showed positivity for both vimentin and c-erbB-2 of which 7 tumours were negative for ER and PR (4 were of grade III). Vimentin was expressed in 90 per cent of grade III tumours compared to 33.3 per cent of grade I tumours. The tumours showing ER and PR positivity did not express vimentin. Nine tumours were negative for ER and PR but showed vimentin expression in cytoplasm. The expression of vimentin in ER and PR negative tumours was statistically significant.

It is thus concluded that c-erbB-2 marker can be used to predict disease progression in ER and PR negative tumours. Vimentin and c-erbB-2 oncoprotein help in detection of tumours which do not respond to routine management. However, AgNOR counts, c-erbB-2 oncoprotein and histologic grade did not show much correlation. Thus AgNOR alone cannot be taken as a marker of tumour proliferation.

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85TH ANNIVERSARY CELEBRATIONS OF THE COUNCIL

The National Institute of Cholera and Enteric Diseases (NICED), Calcutta, organized a one day symposium on Cancer on June 21, 1996. The symposium was attended by the staff of the NICED, Infectious Disease Hospital and Dr. B.C. Roy Memorial Hospital for Children of Calcutta.

The NICED, Calcutta, organised a one day symposium on diarrhoeal diseases on July 23, 1996. The symposium was inaugurated by Dr. Samar Roy, Director, Health Services, Government of West Bengal. Apart from several distinguished scientists and medical experts, medical officers of the Dr. B.C. Roy Memorial Hospital for Children, Dr. B.C. Roy Hospital for Crippled Children and Infectious Diseases Hospital of Calcutta; Scientists from Institute of Chemical Biology, Jadavpur; Bose Institute, Calcutta and

staff members of the NICED participated in the symposium. Dr. S.K. Bhattacharya, Director of the NICED outlined the main achievements of the Institute since its inception in 1962.

The Regional Medical Research Centre, Bhubaneswar, organised a lecture-cum-discussion programme on Health and Nutritional Status of Mothers and Children on August 23, 1996 at the Regional Science Centre, Bhubaneswar which was attended by youth coordinators of Nehru Yuva Kendra Sangathan (East zone). The Regional Medical Research Centre, Jabalpur, organised an awareness programme on Environmental and Occupational Health on August 8, 1996. Staff members from various science college of Madhya Pradesh attending reorientation programme at the R.D. University, Jabalpur, participated in the programme.

ICMR NEWS

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

Meetings of the Scientific Advisory Committees of the ICMR Institutes/Centres:

Rajendra Memorial Research Institute of Medical Sciences, Patna	August 21, 1996
Institute for Research in Reproduction, Mumbai	August 28, 1996
ICMR Genetic Research Centre, Mumbai	August 29, 1996
Enterovirus Research Centre, Mumbai	August 29, 1996
Institute of Pathology, New Delhi.	August 31, 1996
Vector Control Research Centre, Pondicherry	September 3, 1996
Centre for Research in Medical Entomology, Madurai	September 4, 1996
National AIDS Research Institute Pune	September 13, 1996

Meetings of the Scientific Advisory Committees of the Regional Medical Research Centres:

Regional Medical Research Centre, Dibrugarh	August 26, 1996
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Regional Medical Research Centre for Tribals, Jabalpur	August 30, 1996
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Meetings of the Expert Groups (EGs)/Project Review Committees (PRCs) and other meetings held at New Delhi:

EG for Preparation of Protocol for Underaking Clinical Trials with an Ayurvedic Medicine for Cure of Poliomyelitis	August 14, 1996
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EG to Discuss Various Dimensions of HIV/AIDS Vaccine in India	August 22, 1996
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EG on Scientometrics Studies	August 27, 1996
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National Council for Research in Human Reproduction Sub-committee on Reproductive Health Research Need Assessment	August 30, 1996
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PRC for Operational Research Projects on Tuberculosis	August 31, 1996
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Meeting of the Central Ethical Committee of ICMR on Human Research	September 10, 1996
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Participation of ICMR Scientists in Scientific Events:

Dr. G.B. Nair, Asstt. Director, National Institute of Cholera and Enteric Diseases, Calcutta, participated in the Executive Board Meeting of the International Union of Microbiological Societies as also in the International Congress of Bacteriology and Applied Microbiology at Jerusalem (August 16-17 and 18-23, 1996 respectively).

Dr. M. Mohan Ram, Director, National Institute of Nutrition, Hyderabad, participated in the workshop on Institution Building for Research and Advanced Training in Food and Nutrition in Developing Countries at Manila (August 18-23, 1996).

Dr. V.P. Sharma, Director, Malaria Research Centre, Delhi and Dr. B.K. Tyagi Asstt. Director, Desert Medicine Research Centre, Jodhpur, participated in the XX International Congress of Entomology at Florence (August 25-31, 1996).

Dr. Dipika Mohanty, Director and Dr. Anita Nadkarni, Research Assistant, Institute of Immunohaematology, Mumbai, participated in the XXVI Congress of the International Society of Haematology at Singapore (August 25-29, 1996).

Dr. M.D. Gupte, Officer-in-Charge, CJIL Field Unit, Avadi, Madras, Dr. Anil Kumar, Asstt. Director, Regional Medical Research Centre, Bhubaneswar and Dr. K.K. Singh and Dr. DK. Shukla, Asstt. Directors-General, ICMR Headquarters, participated in the XIV International Scientific Meeting of the International Epidemiological Association at Nagoya (August 27-30, 1996).

Dr. C.N. Paramasivan, Dy. Director (Senior Grade), Tuberculosis Research Centre (TRC), Madras, participated in the XV International Working Group on Mycobacterial Taxonomy (IWGMT) Conference on the Genus Mycobacterium at New Castle, England (August 28-31, 1996).

Dr. Geeta Vanage, Sr. Research Officer, Institute for Research in Reproduction, Mumbai, participated in the VII

International Conference on Assisted Reproductive Technology/Andrology 1996 at Zermatt, Switzerland (August 29-31, 1996).

Dr. J.M. Deshpande, Director, Enterovirus Research Centre, Mumbai, participated in the II meeting on Performance of Regional Vaccine Control Laboratories Network at Jakarta (September 2-6, 1996).

Dr. Aruna Dewan, Dy. Director, National Institute of Occupational Health, Ahmedabad, participated in the IX meeting of the Poison Centre Working Group for the IPCS INTOX Project at Cardiff, London (September 2-6, 1996).

Dr. V. Kumaraswami, Dy. Director, TRC, Madras, participated in the VI meeting of the Task Force on Operational Research in Filariasis of the WHO Special Programme for Research at Geneva (September 9-12, 1996).

Dr. S.C. Selgal, Director, Regional Medical Research Centre, Port Blair, participated in the meeting of the International Leptospirosis Society at Nantes, France (September 9-12, 1996).

Dr. A. Roychaudhary, Dy. Director, Regional Occupational Health Centre (Eastern), Calcutta, participated in the XXV International Conference of Occupational Health at Stockholm (September 15-20, 1996).

Appointments:

Dr. P.R. Narayanan took over as Director of the Council's Tuberculosis Research Centre, Madras w.e.f. August 19, 1996.

Hindi Day Celebrations:

As part of the Hindi Day Celebrations by the ICMR Headquarters, a popular lecture (in Hindi) on "Significance of Post Kala-azar Dermal Leishmaniasis in Kala-azar" was delivered on September 12, 1996 by Dr.R.S. Misra, Professor and Head, Department of Dermatology, Leprology and Sexually Transmitted Diseases, Safdarjung Hospital, New Delhi.

INDIAN COUNCIL OF MEDICAL RESEARCH

AWARDS AND PRIZES 1995

The Indian Council of Medical Research invites nominations/applications from Indian Scientists for its various prizes and awards in the field of Biomedical Sciences. Application forms and other relevant information about the prizes can be obtained from the Director-General, Indian Council of Medical Research (INDO-FOREIGN CELL), Ansari Nagar, New Delhi-110029.

Nominations and completed applications should reach this office on or before 30th November, 1996.

1. Basanti Devi Amir Chand Prize (Value = Rs. 5,000):

This prize will be awarded annually to a senior research worker of more than ten years standing for work of outstanding merit in any subject in the field of biomedical science, including clinical research. The term "Clinical Research" implies research into the mechanism and causation of disease, including its prevention and cure. The criteria for award of the prize are the significance and value of addition to existing knowledge contributed by a worker in a particular field in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

The selection for this prize is made one year in advance.

*2. Dr.P.N.Raju Oration Award (Value = Rs.5,000):

This prize will be awarded in alternate years, to an eminent scientist, preferably a medical person, for his/her work in any subject of national importance in the field of Medicine or Public Health. The subject will be notified at the time of advertisement.

*3. Sandoz Oration Award for Research in Cancer (Value = Rs.2,500):

This prize (and a medal) will be awarded in alternate years, to an eminent scientist for outstanding work carried out on a particular aspect of Cancer. The eminence is to be judged on the basis of his/her contributions to cancer research which should have been recognised nationally and internationally and helped towards control, prevention and cure of cancer.

4. Dr.Y.S.Narayana Rao Oration Award in Microbiology (Value = Rs.4,000):

This prize will be given in alternate years, to an eminent scientist for outstanding work carried out in the field of Microbiology. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker in Microbiology in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

5. Chaturvedi Kalawati Jagmohan Das Memorial Award (Value = Rs.2,000):

This prize (and a gold medal) will be awarded once in three years, to an eminent scientist, preferably a medical person, for his/her work in the field of Cardiovascular Diseases. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker in Cardiovascular Diseases in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

* This Prize/Award is not being awarded for the year 1995

6. Dr.Kamala Menon Medical Research Award (Value = Rs.5,000):

This prize will be awarded to an eminent scientist, preferably a medical person, for outstanding contribution made in the field of **Internal Medicine** and **Paediatrics** respectively in alternate years. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker on a subject in which he/she has been actively engaged over a number of years and has shown sustained activity in research. The subject for the 1995 award is **Paediatrics**.

7. Kshanika Oration Award to a Woman Scientist for Research in the field of Biomedical Sciences (Value = Rs.5,000):

This prize will be given annually to an eminent woman scientist for outstanding work carried out in any branch of biomedical science, contributing to the alleviation of human suffering. The criterion for award of this prize is the significance and value of addition to existing knowledge contributed by her in any field of biomedical sciences in which she has been actively engaged over a number of years and has shown sustained activity in research.

***8. Dr.M.K.Seshadri Prize in the field of Practice of Community Medicine (Value = Rs.10,000):**

This prize (and a gold medal) will be awarded in alternate years, to an eminent scientist or institution whose original work has led to useful inventions in or otherwise significantly contributed to the practice of **Community Medicine**.

9. M.N.Sen Oration Award for Practice of Medicine (Value = Rs.5,000):

This prize will be given once in three years, to an eminent scientist for outstanding work carried out in the field of **Practice of Medicine** (clinical, laboratory or therapeutic). The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker to the **Practice of Medicine** in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

10. JALMA Trust Fund Oration Award in the field of Leprosy (Value = Rs.5,000):

This prize (and a medal) will be given annually to an eminent scientist for outstanding research in the field of **Leprosy**. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker on any aspect of leprosy in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

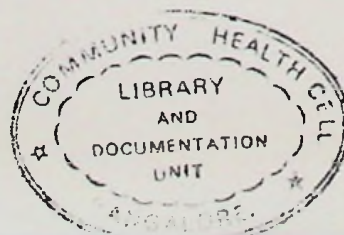
11. Dr.J.B.Srivastav Award in the field of Virology (Value = Rs.10,000):

This prize will be given in alternate years, to an eminent scientist for outstanding work carried out in the field of **Virology**. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker in **Virology** in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

12. ICMR Prize for Biomedical Research for Scientists belonging to Under-privileged Communities (Value = Rs.5,000):

This prize will be given annually to an eminent scientist for his/her outstanding contributions in any field of biomedical sciences. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker in the particular field in which he/she has been actively engaged over a number of years and has shown sustained activity in research. This prize will be awarded to scientists belonging to under-privileged communities.

*** This Prize/Award is not being awarded for the year 1995**



13. ICMR Prize for Biomedical Research conducted in Under-developed Areas (Value = Rs.5,000):

This prize will be awarded annually to an eminent scientist for his/her outstanding contributions in any field of **Biomedical Sciences**. The criterion for award of the prize is the significance and value of biomedical research carried out by a worker based in under-developed parts of the country, or for work carried out in under-developed parts of the country over a period of five years preceding the year for which the award is to be given.

14. BGRC Silver Jubilee Oration Award (Value =Rs.5,000):

This prize will be given in alternate years, to an eminent scientist for outstanding work carried out in the field of **Haematology/Immunohaematology**. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker in this speciality in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

15. Smt.Swaran Kanta Dingley Oration Award (Value = Rs.10,000):

This prize will be given in alternate years, to an eminent scientist for outstanding contribution in the field of **Reproductive Biology**. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker in the field of **Reproductive Biology** in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

16. Dr.M.O.T.Iyengar Memorial Award (Value = Rs.4,000):

This prize will be given annually to an eminent scientist for outstanding contribution in the fields of **Malaria, Filariasis, Plague or Medical Entomology**. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker in any of the fields of **Malaria, Filariasis, Plague or Medical Entomology** in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

17. Prof.B.K.Aikat Oration Award (Value = Rs.3,000):

This prize will be given in alternate years, to an eminent scientist for outstanding work carried out in the field of **Tropical Diseases**. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker in **Tropical Diseases** in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

18. Dr.Vidya Sagar Award (Value = Rs.5,000):

This prize will be awarded in alternate years, to an eminent scientist for outstanding contributions made in the field of **Mental Health**. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker in **Mental Health** in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

19. Amrut Mody-Unichem Prize (Value = Rs.10,000):

This prize will be given to an eminent scientist for outstanding work carried out in the field of **Cardiology & Neurology, and Gastroenterology** (in alternate years). The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker on a subject in which he/she has been actively engaged over a number of years and has shown sustained activity in research. The subject for the 1995 award is **Gastroenterology**.

20. Amrut Mody-Unichem Prize (Value = Rs.10,000):

This prize will be given to an eminent scientist for outstanding work carried out in the field of **Maternal & Child Health, and Chest Diseases** in alternate years. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker on the subject in which he/she has been actively engaged over a number of years and has shown sustained activity in research. The subject for the 1995 award is **Maternal and Child Health**.

21. Chaturvedi Ghanshyam Das Jaigopal Memorial Award (Value = Rs.3,000):

This prize will be given in alternate years, to an eminent scientist for outstanding work carried out in the field of **Immunology**. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker on the subject in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

22. Lala Ram Chand Kandhari Award (Value = Rs.5,000):

This award will be given in alternate years, to an eminent scientist for outstanding research in the fields of **Dermatology and Sexually Transmitted Diseases**. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker on the subject in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

23. Dr.Prem Nath Wahi Award for Cytology and Preventive Oncology (Value = Rs.20,000):

This award will be given in alternate years, to an eminent scientist for outstanding contribution in the field of **Basic and/or Clinical Cytology, and/or Preventive Oncology**. The criterion for award is the significance and value of addition to existing knowledge contributed by a worker on the subject in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

24. Dr.D.N.Prasad Memorial Oration Award (Value = Rs.20,000):

This award (and a medal) will be given in alternate years, to an Indian scientist for significant contribution to research in the field of **Pharmacology**, carried out in India, as evidenced by research papers and innovations. The criteria for award will be the significance and value of addition to existing knowledge in research in **Pharmacology**.

25. Prof.Surindar Mohan Marwah Award (Value = Rs.25,000):

This award will be given once in 3 years to an Indian scientist for significant contribution in the field of **Geriatrics**, through sustained research in India on the problems of the aged as evidenced by research papers in science publications. The subject matter could be biomedical or psychosocial research on problems of the aged, both basic and applied.

**Prize/Award for Scientists above 45 years of age on January 1st of the year
for which the award is to be given**

26. Smt.Pushpa Sriramachari Award (Value = Rs.5,000):

This prize (and a silver medal) will be given in alternate years, to individuals for outstanding contribution to research on **"Pathology and Pathophysiology - Clinical or Experimental"**. The individual should be an established scientist above the age of 45 years and should have made a comprehensive and significant original contribution in unravelling the understanding and the nature, evolution or prevention of any human disease entity.

Prizes/Awards for Young Scientists below 40 years of age on January 1st of the year for which these awards are being given

27. Shakuntala Amir Chand Prizes (Four in Number of Value = Rs.1,500 each) :

These four prizes will be awarded annually to the **best published research work** in any subject in the field of **Biomedical Science** including clinical research. The term 'Clinical Research' covers research into the mechanism and causation of disease and its prevention and cure, and includes work on patients in hospitals, field studies in epidemiology and social medicine, and observations in general practice.

Both medical as well as non-medical graduates are eligible for award of the prize. The prizes are awarded to Indian nationals for work done in any institution in India. **Work started in India but completed abroad will not be acceptable.**

Papers published in Indian or Foreign Journals in the previous two years will be considered for award of these prizes in the current year.

***28. Raja Ravi Sher Singh of Kalsia Memorial Cancer Research Award (Value = Rs.2,000):**

This prize will be awarded in alternate years, to a scientist for outstanding work done in the **Experimental or clinical aspects of cancer or in the organisation and conduct of any service or service-cum-research programme in cancer prevention and treatment.** For the prize to be awarded in the current year the work carried out in the previous year will be considered.

29. Dr.V.N.Patwardhan Prize in Nutritional Sciences (Value = Rs.7,000):

This prize will be given in alternate years, to an eminent scientist, for outstanding work carried out in India on **Fundamental, Clinical or Field Studies in Nutritional Sciences.** The criterion for award of prize is the contribution of a worker to nutritional sciences in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

30. Tilak Venkoba Rao Award (Value = Rs.1,000):

This prize will be given to an eminent scientist for research in the field of **Psychological Medicine and Reproductive Physiology** respectively in alternate years. The criterion for the award is the significance of contribution to existing knowledge by a worker who has been actively engaged in research on the subject over a number of years. The subject for the 1995 award is **Reproductive Physiology.**

31. Dr.T.Ramachandra Rao Award (Value = Rs.3,000):

This prize will be given in alternate years, to a scientist below the age of 40 years for his/her outstanding contribution made in the field of **Medical Entomology.** The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker in this speciality in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

*** This Prize/Award is not being awarded for the year 1995**

32. Dr.C.G.S.Iyer Oration Award (Value = Rs.1,500):

This prize will be given in alternate years, to a scientist below the age of 40 years for his/her outstanding contribution made in the field of Leprosy. The criterion for award of the prize is the significance and value of addition to existing knowledge contributed by a worker in this speciality in which he/she has been actively engaged over a number of years and has shown sustained activity in research.

***33. Dr.Dharamvir Datta Memorial Oration Award (Value = Rs.3,000):**

This award will be given in alternate years, to a scientist (Medical or non-medical) below 40 years of age for work carried out in the last 5 years in India in the field of Liver Diseases. The criteria include significance and value of addition to existing knowledge contributed by a worker in this speciality, with special reference to application of findings to clinical hepatology.

***34. Prof.B.C.Srivastava Foundation Award (Value = Rs.5,000):**

This award will be given in alternate years, to a scientist below the age of 40 years for work in the field of Community Medicine in medical colleges/recognised institutions. The criterion for the award is the significance of research contributions to the practice of community medicine by a worker.

35. Smt. Kamal Satbir Award (Value = Rs.5,000):

This award will be given annually to individuals for outstanding contribution to research on Non-tuberculous Chest Diseases, especially Respiratory Allergy and Chronic Obstructive Lung Diseases, pertaining to mechanism and causation of the diseases, their prevention and/or management.

The work to be assessed would be the research carried out in India and published in scientific journals during the three years preceding the year for which the award is to be given.

36. Major General Saheb Singh Sokhey Award (Value = Rs.10,000):

This award will be given annually to a scientist below the age of 40 years for his/her outstanding contribution in the field of Communicable Diseases depending upon its significance and value in terms of addition to existing knowledge contributed by the worker in that field. The facets of work to be considered could be basic or applied research which add to the knowledge on the mechanism and causation of communicable diseases, their prevention and/or their management. The work to be assessed would be the research carried out in India and published in scientific journals, during the 3 years preceding the year for which the award is to be given.

37. Dr.H.B.Dingley Memorial Award (Value = Rs.5,000):

This award will be given annually to individuals for outstanding contribution to research in the field of 'Paediatrics' by Indian scientists below the age of 40 years. The work to be assessed would be research work carried out in India and published in scientific journals during the 3 years preceding the year for which the award is to be given.

* This Prize/Award is not being awarded for the year 1995

**Dr. B.R.Ambedkar Centenary Award for Excellence in
Biomedical Research (Value Rs. 1.00 lakh)**

Dr. B.R.Ambedkar Centenary Award for excellence in biomedical research was instituted in the year 1991-92 as part of the Dr. Ambedkar Birth Centenary celebrations. The award, of value Rupees one lakh, is to be awarded in alternate years, for excellence in any field of biomedical research, as evidenced by scientific publications in internationally recognised journals, and contribution to advancement of knowledge and/or improvements in medical practices, health programmes *etc.* This Award is open to all age groups.

Direct applications are not accepted for this Award. Only nominations by certain categories of people will be considered. Details are available in a separate brochure, which are available on request.

HOW TO APPLY

Applications/nominations should provide the names and other particulars of the candidates for award of the prizes to the Council in the prescribed proforma.

Five copies (Ten copies in the case of the Basanti Devi Amir Chand Prize) of each of the following documents will have to be sent with the application:-

1. The proforma for application/nomination with the details duly completed.
2. A note giving full details of the outstanding research contribution of the nominee or applicant which makes him/her worthy of the award.
3. A short biographical sketch of the candidate.
4. A list of papers published by the candidate giving details of those published in Indian and Foreign Journals separately, and also indicating whether the journals are indexed or not.
5. Five reprints each of five recent significant papers published on the subject of the award by the applicant/nominee (for the Basanti Devi Amir Chand Prize, ten reprints of each paper are required).

The applications for Shakuntala Amir Chand Prize should be sent along with ten copies each of the following documents.

1. The proforma for application/nomination with the details duly completed.
2. Reprints of the papers submitted for the prize.
3. A note giving details of research work done by the candidate.
4. A list of papers published giving details of those published in Indian and Foreign Journals separately, and also indicating whether the journals are indexed or not.
5. A short biographical sketch of the candidate.

Nomination for Dr.B.R.Ambedkar Centenary Award for Excellence in Bio-Medical Research should be in the separate format prescribed. Direct applications will not be entertained for this Award.

TERMS & CONDITIONS OF ICMR AWARDS/PRIZES

1. Only work published in Scientific (scholarly) Journals will be considered for ICMR Awards.
2. Normally work done during the preceding five years on the subject will be considered (except where otherwise indicated, under "Detailed information on the ICMR prizes/awards").
3. If a scientist has received an ICMR award for a particular subject, the same material will not be considered for another ICMR award or the same award in a subsequent year, unless there is evidence that additional work have been done. As such, those applicants/nominees who have received an ICMR award previously, should clearly indicate the additional work done by them and substantiate the same with reprints of subsequent publications.
4. Only applications/nominations which are complete in all respects will be considered. Five sets of documents (10 in case of Basanti Devi and Shakuntala Amir Chand Prizes) should be submitted, each set containing one copy of the documents indicated in the Section "How to Apply". If sets received are not complete, the application/nomination will not be considered.
5. Applicants/nominees need not provide "No Objection Certificates" from co-authors (since 1990 onwards). However, in the event of any dispute, the onus will be on the applicant/nominee/recipient of an ICMR Award or Prize, and the ICMR will not be responsible for any such dispute arising out of counter claims.
6. The nominations/applications complete in all respects and with all the required documents should reach the Council not later than 30th November, 1996, for ICMR Awards/Prizes for the year 1995.

JOINT APPLICATIONS

In the case of joint applications/publications, the prizes shall be divided between the applicants/authors in such proportion as the Selection Board may decide. The role of the individual who applies for the prize should be clearly indicated so as to make it easy to determine whether major part of the work has been done by that person. A certificate from the Senior Author that the candidate applying for the award has himself/herself made significant contribution to the research work for which his/her paper is being recommended for the award should also be submitted along with the application.

FORMAT FOR FURNISHING RELEVANT INFORMATION ABOUT THE NOMINEE/APPLICANT

Name of Award Applied for _____

1. Name of the Nominee/Applicant:
2. Date of birth and age as on 1st January of the year for which the award is being applied for
3. Academic qualifications beginning with the Bachelor's degree
4. Present employment and posts held previously
5. Details of outstanding research achievements during the last five years
6. Whether the achievements have been recognised/awarded by any learned Society/Institution
7. Number of scientific papers published, and reprints of those papers to be considered for the present application

8. Subject of research work presented for the award
9. Whether you have received earlier any award for the same work or paper. If so: (i) Name (ii) Year (iii) Value of award and (iv) Exact caption of work for which the prize was awarded
10. Give names and designations of all the joint authors, if any, on the work/paper(s) submitted for the award
11. State whether for the same work/paper(s) any of the joint authors have received any award. If so, give the names of all the authors, the name of the prize awarded, year of award and its value
12. If you are a joint author, state precisely what has been your individual contribution to the work
13. State whether you have applied for any other award for the same or any other work. If so, state the name of the award and the subject of work submitted for the award
14. (i) List of papers, if any, submitted earlier for any other award and
(ii) List of papers published subsequently and now submitted for consideration of the award:
15. Address for correspondence: (Please also give telephone, fax and e-mail numbers)

NOTE: Applicants for the the ICMR Prize for Biomedical Research for Scientists belonging to Underprivileged Communities should provide attested Caste/Community Certificates.

ICMR AIDED SYMPOSIA/SEMINARS/WORKSHOPS/COURSES/CONFERENCES

Symposium/Seminar/Workshop/ Course/Conference	Date & Place	Contact Address
Workshop on Design and Evaluation of Targeted Drug Delivery System.	September, 1996; (at Manipal)	Dr. N. Udupa, Convenor of the Workshop, College of Pharmaceutical Sciences, Manipal-576119.
International Seminar on Free Radicals Mediated Diseases and Ayurveda.	September 2-4, 1996; (at Varanasi)	Dr. Yamini B. Tripathi, Organising Secretary of the Seminar, Department of Medicinal Chemistry, Institute of Medical Sciences, Varanasi-221005.
National Training on Modern Technologies for Information Handling.	September 16-20, 1996; (at New Delhi)	Dr. R.P. Kumar, Coordinator of the Training Programme, B.B. Dixit Library, All India Institute of Medical Sciences, New Delhi-110029.
XX National Congress of Indian Association of Medical Microbiologists.	October 31 - November 3, 1996; (at Agra)	Dr. V.M. Katoh, Organising Secretary of the Congress, Department of Microbiology, Central Jalma Institute for Leprosy, Agra-282001.
Symposium on Arid Ecosystem of Thar Desert of Rajasthan and Evolutionary Ecology and Logic of Life.	November 1-3, 1996; (at Jodhpur)	Dr. A.R. Reddy, Convenor of the Symposium, Defence Laboratory, Jodhpur-342011.
International Workshop on Prospects of Medicinal Plants.	November 4-9, 1996; (at Nauni-Solan)	Dr. P.L. Gautam, Organising Secretary, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni-Solan-173230.
Second Asian and Oceanic Congress of Andrology.	November 16-20, 1996; (at Chandigarh)	Dr. N.R. Kalla, Chairman of Organising Committee of the Congress, Department of Biophysics, Panjab University, Chandigarh-160014.
XX National Conference of the Indian Society for Surgery of Hand.	December 7-8, 1996; (at Agra)	Dr. S. Husain, Organising Secretary of the Conference, Department of Plastic and Reconstructive Surgery, Central Jalma Institute for Leprosy, Agra-282001.

COUNCIL'S TRAINING PROGRAMMES

Leprosy

At the Central Jalma Institute for Leprosy, Agra:

- Multidrug Therapy Orientation Course in Leprosy for Medical Officers (September 9-20, 1996).

Reproductive Biology

At the Institute for Research in Reproduction, Mumbai:

- Training Course on Current Trends in Management of Infertility and Reproductive Disorders (September 2-13, 1996).

Nutrition

At the National Institute of Nutrition, Hyderabad:

- Annual Training Course in Nutrition (December 1, 1996-February 28, 1997).

Occupational Health

At the National Institute of Occupational Health, Ahmedabad:

- Orientation Course on Occupational Health for Industrial Medical Officers (September 17-29, 1996).

Laboratory Animal Technology

At the National Centre for Laboratory Animal Science, National Institute of Nutrition, Hyderabad:

- Training Course for Laboratory Animal Supervisors (September 2-November 29, 1996).

Haematology

At the Institute of Immunohaematology, Mumbai:

- Training Course in Advanced Haematology and Immunohaematology (September 17-October 4, 1996).

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