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ALLIUMS AS FOOD FOR HEALTHY LIFE

Nutrient interventions are receiving attention as prophylactic measures to reduce the incidence of cancer and mutation-related diseases[1-3]. Plant constituents, particularly vegetables and fruits are rich in components with antioxidant properties[1,4]. These substances prevent DNA damage implicated in cancer causation [5,6]. Members of allium family are reported to have antimutagenic properties and other therapeutic values[7,8]. In India, garlic (*Allium sativum*) and onion (*Allium cepa varcepa*) are used extensively in cooking and so their antimutagenic properties are of considerable interest and importance in the prevention of certain types of cancer.

Alliums in Traditional Medicine

An Egyptian medical papyrus, known as the "Codex Elsers" dating back to 1500 BC, gives description of over 20 garlic preparations which were used to treat a wide variety of complaints like headache, body weakness and throat infections. The *Charaka Samhita* (1st century AD), the *Ayurvedic* treatise, also describes the curative properties of onion and garlic. Alliums were claimed to possess diuretic properties, aid in digestion, act as heart stimulant, improve eye sight and alleviate rheumatic problems. The Greek military physician, Discorides, has recommended the use of onion and garlic as medicine for infectious diseases and non communicable diseases. Garlic is still employed in *Ayurveda* and other traditional systems of medicine like *Unani* and *Tibbi* both as prophylactic and therapeutic agents for several diseases including cholera, typhoid, dysentery, duodenal ulcer and dyspepsia[9].

Flavours and Chemistry

Alliums are mostly popular for their flavour which is characteristic of sulphur containing compounds, formed directly either by crushing or following a chemical reaction[10]. There are species-specific differences in *Allium* with regard to the quantity and quality of their specific flavour precursors, S-alk(en)yl-L-cysteine sulphoxides. The non volatile precursors release volatile sulphur compounds through allinase activity and chemical degradation[11,12]. The resultant products are called thiosulphinates which are a combination of sulphides, disulphides and trisulphides. These thiosulphinates which are pungent and unstable, are directly responsible for the characteristic flavour of onion and garlic[13]. The tear-inducing principle of onion is the result of interaction of allinase with cysteine sulphoxide. Leeks (*Allium porrum*) and shallots (*Allium schoeno prasum* L) contain this chemical whereas, this is absent in garlic. Allium (S-allyl-L-cysteine sulphoxide) in garlic is the precursor of allium which is the main garlic flavour[14]. Ohsumi *et al*[14,15] succeeded in producing an interspecific hybrid between onion and garlic by the nascent embryo rescue

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technique. The hybrid plant produced S-1-propenyl-L-cysteine sulphoxide, allium and S-methyl-L-cysteine sulphoxide in the bulb. The sliced hybrid bulb had an odour resembling a mixture of onion and garlic[15].

Medicinal Properties of Alliums

Lipid Lowering Properties

Extensive studies have been carried out to investigate the potential of garlic to lower serum lipids; garlic being used as juice, as oil in capsule form, and in the raw form upto 10-50 g[16]. Various studies have shown that around 10% reduction in serum cholesterol can be achieved by taking garlic in various forms[17]. Most of the human trials have revealed a positive effect of garlic intake on serum low density lipoprotein. A review by Agarwal[18] on a series of trials employing Kwai dried garlic extract for 3-16 wk at a rate of 600-900 mg/wk suggested reduction in cholesterol ranging from 6 to 22%. The levels of triglycerides were also lowered. Garlic supplementation is also reported to increase high density lipoproteins which can scavenge the small density lipoproteins in plasma and prevent atherosclerosis. Metaanalysis of the results from 28 studies on patients with hypercholesterolaemia revealed on an average 9% reduction in cholesterol[19]. A metaanalysis of 16 trials indicated a 12% average reduction in cholesterol[20]. Neil *et al*[21] in a double blind randomised trial on 115 individuals with hyperlipidaemia, using dried garlic tablets at a dose of 30 mg thrice daily, found that garlic was less effective in reducing total cholesterol than had been suggested by previous metaanalysis. The intake of alliums through diet or in any form must be continued for at least 2-3 months. The lowered lipid levels may, however, rise once the intake is discontinued. During the initial period following garlic intake a slight increase in lipid levels may be seen which could be due to the mobilisation of lipid deposits from tissues to extra cellular fluids[16].

Effect on Platelet Aggregation

Increased platelet activity is an associated factor in atherosclerosis and thrombogenesis and platelet aggregation is a risk factor for heart disease. Both onion and garlic have been reported to possess platelet aggregation inhibitor factor[22]. Cooking procedures like frying or boiling do not alter the activity of this factor[16]. Evidence exists to suggest that the addition of fried onion (about 50-70 g) to the food can reverse the platelet aggregation after consumption of a fat rich meal. Onion oil is reported to possess greater antiplatelet activity as compared to garlic oil[9]. This inhibition of platelet activity is due to the interference with prostaglandin biosynthesis through inhibition of cyclo-oxygenase[23] and lipo-oxygenase with inhibition of thromboxane synthesis and arachidonic acid uptake by the platelets[24].

Ajoene present in garlic is presumed to have an antiaggregatory effect on blood platelets. It is reported to interact with platelet IIb-IIIa complexes. This action is mediated by platelet membrane G proteins[25]. In a placebo controlled double blind trial 800 mg of dried garlic powder was given to humans for four weeks. Spontaneous aggregation disappeared and the plasma viscosity decreased by 3.2% with a 9.5% decrease in diastolic blood pressure[26]. A randomised placebo controlled double blind study with garlic extract failed to demonstrate an effect on platelet aggregation and serum thromboxane levels[27]. There seems to be variation due to the method of preparation of garlic extract/powder.

In a ten month study on moderately hypercholesterolaemic men administered aged garlic extract daily, platelet adhesion to fibrinogen was reduced by 30% as compared to the placebo group. A trend towards decreased susceptibility of lipoproteins to oxidation was also noted in the garlic group[28].

In another study by Goldman *et al*[29], the antiplatelet activity of onion was correlated to the concentrations of organosulphur compounds. These authors have suggested that genotype and bulb sulphur content should be taken into account in studies assessing the antiplatelet activity of onion.

Effect on Fibrinogen and Blood Coagulation

Chutani and Bordia[30] observed fibrinolytic activity due to garlic intake in a study of 20 patients with ischaemic heart disease. Enhanced fibrinolysis was also observed in a group of healthy medical students fed 10 g of fresh garlic daily for 2 months[31].

The effects of garlic and onion consumption on fibrinogen levels, clotting time and fibrinolytic activity have been studied in humans. In an epidemiological study in the Jain community in India, it was observed that subjects who never ate garlic/onion had higher plasma fibrinogen levels, shorter clotting time and lower fibrinolytic activity[32].

Antimicrobial Effects of Allium

Antibacterial activity

The antibacterial properties of garlic are well known. It is active against both Gram positive and negative bacteria while onion is effective only against Gram positive bacteria[33]. The effect is attributed to the allium[34] and ajoene[35] present in garlic. These two compounds have the potential to oxidise SH groups in bacteria[34,35].

Antifungal activity

Many fungal pathogens are believed to be sensitive to the aqueous extract of garlic. Its antidermatophytic activity is comparable with that of Ketoconazole[36]. Its use for otomycosis caused by Aspergillus was shown to be superior to that of pharmaceutical preparations[37]. The observed antifungal activity is due to sulphide components or ajoene present in garlic. Extracts of onion were found to suppress fungal growth to a lesser extent than those of garlic.

Antiviral activity

Viruses have been reported to be deactivated by garlic. Some of the viruses which are sensitive to garlic are herpes simplex type I and II, vaccinia, vesicular stomatitis and human rhinovirus. The antiviral activity of garlic has been attributed to ajoene, allium, allylmethyl thiosulphinate and methyl allyl thiosulphinate[36].

Antiaging Activity

Garlic is thought to retard ageing, prolong life span, and improve learning and spatial memory[39]. Ageing is associated with the degeneration of tissues and organs due to free radical mediated injuries to the cells. Oxidative damage is reduced by garlic which therefore affords protection to tissues against degenerative disorders. The free radical scavenging property of garlic is due to its rich content of sulphur containing chemicals[40]. Garlic extract was able to scavenge exogenously generated hydroxyl radicals. Even after the garlic extract was heated to 100°C for 60 min there was only 10% reduction in its activity[41].

Anticancer Activity

Currently, the nonnutrient components of diet are receiving attention for their ability to protect against certain types of cancer. Fruits and vegetables are rich sources of these agents[42]. Epidemiological evidence demonstrates an inverse correlation between intake of allium vegetables and the risk of stomach cancer[43-44]. Most cancers are likely to originate as a consequence of series of mutational events and hence protection against mutations could be beneficial at the late as well as early stages of cancer development. Consumption of vegetables, containing antimutagenic compounds, may reduce the risk of mutations and thereby the risk of cancer[43].

There are reports documenting the tumour inhibiting activity of the oils of the garlic and onion, and other sulphur components of alliums against chemical carcinogens induced tumours in experimental animals[45].

A recent study reports that topical application of diallyl sulphide (DAS) afforded protection against polycyclic aromatic hydrocarbon induced mouse skin carcinogenesis[46]. One mechanism through which alliums may inhibit tumourigenesis could be by inhibiting the formation of DNA-carcinogen adducts[47]. Diallyl disulphide (DADS) significantly inhibited the growth of H-ras oncogene transformed tumours in nude mice. This inhibition was correlated with the inhibition of P_{21}H-ras membrane association in the tumour tissue[48].

NIN Studies

Studies were undertaken at the National Institute of Nutrition (NIN), Hyderabad to evaluate the antimutagenic potential of garlic and onion fed through diets to rats followed by carcinogen exposure and assessment of urinary mutagenicity by *Salmonella* TA 98 and TA 100 with and without activation system (S9).

The drug metabolising enzymes play a vital role in the detoxification and metabolic activation of xenobiotics. The balance between these enzymes determine the ultimate toxicity of chemical carcinogens. Therefore, at the end of the experimental period, the levels of two detoxification enzymes were measured to evaluate the effect of feeding of garlic on the activities of the two enzymes in rat tissues. Any increase in the levels of these enzymes would indicate the protective nature of garlic[49].

Wistar rats aged 8-10 wk were divided into various groups and fed, garlic (0.1, 0.5, 1%) or onion (1 and 5%) containing diet for one month. The food intake of the animals was recorded every week throughout the study, while the body weights were recorded at the beginning and end of the experiment. After 1 month of feeding garlic/onion diet, the carcinogen treatment groups received a single intraperitoneal dose of benzo(a)pyrene (BP) or 3-methylcholanthrene (3 MC) in groundnut oil. The

mutagen content of urine collected 24 h after administration of carcinogens was estimated by the short term Ames assay.

There was no difference in the weekly food intake between the control rats and groups given garlic/onion containing diet. Similarly, no difference in the final body weight of the animals was noted due to garlic/onion feeding[50,51].

Effect of Garlic Feeding

The rats which received carcinogen showed significantly higher urinary excretion of mutagens, while those fed garlic or standard casein based diet did not show mutagenic substances in the urne.

There was a signifcant reduction in the urinary excretion of mutagens in the BP exposed rats fed garlic as indicated by a decreased number of revertants in both TA 98 and TA 100 strains in the presence and absence of metabolic activation system (S9: 9000 g liver supernatant). The BP treated animals fed 0.5 and 1% garlic showed maximum inhibitory effect in TA 98 strain whereas with respect to TA 100 strain all the three levels of garlic feeding resulted in similar extent of inhibition (Figs 1a and 1b).

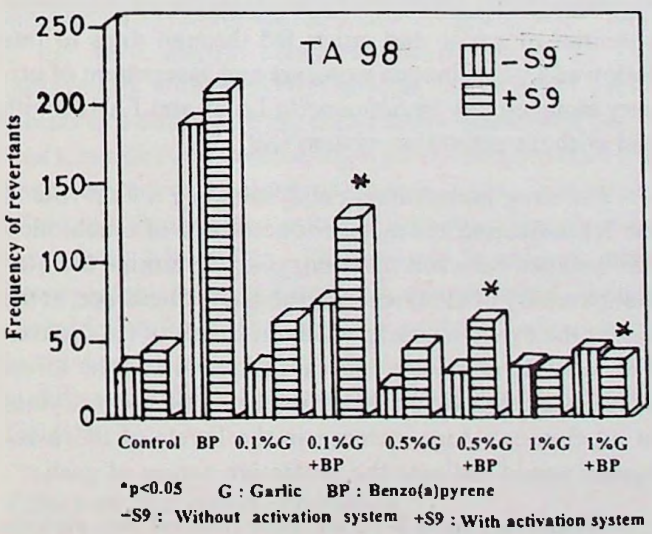


Fig.1a. Reversion frequency in *S.typhimurium* TA98 with garlic feeding

In TA 98 strain with and without metabolic activation, there was significant reduction in the frequency of revertants in the urine of rats treated with 3 MC and given a diet containing 0.1, 0.5 and 1% garlic. However, the results with all the three doses were similar and no dose dependent reduction was observed. On the other hand, in TA 100, a dose dependent reduction in mutagenesis was noted in the presence of metabolic activation system, whereas in the absence of activation system, all the three doses of garlic feeding showed similar inhibitory effect[51].

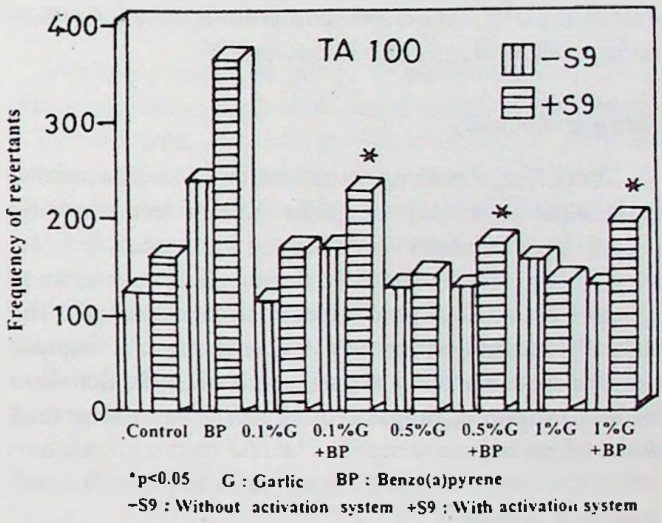


Fig.1b. Reversion frequency in *S.typhimurium* TA100 with garlic feeding

Effect of Onion Feeding

Onion feeding at 1 and 5% inhibited the formation and excretion of urinary mutagens as indicated by decreased frequency of revertants with TA 98 and TA 100 strains of *Salmonella typhimurium* treated with urine extracts of rats exposed to BP and fed onion. Similar observations were made in the presence and absence of activation system along with urine extracts (Figs 2a and 2b). The urinary mutagen levels in rats given onion containing diet and treated with 3 MC were significantly lower than 3 MC treated rats given control diet without onion. However, no differences were noted in 3 MC treated groups fed 1 or 5% onion[50].

Effect on Enzymes

Stimulation of the activity of liver cytosolic glutathione-S-transferase was seen on garlic feeding. The activity of quinone reductase in liver and lung microsomes was elevated in animals fed garlic containing diets. Tissue detoxification enzymes inhibit the activation of oxidative pathways of xenobiotics which results in toxic metabolites binding to DNA and manifesting as mutations[52,53].

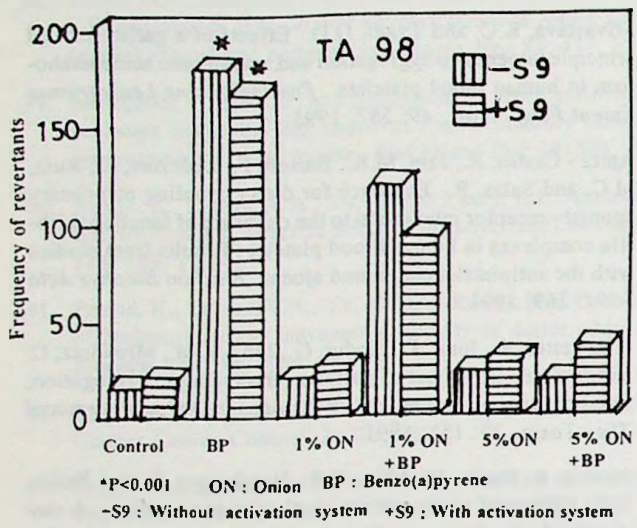


Fig.2a. Reversion frequency in *S.typhimurium* TA98 with onion feeding

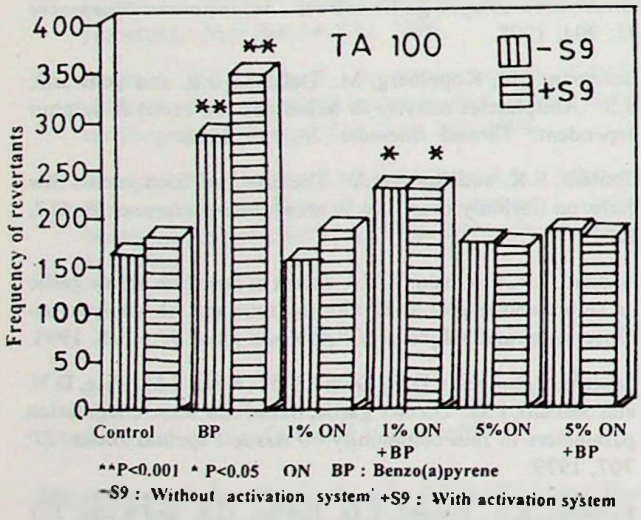


Fig.2b. Reversion frequency in *S.typhimurium* TA100 with onion feeding

The reduction in the excretion of carcinogen derived mutagens due to garlic/onion feeding to rats suggested that one of the steps involved in tumourigenesis could be countered by protective substances. Enhancement in the levels of tissue detoxification enzymes could be another important mechanism through which these dietary agents could confer their protective effects. The antimutagenic effect was observed even at low levels (0.1 and 0.5%) of garlic. These correspond to 100 and 500 mg of garlic/ 100 g of diet, which can be easily consumed through diet.

Experimental evidence exists to show that alliums can afford protection against development of neoplasia through various mechanisms. The epidemiological studies have also established the protective effect of garlic. In Shandong Province of China where garlic consumption is about 20 g/day, the reported evidence of death due to gastric cancer is 3.4/100,000 population whereas in another area where little or no garlic is eaten, the death rate due to gastric cancer is as high as 40/100,000 population[54].

Conclusions

The data on the effects of alliums, particularly garlic, suggest that consumption of these vegetables is beneficial. Since studies conducted at NIN have shown that cooking (boiling and frying) does not alter the antimutagenic properties of garlic, it may be liberally incorporated in the diet. In addition, onions can also be eaten as salad. In the West, vegetables of the genus allium and their oils are used in seasonings, salad dressing and sauces. Although advances in modern medicine are able to meet the challenges posed by non communicable diseases, the control of such problems through prevention may be cost effective. This could be achieved by adopting a sensible life-style including dietary changes. Diets rich in some of these protective agents may confer excellent beneficial effects. Adequate intake of nonnutrients along with nutrients is useful in disease prevention but on no account should these be substituted for medicines prescribed by physicians for treating any disorder. They can be used as supplement but not as substitutes for disease management.

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This write-up has been contributed by Dr. K. Polasa, Asstt. Director and Dr. K. Krishnaswamy, Director, National Institute of Nutrition, Hyderabad.

ICMR NEWS

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

Meetings of the Task Forces (TFs)/Project Review Committees (PRCs)/Expert Groups (EGs)/Project Advisory Group (PRG)/Consultative Group held at New Delhi:

PRC on Pharmacology	March 16, 1999
TF on Suicidal Behaviour	March 19, 1999
PRG of the Division of Reproductive Health and Nutrition	March 24-25, 1999
EG on Environmental Carcinogen Testing Units	April 6, 1999
TF on Health Hazards of *Pan Masala* and Tobacco	April 12, 1999
PRC for Proposals under Non communicable Diseases	April 28, 1999
TF on Application of Remote Sensing and Geographical Information System in Health	April 29, 1999
Consultative Group meeting on Control of Neonatal Tetanus	April 29, 1999
Meeting of Experts and Investigators on Traditional Remedies for Diabetes Mellitus	May 3, 1999

Participation of ICMR Scientists in Scientific Events:

Dr. R.S. Yadav, Assistant Director and Officer-in-Charge, Field Station of the Malaria Research Centre, Delhi, at Nadiad, participated in the MIM African Malaria Conference at Durban (March 14-18, 1999).

Dr. R.S. Paranjape, Dy. Director and Officer-in-Charge and Dr. R.R. Gangakhedkar, Sr. Research Officer, National AIDS Research Institute (NARI), Pune, participated in the Workshop on AIDS Research at Paris (March 15-22, 1999).

Dr. L. Singotam, Dy. Director, National Institute of Nutrition, Hyderabad, participated in the Ninth Annual International Conference on Scanning Microscopies "Scanning 99" at Chicago (April 11-14, 1999).

Dr. C.N. Paramasivan, Dy. Director (Sr. Grade), Tuberculosis Research Centre, Chennai, participated in a WHO Regional Training Workshop on Laboratory Methods for TB Control at Jakarta (April 16-25, 1999).

Dr. R.S. Tewari, Director, Regional Medical Research Centre for Tribals, Jabalpur, participated in the Ninth Annual Public Health Forum: Poverty, Inequality and Health at London (April 18-23, 1999).

Dr. N.K. Ganguly, Director-General, ICMR, participated in the Twenty Fourth Session of the WHO South-East Asia Advisory Committee on Health Research at Yangon (April 20-23, 1999).

Dr. Y.N. Prasanna, Research Officer, and Officer-in-Charge, Field Station of the National Institute of Virology (NIV), Pune, at Bangalore, participated in the Eighth Consultation of Virologists from WHO South East Asia Regional (SEAR) Polio Lab Network and in the Sixth SEAR EPI Technology Consultative Group meeting on Vaccine Preventable Diseases at Dhaka (May 2-6, 1999).

Dr. N.K. Ganguly, D.G., ICMR, Dr. M.D. Gupte, Director, Institute for Research in Medical Statistics, Chennai; Dr. D.A. Gadkari, Director, NIV, Pune; Dr. R.S. Paranjape, NARI, Pune; and Dr. Sekhar Chakrabarti, Deputy Director (Sr. Grade), National Institute of Cholera and Enteric Diseases, Calcutta, participated in the Workshop on New Concepts in HIV Vaccine Development at Bethesda (May 3-5, 1999). Dr. Chakrabarti also participated in the Johns Hopkins-Fogarty Satellite Vaccine meeting at Bethesda (May 7, 1999).

Dr. P.K. Das, Director, Vector Control Research Centre, Pondicherry, participated in the Intercountry Consultative meeting on Alternative Approaches to Vector Control at Yangon (May 4-7, 1999).

Dr. A.H. Bandivedkar, Research Officer, Institute for Research in Reproduction, Mumbai, participated in the Tenth World Congress on Human Reproduction at Salvador (May 4-8, 1999).

Workshops:

A ICMR/WHO Workshop on "Research and Health Care Priorities in Geriatric Medicine and Ageing" was organised at New Delhi (March 16-18, 1999).

A ICMR/WHO Workshop on "Ethical Issues in Biomedical Research" was organized at New Delhi (March 22-24, 1999).

A Workshop on "Laboratory Diagnosis of Leptospirosis" was organized at Port Blair for 3 weeks (from April 29, 1999).

COUNCIL'S TRAINING PROGRAMMES FOR 1999-2000

Leprosy

At the Central JALMA Institute for Leprosy, Agra:

- Training Course for Medical Officers Working under the National Leprosy Eradication Programme (April and September, 1999).

Reproductive Biology

At the Institute for Research in Reproduction, Mumbai:

- Training Course in Molecular Techniques in Ovarian Function (September 27-October 2, 1999).
- Training Course on Cytological Detection of Reproductive Tract Infections (December 13-17, 1999).

Endocrinology

At the National Institute of Nutrition,, Hyderabad:

- Annual Certificate Course on Endocrinological Techniques and their Application (August 1 - September 15, 1999).

Nutrition

At the National Institute of Nutrition, Hyderabad:

- M.Sc. in Applied Nutrition (June 1, 1999-February 28, 2000).
- Postgraduate Certificate Course in Nutrition (December 1, 1999-February 28, 2000).

Laboratory Animal Technology

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

- Training Course for Laboratory Animal Technicians (June 14-July 30, 1999).

- Training Course for Laboratory Animal Supervisors (September 1-November 30, 1999).

Medical Entomology:

At the Vector Control Research Centre, Pondicherry:

- Postgraduate Diploma Course in Medical Entomology (from July 1999).

Biomedical Statistics

At the Institute for Research in Medical Statistics, Chennai:

- Basic Course in Statistics for Medical Officers (July 1999).
- Training Course in Field Epidemiology (November, 1999).

Haematology

At the Institute of Immunohaematology, Mumbai:

- Training Course in Transfusion Medicine for Blood Bank Medical Officers (August 31-October 29, 1999).
- Training Course in Blood Group Serology and Blood Bank Methodology for Blood Bank Technicians (August 31-September 30, 1999).
- Training Course in Advanced Haematology and Immunohaematology (October 11-29, 1999).

INDIAN COUNCIL OF MEDICAL RESEARCH

AWARDS AND PRIZES 1997

The Indian Council of Medical Research invites nominations/applications from Indian scientists for its various prizes and awards in the field of biomedical sciences. Details of the awards/prizes , as also the format for application may be seen in the following pages. They may also be obtained from the Director-General, Indian Council of Medical Research, (Indo-Foreign Cell), Post Box No. 4911, Ansari Nagar, New Delhi-110029.

Nominations/completed applications should reach this office on or before **31st August, 1999**.

DETAILED INFORMATION

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 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.

***Awards which will not be given for 1997.**

***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.

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 award for 1997 will be in the field of '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 Oration 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.

***Awards which will not be given for 1997.**

12. ICMR Prize for Biomedical Research for Scientists belonging to Under-privileged Communities (Value : Rs.10,000)

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.**

13. ICMR Prize for Biomedical Research conducted in Under-developed Areas (Value : Rs.10,000)

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 award for 1997 will be in the field of 'GASTROENTEROLOGY'.

***Awards which will not be given for 1997.**

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 award for 1997 will be in the field of "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.30,000):

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 2 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 current year

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 current year

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

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***Awards which will not be given for 1997.**

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 award for 1997 will be in the field of "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.

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.

***Awards which will not be given for 1997.**

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.

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 is 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 Biomedical 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 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 **31st August,1999,** for ICMR Awards/Prizes for the year 1997.

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 given
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 Under-privileged Communities should provide attested Caste/Community Certificates.

LIFE SCIENCES RESEARCH BOARD

The Defence Research & Development Organisation (DRDO), New Delhi, has established a Life Sciences Research Board (LSRB) to promote original, imaginative research in various disciplines of Life Sciences. The aim of the LSRB is to expand and strengthen the knowledge base of Life Sciences in the country by utilizing and networking of national resources of knowledge, know-how, expertise, facilities and infrastructure.

The LSRB supports research proposals from non-Defence institutions in various areas of Life Sciences *eg* biological and biomedical sciences, psychology, physiology, bioengineering, biotechnology, specialized high altitude agriculture, food science & technology, *etc.* Innovative ideas and proposals from young scientists will be encouraged. For further information, please write to **The Secretary, Life Sciences Research Board, DRDO Hqs, 'B' Wing, Sena Bhavan, New Delhi-110011.**

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