

**ICMR's Most Cited
Research Papers :
A Chronicle
(1950-2010)**



**INDIAN COUNCIL OF MEDICAL RESEARCH
New Delhi**

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Although all efforts have been made to make the information* as accurate as possible, the council will not be responsible for any loss to any person caused by inaccuracy in the information available in this document.

**The information/data provided in this document have been compiled till the period of December 2010.*

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November, 2011

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Published by the Division of Publication and Information
on behalf of the Director General, Indian Council of Medical Research, New Delhi - 110 029

Printed at: Aravali Printers & Publishers Pvt. Ltd., W-30, Okhla Industrial Area, Phase-II, New Delhi - 110 020

FOREWORD

The idea of publishing some sort of a volume containing ‘*Citation Classics*’ of published papers from ICMR to celebrate the Centenary Year of ICMR came to us some time back during the year. It was thought that we should try to produce a volume in 2011, preferably in time for the November Closing Ceremony of the Centenary Celebrations. It was decided that only those papers will be covered for ‘Citations’ which have been published during 1950-2010, as the tool for capturing ‘Citations’ is available only from 1945 onwards.



It would be particularly helpful for contemporary and future medical researchers to assemble a set of papers that would represent the best that had come out of our Institutions. The question was: How should we define ‘best’? Identification of the most significant contributions, or ‘*Classics*’, in the literature of a scientific discipline is difficult. Recent computer-based citation statistics make it possible to identify frequently cited articles published from 1945 onwards and can be designated as ‘*Citation Classics*’. The identified ‘*Citation Classics*’ may not provide a clear guide to all research work being carried out by the Council. Nevertheless, they do identify a broad compass of authors from the council in areas that have been considered priority by ICMR.

The most cited papers in the corresponding years of 1950-2010 considered as ICMR’s *research classic* have been reprinted here. Some of the researches have ‘visible’ effects on the general well being of the Nation. The trend of ‘Citations’ of ICMR research papers are clearly indicating the fact that, after an initial ‘lull’ the international and national scientific community started noticing the work being reported from the scientists of council and many studies resulted into various national programmes and policies. In last one decade emphasis was given on genetically modified foods and stem cell research and accordingly capacity building was developed considerably. The research being carried out by the Council in the areas chosen for this document has attracted researchers at global level as well.

Thus, potential ‘readers’ of this document, unfamiliar with ICMR’s published heritage would be having access to a single source where they could quickly identify those articles most frequently associated with their research interest. The easier it is for the potential researcher to gain familiarity with ICMR’s literature, the more likely they are to acquire interest and confidence in productivity of scientists of ICMR.

A handwritten signature in blue ink, appearing to read 'V.M. Katoch', written in a cursive style.

Dr. V.M. Katoch
Secretary, DHR, Govt. of India
& Director General, ICMR

PREFACE

The initiative of re-printing as an anthology of 'Citation Classics'-the already published scientific papers acclaimed by ICMR, in the year of the Centenary occurred as befitting tribute to the authors who created new knowledge for improving our understanding about many areas of human health, most relevant to the people of India.

The task of identifying, archiving and retrieving the scientific papers as full text (pdf) from websites of the respective Journals in which they had first appeared, was arduous but rewarding. As the citation tool was developed much later when the first endeavor of publishing scientific paper had been put in place, the exploration could be possible only from the year 1945 and onwards. With the help of this tool the papers presented in this volume could be captured.

For selecting the 'best' papers in our context, a set of criterion helped locate resources and identify particular papers because citation counts offered certain distinct advantages. Easier obtainability also makes them objectively discernible to others. In addition, citation counts, as indicators of the quality of research publications, have become enough powerful enabling us in making critical inputs as is perceptible from the history of its sophistication. The method also makes possible an overview of research in particular field that enables a scholar to judge its quality. Citation rates fluctuate for each discipline. The number of citations indicating a classic in botany, relatively a small field, might be lower than the number required to make a classic in a large field such as biochemistry. In this context, the intent was to identify (through Science Citation Index -SCI) a core set of (year-wise) ICMR articles published in a research journal that were frequently cited by other authors. The citations were collected online from the Science Citation Index for each year, individually. The most frequently cited articles were then sorted by year to identify a "Classic Paper" for that year.

The number of citations to a large extent reflects scientific relevance of paper over the years but it may not necessarily be the best as bias in selection of the Journal for indexing and relevance of the study to particular people, area or society may play dubious role. Therefore, the selection of papers in this anthology may be taken only as indicative and not entirely an index for assessing the real contribution and worth of the work of a scientist or his organization from which he/ she got logistical support for producing new knowledge. Overall, this is an useful and interesting measurement.

The impact of the research studies reproduced in this volume is now measurably visible to the nation and could be best understood in its various implications and manifestations through quantifiable growth indicators that are periodically obtained by government during an institutional and nationwide exercise while assessing progress and preparing plans for the people. The international scientific community started noticing the research studies reported by the scientists of the Council, particularly those that manifest into various National Programmes and were incorporated in the policy framework such as the work done in the

field of leprosy, nutrition, bacterial and viral infections, parasitic diseases and reproductive health, metabolic disorders ,etc.

This compilation is a small tribute to those who contributed to the vast published heritage of ICMR. It has the potential to attract readers who may appreciate the vision of the researchers indirectly reflecting the priorities of ICMR over the years. This distinct publication has the potential to become a source for quickly identifying the area of research interests that have been considered highly relevant to India. Hopefully, this document can also serve as quick reference tool for assessing the major scientific contributions of ICMR.

This publication is based on a collection of the most cited research papers that were authored by scientists working in various laboratories of the Indian Council of Medical Research and arranged chronologically from 1950 to 2010.

Date: November, 2011
New Delhi

(Divya Srivastava)
Indian Council of Medical Research

INDIAN COUNCIL OF MEDICAL RESEARCH

AN INTRODUCTION

Indian Council of Medical Research (ICMR) is one of the oldest medical research councils in the world. In 1911, officers of the then Indian Medical Services had the vision and foresight to create Indian Research Fund Association. Soon after independence, it was rechristened as Indian Council of Medical Research in pursuance of the recommendations of the Health Survey and Development Committee headed by Sir Joseph Bhore. What was started to conduct “enquiry” into health problems, has blossomed into a vibrant network of 31 permanent Institutes/Centres and over 70 field stations, employing over 5000 personnel including 750 scientists. Its allocation has also grown over successive plan period. In the 11th Plan it stood at Rs. 4496 crores.

The ICMR has evolved over the years in line with changing health research needs, effectively addressing the new challenges that have emerged as a result of the economic, demographic, nutritional and epidemiological transition of the country. With the changing health challenges, the demands on ICMR are also increasing. The mission of ICMR is to promote better health through research. It provides stewardship, conducts and supports research, generates knowledge and ensures utilization of knowledge in areas of national public health importance.

The role of research and modern science in fighting diseases and improving health is being increasingly re-emphasized. Links between research and disease control programmes are being better appreciated. The current strategy of ICMR has close interaction with health systems, including disease control programmes which is supported by continued exploitation of scientific and technological advances from basic to applied, biomedical to health sciences and from laboratory to field research.

The Council has accepted a twin track approach to meet its objectives –intramural (through its institutes) and extramural research (through grants-in-aid to projects in non-ICMR institutions).

The Permanent institutes of ICMR are mission-oriented discipline/disease-specific laboratories strategically located in different parts of the country. Extramural research is promoted basically to strengthen the biomedical expertise and infrastructure especially in medical colleges and the university system, aimed at developing and fostering a culture of research in academia. Currently, the ICMR spends about 25% of its budget on extramural research programme.

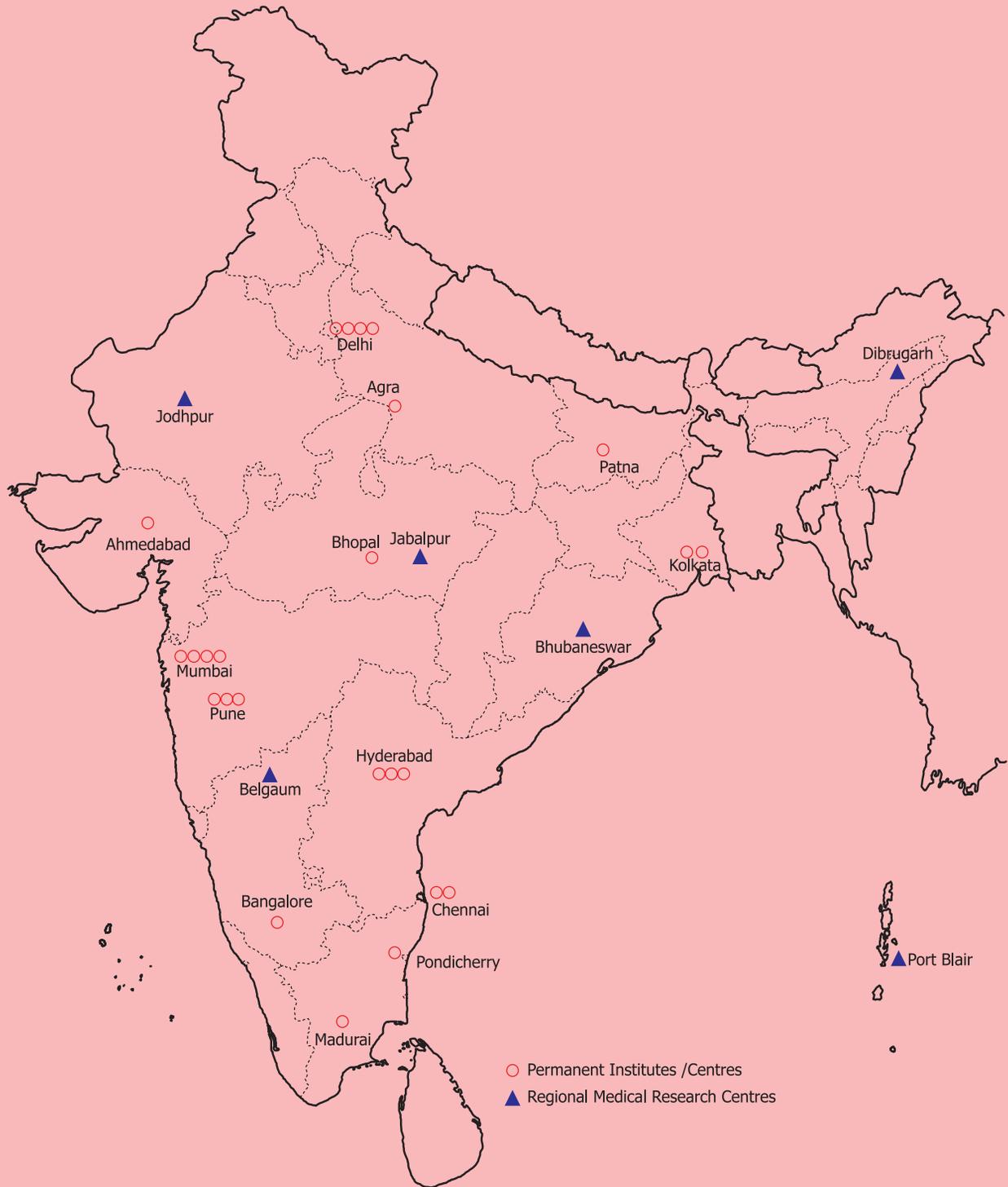
The research priorities of the Council coincide with health policy and priorities of the country. It works very closely with the national programmes, which have well designed targets for control, elimination and eradication of diseases. The ICMR is actively engaged in various aspects of research for control of communicable diseases (HIV/AIDS, tuberculosis, malaria and others); infectious diseases targeted for elimination (kala-azar, lymphatic filariasis, leprosy) and those targeted for eradication (yaws, poliomyelitis); non-communicable diseases (cardiovascular diseases, neurological disorders, metabolic diseases, cancers, injuries, *etc.*); and improving maternal and child health including nutrition.

The majority of the research activities of the Council are directed towards diseases that have significant links with poverty. It has a special focus on health of marginalized and under privileged section of society. It is responsive to issues of equity, gender, ethnicity, race and caste.

The ICMR has provided critical research support whenever the health needs of the country demanded rapid responses. Recent examples that are of such national concerns are SARS, Avian Flu (H5N1), pandemic flu (H1N1) and other new and emerging infections.

With globalization, international collaborative research has also increased. The Council has played an important role in defining the limits of collaborative research and ensuring that such research is conducted in an ethically acceptable manner.

ICMR Institutional Network



ICMR Institutional Network

National Institute of Nutrition, Hyderabad	1918
National Institute of Virology, Pune	1952
National Institute for Research in Reproductive Health, Mumbai	1954
National Institute for Research in Tuberculosis, Chennai	1956
National Institute of Immunohaematology, Mumbai	1957
National Institute of Cholera and Enteric Diseases, Kolkata	1962
National Institute of Pathology, New Delhi	1965
National Institute of Occupational Health, Ahmedabad	1966
National JALMA Institute for Leprosy and Other Mycobacterial Diseases, Agra	1967
Vector Control Research Centre, Pondicherry	1975
National Centre for Laboratory Animal Sciences, Hyderabad	1976
National Institute of Malaria Research, New Delhi	1977
Rajendra Memorial Research Institute of Medical Sciences, Patna	1977
National Institute of Medical Statistics, New Delhi	1978
Food and Drug Toxicology Research Centre, Hyderabad	1978
Microbial Containment Complex, Pune	1978
National Institute of Epidemiology, Chennai	1978
Institute of Cytology and Preventive Oncology, NOIDA	1979
Enterovirus Research Centre, Mumbai	1981
Regional Medical Research Centre, Bhubaneswar	1981
Regional Medical Research Centre for N.E. Region, Dibrugarh	1982
Regional Medical Research Centre, Port Blair	1983
Regional Medical Research Centre for Tribals, Jabalpur	1984
Desert Medicine Research Centre, Jodhpur	1984
Regional Medical Research Centre, Belgaum	1984
Centre for Research in Medical Entomology, Madurai	1985
Genetic Research Centre, Mumbai	1986
ICMR Virus Unit, Kolkata	1989
National AIDS Research Institute, Pune	1992
National Institute for Research in Environmental Health, Bhopal	2010
National Centre for Disease Informatics and Research, Bangalore	2011