

Dr. Subhas Mukherjee

A visionary and pioneer of IVF



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Foreword

The incredible journey leading to the birth of India's and Asia's first and the world's second test-tube baby in 1978 was the brainchild of an ingenious, resourceful and inspirational scientist, Dr. Subhas Mukherjee. This talented physician's passionate approach to overcome infertility is a beacon in today's times. However, Dr. Mukherjee's incredible feat was heavily mocked and shrouded from the rest of the world by his fellow countrymen for many decades. Only recently was the veil lifted by a courageous man, Dr. T. C. Anand Kumar, who himself was credited with the birth of India's first test-tube baby. He not only gave up his prestigious crown but also, fully credited Dr. Subhas Mukherjee as being the first to achieve this feat. He also joined the crusade initiated by Prof. Sunit Mukherjee and Mrs. Namita Mukherjee to give Dr. Subhas Mukherjee his dues. In 2002, after 21 years of his death, ICMR recognized his work for the first time. Dr. Subhas Mukherjee's method of combining in-vitro fertilization and cryopreservation of human embryos is the currently preferred technique of assisted reproduction. Today, more than 3 million test-tube babies worldwide see the light of the day from the method discovered by Dr. Subhas Mukherjee.

To garner interest into the life and works of Dr. Subhas Mukherjee, our Institute with financial support from Indian National Science Academy has undertaken a project to spread awareness about his achievements. Dr. Srabani Mukherjee, Scientist "F" at ICMR-NIRRH and Dr. Rajvi Mehta, alumini of ICMR-NIRRH and a clinical embryologist, have initiated to collate all of Dr. Subhas Mukherjee's handwritten notes, documents, sketches, photos and archive these for posterity for the medical history of India's first test-tube baby.

On the occasion of the Golden Jubilee Celebrations of our Institute, it would seem fitting to pay tribute to the man behind one of the most progressive techniques which has transformed the course of reproductive medicine. I congratulate the authors for their efforts to provide the information to the readers in a concise, simple language.

Dr. Smita D. Mahale
Director, ICMR-NIRRH

Preface

It gives us great pleasure to present this publication about Dr. Subhas Mukherjee, creator of India's first test-tube baby "Durga", in Calcutta and one of the greatest scientists that India has produced in the last century, on the occasion of the Golden Jubilee of the ICMR-National Institute for Research in Reproductive Health (NIRRH). Dr. Mukherjee's hard earned achievement was ridiculed and kept away from scientific community. In fact, NIRRH in collaboration with the KEM Hospital Mumbai was responsible for the birth of India's first "scientifically documented" test-tube baby on 6th August, 1986 under the leadership of Dr. T.C. Anand Kumar, the former Director of NIRRH and gynaecologist Dr. Indira Hinduja. More than a decade later, Dr. T. C. Anand Kumar on the request of Prof. Sunit Mukherjee studied the notes and publications of Dr. Subhas Mukherjee and publicly accepted Dr. Subhas Mukherjee as Architect of India's first test-tube baby.

The valuable notes, documents, diaries, publications, photographs of Dr. Subhas Mukherjee's were available at "Dr. Subhas Mukherjee Memorial Reproductive Biology Research Centre", Calcutta and were donated to us by Prof. Sunit Mukherjee. With great support and encouragement from Dr. Smita Mahale, current Director of ICMR-NIRRH, we have endeavoured to archive these priceless documents which are appropriate to be showcased at a science museum, and this publication is a result of her motivation.

We acknowledge the financial assistance from Indian National Science Academy and Indian Council of Medical Research for this endeavour. We thank Mr. Ram Shankar Barai and Mr. Bhalchandra Kulkarni for patiently scanning and archiving all the documents. We also acknowledge the contributions of Ms. Roshan Dadachanji and Ms. Dhanashree Gaikwad for their assistance in compilation of this publication.

We hope that this publication inspires the current and future generation of scientists to pursue the truth despite failures that may come our way.

Dr. Srabani Mukherjee & Dr. Rajvi H. Mehta

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Dr. Subhas Mukherjee
16th January 1931 - 19th June 1981

Dr. Subhas Mukherjee: A Scientist Ahead of his Time

Dr. Subhas Mukherjee created history when he became the first physician in India to perform *in vitro* fertilization (IVF) resulting in the birth of 'Durga' (Kanupriya Agarwal) on 3rd October 1978 in Calcutta, West Bengal. It was just 67 days after the birth of world's first IVF baby, 'Louise Brown' in England by the pioneering physiologist, Prof. Robert G. Edwards and Gynaecologist Dr. Patrick Steptoe. Prof. Edwards was awarded the Nobel Prize for his path breaking work in 2010, while Dr. Subhas Mukherjee never got any recognition but was instead humiliated to an extent that drove him to end his life. Not only he was the first Asian to successfully carry out IVF but the first in the world to lead to the birth of a test-tube baby after freezing human embryos. His claims were dishonoured by his colleagues as well as the Government; and unable to cope with this humiliation he ended his life on 19th June 1981. With his untimely death, our country lost a brilliant scientist in the field of reproductive biology. Dr. Subhas Mukherjee's monumental and ground-breaking work was ultimately brought to light by Dr. T. C. Anand Kumar, former Director of ICMR-NIRRH who himself was credited with the birth of India's first scientifically documented IVF baby. He not only honoured Dr. Subhas Mukherjee's work but also brought it to the attention of the national and global medical fraternity.

Prof. Sunit Mukherjee, a food technologist and a close friend of Dr. Subhas Mukherjee and Mrs. Namita Mukherjee (Dr. Subhas Mukherjee's wife), set up a Research Centre named "Dr. Subhas Mukherjee Memorial Reproductive Biology Research Centre" at Behala, Calcutta to keep the memory of Dr. Subhas Mukherjee alive.

It is the contributions of these three individuals that Dr. Subhas Mukherjee is respected and remembered as someone who pioneered the process for the birth of test-tube babies. At this Memorial Centre Mrs. Namita and Prof. Sunit Mukherjee

had maintained a collection of numerous documents, handwritten scientific notes, papers (unpublished), newspaper and media cuttings and Dr. Subhas Mukherjee's personal and governmental correspondence. Prof. Sunit Mukherjee solely took care of all these valuable documents until his demise recently on 4th January 2020.

This booklet is an outcome of the review of these documents and numerous interviews we had with Prof. Sunit Mukherjee at the Memorial Centre, Calcutta .

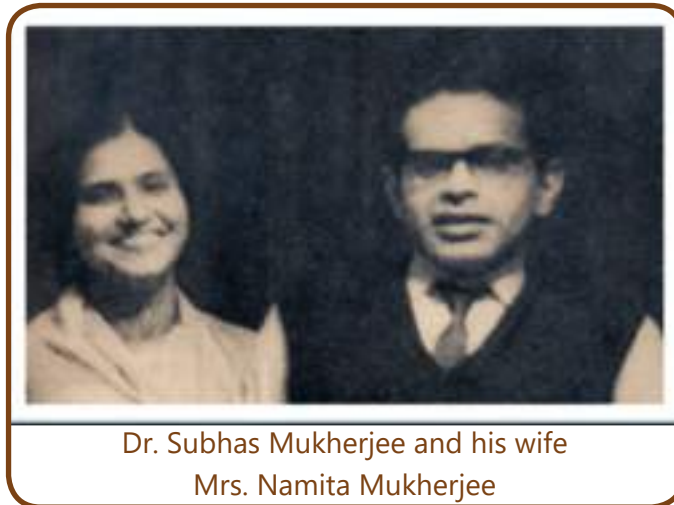
A Brief Bio-Sketch of Dr. Subhas Mukherjee

On 16th January 1931, at Hazaribagh Bihar, Dr. Satyendra Nath Mukherjee and Mrs. Jyotsna Devi were blessed with a baby boy who they named "Subhas". Dr. Satyendra Nath Mukherjee was a well-known radiologist and they were descendants of renowned Krittibas who decoded the epic "Ramayana" in Bengali.

Subhas studied in the Khelat Chandra School, Calcutta for a few years where he treasured his memories of learning Bengali under the great novelist Bibhuti Bhushan Bandyopadhyay. He completed his matriculation from Bow Bazar High School in first division followed by I.Sc. from Surendra Nath College and B.Sc. (Hons.) in Physiology from the Presidency College, Calcutta. He earned his MBBS degree from the National Medical College in 1954, standing first in Obstetrics and Gynaecology for which he received the 'Hemangini' Scholarship and College Medal.

Dr. Subhas Mukherjee was a keen researcher and he obtained his first Ph.D. degree in reproductive physiology in 1958 under the guidance, Dr. Sachchidananda Banerjee, who was the head of the department of Physiology, Presidency College, Calcutta. His research was mainly focused on "The biochemical changes in normal and abnormal

pregnancy". He observed that in abnormal pregnancy like pre-eclamptic toxemia, glutathione and ascorbic acid levels were reduced whereas the dehydroascorbic acid was increased in blood. He hypothesized that the decreased levels of glutathione were due to its interaction with some toxin. Decades later, researchers confirmed that reactive oxygen species (ROS) produced by various metabolic processes are neutralized by glutathione and other reducing agents.



In 1960, he married Namita and a year later, he was awarded a Colombo Scholarship and worked in UK at the Clinical Endocrinology Research Unit in Edinburgh where he received his second Ph.D. degree. His mentor was the renowned reproductive physiologist Prof. John A. Loraine and his research was based on "Developing new, sensitive bioassays for luteinizing hormone based on depletion of cholesterol in rat ovaries". During this time, he also worked at the Royal Infirmary, Edinburgh for a few years and it was here that his fascination for research in reproductive physiology and endocrinology developed further.

In 1967, he returned from Edinburgh and joined Sir Nil Ratan Sarkar (NRS) Medical College, Calcutta, as a Lecturer and subsequently became a Reader and Professor of physiology. He stayed at the college campus with his wife Namita on the first floor and built an animal house for rats, guinea pigs, rabbits and monkeys in a small unused room on the ground floor to conduct his innovative experiments to fulfil his

thirst for scientific research in reproductive biology and endocrinology.

Later he was transferred to B.S. Medical College, Bankura, West Bengal, as a professor and became the Head of the Department. It was during this time that he successfully produced India's first test-tube baby, whose identity was concealed at the request of her parents and was referred as "Durga" as she was born during the "Durga Puja" festival.



Dr. Subhas Mukherjee with his colleagues and students at the B.S Medical College, Bankura, West Bengal.

After the birth of Durga, he faced ridicule, humiliation from the scientific community and government bodies. He could not handle the stress and suffered from a heart attack. He was transferred to R.G. Kar Medical College, Calcutta in 1980 and eventually to Regional Institute of Ophthalmology, Medical College, Calcutta, which sealed all opportunities for him to continue his research in reproductive medicine and under the burden of this unjust punishment, he ultimately ended his life.

IVF: Changing the Face of Reproductive Medicine

In 1978, Dr. Subhas Mukherjee and his team of scientists used a revolutionary technique culminating in the birth of the first test-tube baby of India on 3rd October 1978, at Belleview Clinic in Calcutta. This team consisted of Dr. Subhas Mukherjee, then Professor of Physiology at Bankura Sammilani Medical College, Prof. Sunit Mukherjee, Professor of Food Technology and Biochemical Engineering of Jadavpur University, and Dr. Saroj Kranti Bhattacharya, Associate Professor of Gynaecology and Obstetrics at Calcutta Medical College. Dr. Subhas Mukherjee's experiment resulted in the birth of the first child to Mr. Prabhat Kumar and Mrs. Bela Agarwal. They named their daughter Kanupriya, lovingly called "Durga" after the Hindu goddess as she was born during "Durga Puja". This massive accomplishment was exactly 67 days after the birth of world's first IVF baby "Louise" announced by Prof. Robert Edward and Dr. Patrick Steptoe.

Unlike his counterparts in England, the techniques used by Dr. Subhas Mukherjee were very different.

The use of gonadotropins: Dr. Subhas Mukherjee had used human menopausal gonadotropin (hMG) for ovarian stimulation unlike Prof. Edwards and Dr. Steptoe who had recovered an oocyte from a natural cycle. Prof. Edwards and team had also attempted to stimulate the women with gonadotropins but were unsuccessful as it resulted in a shortened luteal phase which necessitated injecting the women with painful, oil-based injections of progesterone. Edwards and team therefore abandoned this approach and moved towards natural unstimulated cycles. Dr. Subhas Mukherjee too faced similar problems of a shortened luteal phase. So, instead of transferring the embryos in the stimulated cycle, he attempted to freeze the embryos and then transfer them in the subsequent natural cycle with a normal luteal phase.

Cryopreservation of the human embryos: The embryos that developed from the *in vitro* fertilized oocytes were cryopreserved for 53 days. He transferred the thawed embryos into the uterus leading to the birth of Durga. Thus he became the first in the world to cryopreserve human embryos. This technique of cryopreservation of human embryos was first reported in Nature by Trounson and Mohr in 1983 nearly 5 years after the birth of Durga.

Transvaginal retrieval of oocytes: He was the first to use a minimally invasive transvaginal approach for the retrieval of the oocytes. Dr. Steptoe used the more invasive, trans-abdominal laparoscopic approach. It was only in the mid-1980s that transvaginal ultrasound probes were available making it possible to use them to visualise the follicles and retrieve oocytes transvaginally - which remains the method of choice even today.

Strikingly, Dr. Subhas Mukherjee's inventive techniques have become the standard approach for modern day IVF where gonadotropin stimulation, transvaginal approach of oocyte retrieval and embryo cryopreservation are now routinely used.

The details of the procedure:

Dr. Subhas Mukherjee's foray into IVF began after Mrs. Bela Agarwal, aged 31 and a case of primary infertility due to diseased tubes but normal menstrual history was referred to him by another doctor. He proposed to perform a never before attempted experiment with the couple. However, at the same time he offered no guarantee on the birth of the child and he mentioned that even if the child was born it may not be normal. Despite the risks, the Agarwal's agreed to the procedure because they preferred having an abnormal child than living childless for an entire life.

Dr. Mukherjee's experiment began with using gonadotropins for the first time to stimulate the ovaries before harvesting oocytes. He used the transvaginal colpotomy method for aspirating the oocytes. He aspirated fluids from five follicles in separate flat bottomed flasks and transferred them to the 37°C incubator for 4 hours.

Later, the fluid was screened under the microscope, the pre-ovulatory oocytes identified and were further incubated for 4 hours before co-incubating them in the husband's sperm suspension for 24 hours. The zygotes formed, were transferred to other medium and incubated for another 72 hours where all these cleaved and developed into embryos.

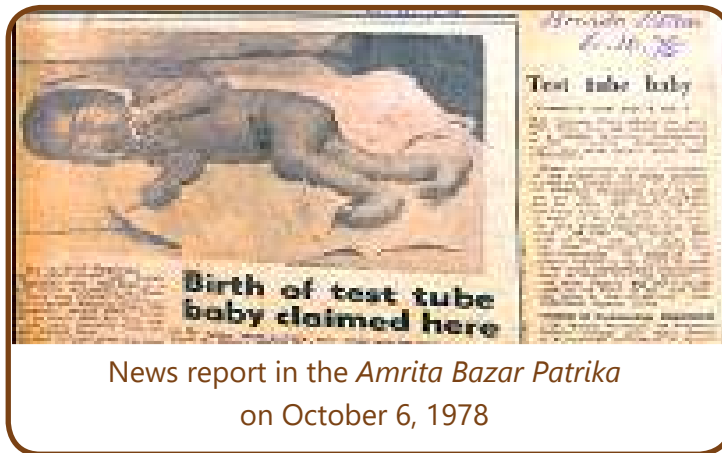


The incubator used by Dr. Subhas Mukherjee for IVF which is presently kept at the Dr. Subhas Mukherjee Memorial Reproductive Biology Research Centre

Dr. Mukherjee cryopreserved these embryos in liquid nitrogen using dimethylsulfoxide (DMSO) as a cryoprotectant. After 53 days he thawed the embryos by incubating them at 37°C for 1 hour and transferred them to Mrs. Bela Agarwal's uterus in her subsequent cycle. The slow freezing of embryos was carried out manually in a glass vacuum flask using an alcohol-dry ice bath with dry ice constantly added at set intervals with the help of Prof. Sunit Mukherjee. He carried out all these experiments at home without any laboratory facility and modern technological

assistance. Mrs. Agarwal tested positive for pregnancy on 14th February, 1978.

On 3rd October 1978, Mrs. Bela Agarwal delivered a healthy baby girl named "Durga" (Kanupriya Agarwal) by caesarean section. This news was reported in the Amrita Bazar Patrika on 6th October, 1978.



News report in the *Amrita Bazar Patrika*
on October 6, 1978

Dr. Subhas Mukherjee presented lectures on his astounding work of creating India's first test-tube baby, using techniques totally different from the British team, at various forums in Calcutta, the Benaras Hindu University and Guwahati Medical College. Although the details of his techniques used were not published in scientific journals, he did publish the details of the procedure used for freezing human embryos in the Indian Journal of Cryogenics in 1979 .

While the news of the birth of India's first IVF baby was welcomed enthusiastically all around the world, the Indian medical fraternity failed to acknowledge the birth of "Durga" and instead criticized Dr. Subhas Mukherjee and his team. An 'expert' committee was set up to evaluate Dr. Subhas Mukherjee's work.

This committee of experts were skeptical about his work. They doubted every aspect of his work and posed several questions: How did he procure gonadotropins? Why did he use liquid nitrogen to cryopreserve? etc. Following detailed discussion at Institute of Radio Physics and Electronics, Calcutta on 17th November 1978, the

committee came to the conclusion that his work was 'bogus'. This indeed was a big blow to Dr. Subhas Mukherjee as it questioned his integrity and also restricted his research further.

Lack of permission to disseminate his data with scientific world was one of the reasons why inspite of being the first to implement several novel techniques for transforming the field of reproductive medicine, others were credited and claimed to be "first" in developing these methods.

These included the use of gonadotropins for ovarian stimulation during IVF treatment in 1981 by Howard Jones in Virginia, USA, cryopreservation technique by Trounson and Mohr in 1983, and use of Transvaginal colpotomy in 1983 by Gleicher.

Controversy and Death

The 'expert' committee consisting of members not directly related to endocrinology or reproductive biology publicly mocked and declared the work of Dr. Subhas Mukherjee and his team as implausible. Moreover, the Agarwal's failed to come forward to substantiate Dr. Subhas Mukherjee's claims due to fear of social ostracization and concern of their daughter's future.

This verdict of the 'expert' committee impacted Dr. Subhas Mukherjee's ability to travel to various international conferences to which he was invited to share his research in USA and Primate Research Institute, Kyoto University, Japan. He was also invited to the 3rd World Congress on Human Reproduction held in 1981 in West Germany which he could not attend due to government restrictions.

As a final act of humiliation, he was transferred to Regional Institute of Ophthalmology as a professor of electrophysiology. Instead of receiving recognition from the West Bengal Government and his academic colleagues, he faced criticism, social ostracization and bureaucratic negligence. He committed suicide in his Calcutta

residence on 19th June 1981 at the age of 50.

The Nation failed to accept such a great achievement at that time leading to the untimely demise of a highly acclaimed Indian scientist who would have metamorphosed the underpinnings of reproductive physiology.



It is imperative to mention the commitment of his fellow scientist, Prof. Sunit Mukherjee, who assisted him with the cryobiology procedure and put in relentless effort all his life to ensure that his friend, whose work was considered to be fraudulent, got back the respect that he deserved for his work.

Contributions in Other Areas of Research

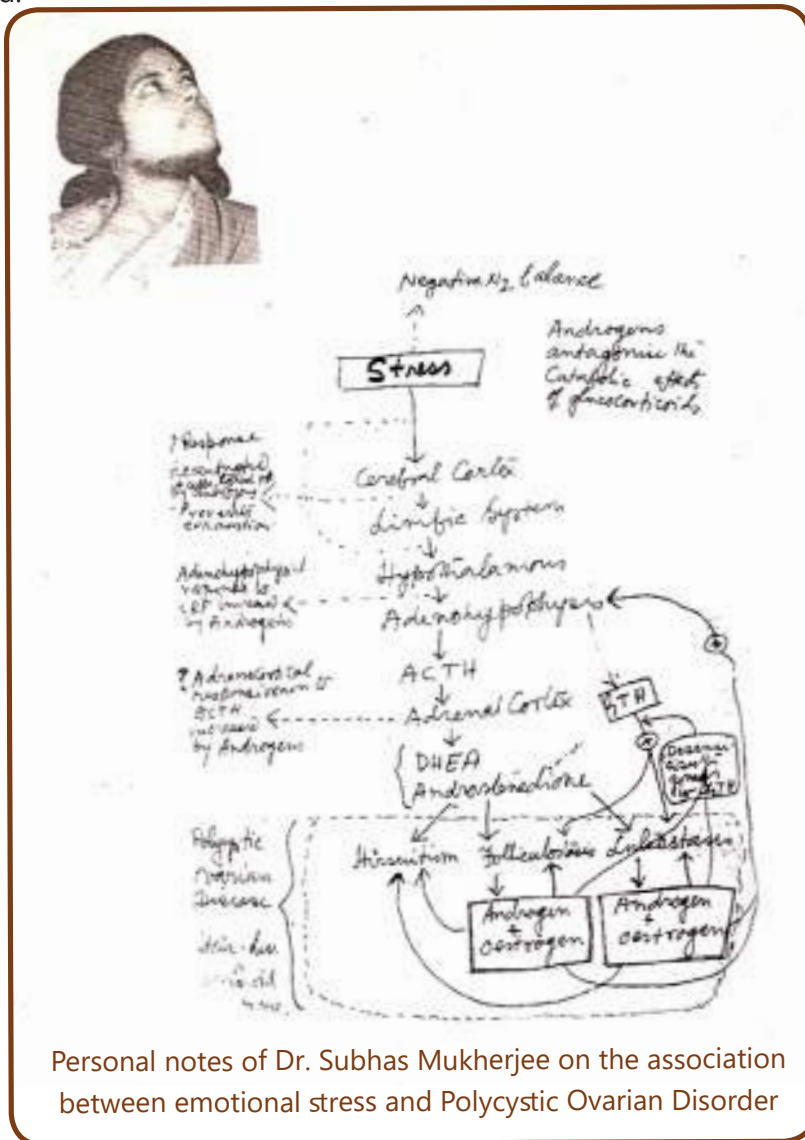
Nutrition: Before venturing into the novel field of IVF, Dr. Subhas Mukherjee also contributed passionately to research on nutrition. During the Bangladesh war, many refugees migrating to India were falling prey to malnutrition. The protein deficiency was treated by Dr. Mukherjee giving Fish Protein Concentrate (FPC) to the refugees during 1971. The FPC was prepared at Norway from sea-fish which had 80% protein content. He reported these findings in 'Applied Nutrition Journal', (1973) titled "Acceptability trial of fish protein concentrate" during Bangladesh war. He also wrote an essay entitled "How to tackle the protein gap of Bangladesh" in "Applied Nutrition Journal", (1973) which was after Bangladesh became an independent country.

Cellular origin of hCG: His research was mainly based on the original findings by Theodore Langhams in 1870 on the cellular origin of hCG. He proved that hCG like gonadotrophic substance originated from non-pregnant human endometrial tissue and was required for supporting healthy menstrual cycles. He also identified it as a key factor in maintaining the corpus luteum immediately after fertilization.

Testicular feminization: He also contributed to reproductive and endocrinology research other than in the field of IVF. He had published a paper on a transsexual case study titled "Testicular Feminisation Syndrome" in the Journal of Obstetrics and Gynaecology of India, (1973).

The use of testosterone for the management of female infertility: He had done fundamental work on the use of testosterone in management of female infertility. He studied the luteotrophic effects of testosterone and showed that application of testosterone to the female rats increases the weight of both uterus and ovary, protein synthesis and fertility of rats. He always believed and said "It is science and technology which brings social revolution".

Emotional stress and Polycystic Ovarian Disorder: He hypothesized that emotional stress is related to female infertility, especially Polycystic Ovarian Disorder or Stein Levanthal Syndrome and presented his work at the "International Congress on Physiological Science" in June 1977 at Paris. Nowadays, this association is well accepted.



Personal notes of Dr. Subhas Mukherjee on the association between emotional stress and Polycystic Ovarian Disorder

Apart from scientific research, he was proficient in writing and drawing and he poured all his thoughts and feelings into his personal journals and sketches.

Late Recognition

Dr. T. C. Anand Kumar and Dr. Indira Hinduja announced the birth of India's first "scientifically" documented IVF baby, Harsha, at the ICMR's Institute for Research in Reproduction (IRR) in collaboration with KEM Hospital Mumbai in 1986. This work was published in the ICMR Bulletin in 1986 and in the *Journal of In Vitro Fertilization and Embryo Transfer* in 1988.

Dr. T. C. Anand Kumar, was invited for the Dr. Subhas Mukherjee Memorial Oration organized by Prof. Sunit Mukherjee on 19th June 1983, but he could not attend the event. In 1997, Dr. T. C. Anand Kumar attended the Dr. Subhas Mukherjee Memorial Lecture on "The Third National Congress on Assisted Reproductive Technology".

Prof. Sunit Mukherjee requested Dr. T. C. Anand Kumar to go through the papers and handwritten notes of Dr. Subhas Mukherjee. After going through these documents, Dr. T. C. Anand Kumar took a very courageous step to fully give credit to Dr. Subhas Mukherjee for his pioneering feat and acknowledged 'Durga' as being the first IVF baby of India. He collated all the published and unpublished work of Dr. Subhas Mukherjee in Current Science (1997) entitled "The Architect of India's First Test-Tube Baby : Dr. Subhas Mukerji".

HISTORICAL NOTES

Architect of India's first test tube baby: Dr Subhas Mukerji (16 January 1931 to 19 July 1981)

T. C. Anand Kumar

According to Dr. T. C. Anand Kumar, Dr. Subhas Mukherjee was 'far ahead of his time' in successfully using an ovarian stimulation protocol before anyone else in the world had thought of doing so.

Dr. Mukherjee's invention of combining *in-vitro* fertilization and cryopreservation of human embryos is the most widely used technique for assisted reproduction.

In 2002, ICMR recognized Dr. Subhas Mukherjee's work for the first time, 21 years after the birth of first IVF baby in India due to the efforts made by Dr. T. C. Anand Kumar.



Dr. Vasantha Muthuswamy, Ms. Kanupriya with Dr. T. C. Anand Kumar at an event to commemorate the silver jubilee of IVF

In 2003, Ms. Kanupriya Agarwal, "Durga" spoke at a seminar arranged by Dr. T. C. Anand Kumar's Hope Infertility Clinic with the help of ICMR and the Inter Academy Biomedical Science Forum in Bangalore on the occasion of the silver jubilee of IVF.

Posthumous Accolades

- After the sad demise of Dr. Subhas Mukherjee, the Indian Cryogenics Council started the “Dr. Subhas Mukherjee Memorial Oration” in 1982.



- The Jadavpur University, Indian Cryogenics Council and Behala Balananda Bramachari Hospital established the “Dr. Subhas Mukherjee Memorial Reproductive Biology Research Centre” at Behala, Calcutta which was inaugurated by Prof. Asoke Mitra on 19th June, 1985.
- In 1985, Mr. Tapan Sinha directed a film “Ek Doctor Ki Maut” based on the life of Dr. Subhas Mukherjee.

Soon after Dr. T. C. Anand Kumar’s announcement, many scientific societies recognized Dr. Mukherjee's work.

- A plaque was set on 19th June 2006, at the entrance of academic building of NRS Medical College and was inaugurated by Dr. Surjya Kanta Mishra, Hon’ble Minister,

Health & Family Welfare, Government of West Bengal to acknowledge the contributions of Dr. Subhas Mukherjee.

- In 2007, Dr. Subhas Mukherjee's name was listed in "Dictionary of Medical Biography' published by World Foundation which enlisted 1100 scientists who made path breaking contributions to medical science.
- On the occasion of 30 years of IVF, Brazilian Medical Society organised an event on 7th November 2007, where they recognised and honoured Dr. Subhas Mukherjee for his achievements by offering a trophy to "Dr. Subhas Mukherjee Memorial Reproductive Biology Research Centre" and another to Dr. T. C. Anand Kumar to symbolise the success of IVF.
- "Life and Work" of Dr. Subhas Mukherjee was published in the "DAWN" Vol-11, 2011, a peer reviewed journal on world literature, tribal studies and warfare awareness."
- Sandra Barnreuther, a graduate of University of Heidelberg, Germany wrote her Ph.D. thesis on "The History of IVF in India" in 2012, where she highlighted Dr. Subhas Mukherjee's endeavour behind India's first successful IVF baby.



Dr. Smita Mahale, Director, ICMR-NIRRH, Mumbai with Prof. Sunit Mukherjee when she delivered the Subhas Mukherjee Oration, 2019

- Dr. Subhas Mukherjee Award was announced by ICMR in the year 2012 in his memory. This award is granted to a scientist for outstanding contributions, in the field of assisted reproductive technology, reproductive biology and endocrinology, and reproductive health.
- A life-sized statue of the Dr. Subhas Mukherjee was unveiled near his birthplace at Sadar Hospital, Hazaribagh in 2018.



Dr. Subhas Mukherjee's statue was unveiled at his birthplace Hazaribagh at Sadar Hospital in Jharkhand.

Tribute to the Advocates of Dr. Subhas Mukherjee's work

The three strongest advocates of Dr. Subhas Mukherjee are no more.

Dr. T. C. Anand Kumar passed away on 26th January 2010. He along with Dr. Indira Hinduja was credited with the birth of India's first IVF baby. He could have kept silent even after knowing the details about Dr. Subhas Mukherjee. A true scientist has a quest for the truth and he too gave up his own laurels to give due credit to Dr. Subhas Mukherjee. If not for him, the world would possibly never have known about the legend, "Dr. Subhas Mukherjee."

Mrs. Namita Mukherjee, wife of Dr. Subhas Mukherjee, a history teacher supported him to pursue his love for science and medicine. She succumbed to her long-term illness on 12th July 2014, after tremendous suffering.

Prof. Sunit Mukherjee passed away on 4th January, 2020. A true friend who literally devoted his entire life to wipe out the blemish of "fraud" that was levied on Dr. Subhas Mukherjee and gave his friend, the due credit that he deserved. He said that Dr. Subhas Mukherjee should be remembered as an innovator who had many ideas for reproductive medicine which too had an untimely death.

Chronicling the achievements and rapid advancements in the field of IVF would remain incomplete without the noteworthy mention of Dr. Subhas Mukherjee. His meticulous research has kindled hope for many couples, struggling to conceive, saving them from emotional and social misery. Dr. Subhas Mukherjee is no longer with us but will continue to live forever through his outstanding scientific contributions.

The Authors

Dr. Srabani Mukherjee:



She is Scientist 'F' and head of Molecular Endocrinology Department at the ICMR-NIRRH. She has been meticulously pursuing scientific research in the field of female infertility for nearly two decades. She has earned her doctorate in Biochemistry from Indian Institute of Chemical Biology, CSIR, Calcutta and completed her Post-doctoral training at the University of Texas Health Science Centre, USA. She is currently focused towards elucidating the pathophysiology of the polycystic ovary syndrome using multi-faceted approach. Dr. Srabani Mukherjee is the author of several research publications in journals of international repute in the

field of molecular biology and reproduction. She has been honored with the prestigious Dr. G. P. Talwar Award for Middle Career Scientists and Labhsetwar Award for eminent research in the field of reproductive health.

Dr. Rajvi H. Mehta:



She is an alumni of Institute for Research in Reproduction (now ICMR-NIRRH) who worked with IRR-KEM's IVF team for 5 years. She obtained her doctorate on the "Biology of the Human oocyte in women undergoing IVF-ET" under the guidance of Dr. T.C. Anand Kumar. She then worked as a clinical embryologist at Hope Infertility Clinic, Bangalore and assisted Dr. T. C. Anand Kumar in going through the documents of Dr. Subhas Mukherjee. She has published original papers on infertility; co-authored ICMR's Manual on Human IVF-ET and contributed over a dozen chapters to Textbooks on

ART. She has been awarded Indian Society of Assisted Reproduction's first young scientist award and has been an invited speaker at the European Society of Human Reproduction and Embryology (ESHRE). She is currently an Academic Consultant to Cooper Surgicals, India and Scientific Consultant to Trivector Biomed.

MADONNA



"I draw pictures of live Madonnas with hormones"
- Dr. Subhas Mukherjee



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