

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

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I was recently invited to deliver the Subhas Mukerji Memorial Oration at the Third National Congress on Assisted Reproductive Technology and Advances in Infertility Management held in Calcutta on 8 February 1997. I had never met Subhas Mukerji but I did come to know of his name when it shot into instant fame following a report by K. S. Jayaraman in the *New Scientist*¹ about Mukerji's announcement of the birth of India's first test tube baby on 3 October 1978. Unfortunately, shortly after his announcement, Mukerji put an end to his Life for reasons that were not widely known. The matter was soon forgotten and his claim was generally thought to be one of those scientific aberrations that occur from time to time.

The organizers of the recent Calcutta meeting believed that I was pre-eminently qualified and experienced to delve into whatever material was available regarding Mukerji's past work and throw light on it. The reason for this assumption perhaps lay because of my having played a key role in the birth of another test tube baby, Harsha, on 6 August 1986. This birth was announced by myself, when I was the Director of the ICMR's Institute for Research in Reproduction and Dr G. B. Parulekar, Dean of our collaborating institution, King Edward Memorial (KEM) Hospital, Bombay. Harsha was described as India's first 'scientifically documented' test tube baby because details of Mukerji's work were not then available. I published our technical and procedural details in the *ICMR Bulletin*². The work leading to Harsha's birth was executed by a team of scientists from the IRR and clinicians from the KEM Hospital working under my direct guidance and supervision.

Material for this article comprised Mukerji's handwritten laboratory notes, list of his publications and papers presented at various scientific meetings, his correspondence with various scientists abroad and the Government of West Bengal, under which he served and the personal interviews I had with some of

major *dramatis personae* in this whole episode.

On going through this material I have no doubt that Mukerji did produce a test tube baby. He and his colleagues were obviously working on their project at the same time as R. G. Edwards and Patrick Steptoe were working in England. These two groups were oblivious of each others work. However, it is interesting to note that Mukerji and Edwards obtained their doctorate from



the Edinburgh University and that both had attended the symposium organized in 1971 in Bombay when the Institute for Research in Reproduction was inaugurated. Unlike Edwards and Steptoe, who got kudos for their achievement, Mukerji and his associates were ridiculed by the medical fraternity and victimized by the bureaucracy. Both these humiliating experiences led him to put an end to his life.

Not much of his triumphant achievements nor the tragic circumstances leading to his demise is widely known. There has however, been in existence, as I learnt only quite recently, a small group of scientists in Calcutta who

firmly believe that Mukerji did produce India's first test tube baby. This group has perpetuated the memory of Subhas Mukerji for a decade and a half through scientific activities. The sincerity of this group and its strong conviction leaves one without any doubt that Mukerji did not stake a fraudulent claim.

My own research coupled with the existence of this group provide compelling reasons to make known these facts to a larger group of people so that they can appreciate a part of the India's triumphant, and yet tragic, scientific heritage.

Announcement of the birth of India's first test tube baby

Calcutta Doordarshan flashed the news of the birth of India's first and the world's second test tube baby on Tuesday, 3 October 1978 at 11.44 AM. The team responsible for this procreation comprised Subhas Mukerji, Professor of Physiology, Bankura Sammilani Medical College; Sunit Mukerji, Professor of Food Technology, Jadavpur University and Dr Saroj Kanti Bhattacharya, Associate Professor of Gynaecology and Obstetrics at the Calcutta Medical College. This news was widely reported in almost all the leading dailies of Calcutta^{1,3-5}. Some essential details of the procedure were described and a photograph of a new born baby was published. The baby girl was given a pseudonym, Durga, after the most popular goddess of Bengalee Hindus. The mother's name was mentioned as Mrs Bela Agarwal⁵.

Technical procedure as described by Subhas Mukerji and colleagues

At the behest of the West Bengal Government, Subhas Mukerji, Sunit Mukherjee and S. K. Bhattacharya submitted a signed report on 19 October 1978, sixteen days after Durga was born. This report titled 'Transfer of *in vitro* fertilized frozen-thawed human embryo' briefly describes their work leading to Durga's

birth. The contents of this crucial document are not widely known and is therefore reproduced verbatim:

'Mrs Agarwal aged 31, married for 16 years, a case for primary infertility due to diseased tubes had apparently normal ovulatory period on 12-11-77. On 14-11-77, 16-11-77, 18-11-77 and 20-11-77 she had 4 ampoules of inj. Pergonal i.m. twice daily each day; on 22-11-77 she received 6000 I.U. of hCG (Physex, Leo) i.m. On 24-11-77 she was subjected to colpotomy when each of her ovaries were delivered through the colpotomy wound one after the other. Follicles measuring approximately 2 cm were identified and the follicular content aspirated by glass syringe using short bevelled needle. The aspirated material from 5 follicles also containing follicular fluid were collected in separate flat bottomed sterile vials and put into an incubator straight away set at 37°C. Each of these were examined microscopically using ordinary microscope and the corona cell covered preovulatory oocytes were identified subsequently. The incubation was continued for 4 hours approximately. Then husband's semen was collected, washed twice and 2×10^6 spermatozoal suspension per ml was prepared using modified Tyrode's solution with serum. The identified oocytes were transferred into the spermatozoal suspension and incubated for approximately 24 hours. After this the oocytes were transferred to freshly collected nontoxic heparinized cervix-uterine fluid drops containing approximately 100 I.U. Penicillin/ml, under paraffin. The incubation was continued (37°C) for another approximately 72 hours. The oocytes examined microscopically five in number were all cleaving showing 8 or more cleavage cells. The suspended embryos were equilibrated in a stepwise fashion at 20°C with 1.5 M Dimethyl Sulphoxide and frozen in ampoules as follows:

'Based on the available information in the literature this simple technique was adopted to freeze, store and thaw the embryo. Initially the sealed ampoules containing embryos were cooled slowly in alcohol bath in a glass dewar by adding carbon dioxide snow at regular intervals. A blank experiment was done to see that the temperature drops at the rate of about 0.5°C/min. After -7°C the rate was increased to about 1°C/min and the addition of snow was continued for about an hour.

Then the ampoules were chilled in liquid nitrogen in a dewar. The ampoules were stored in cryogen for about 53 days.

'Before use the ampoules were thawed individually slowly at the rate of about 4°C/min by adding continuously fresh alcohol to the alcohol bath until about -7°C. Then the ampoules were transferred to iced water and finally warmed with tap water.

'On the day of transfer the embryos after thawing were incubated for at least 1 h at 37°C. Mrs Agarwal had a delayed period on 3-1-78. On 18-1-78, 19-1-78 and 20-1-78, three embryos suspended in cervical fluid were transferred into the uterus near the fundus per Os using a microsyringe attached with a transparent plastic tube. Mrs Agarwal missed her periods with clinical symptoms of pregnancy and immunological test for pregnancy was positive on 14-2-78 and again on 21-2-78. She was delivered of a healthy female baby weighing 3 kg, 350 gm on 3-10-78 by lower segment Caesarean section.'

Subhas Mukerji's academic background

Subhas Mukerji was a medical graduate of the Calcutta University. He went on to work for his D Phil degree under Professor Sachidananda Banerjee of the same University. The subject of his study was biochemical changes in normal and abnormal pregnancy. He was awarded a Colombo Plan scholarship to work in the MRC Clinical Endocrinology Research Unit in Edinburgh under Professor John A. Loraine, an eminent reproductive physiologist. His research was directed to developing new, sensitive bioassays for gonadotropins using ovaries in intact rats. This was one of the hot topics of the sixties when radioimmunoassay had not yet made its advent; one had to depend on these very sensitive, but cumbersome, assay methods to understand the physiology of reproduction. Indeed, some of the very early foundations of reproductive endocrinology were laid using such assays. It must be noted that there were very few laboratories in the world at that time who had the competence to undertake such studies. A person had to be really hardworking, dedicated and putting in long hours of work to get meaningful results out of such assays. I mention all this to highlight the fact that

Mukerji had acquired considerable research skills in such areas that are normally seen only in those confined to the research laboratory.

Mukerji's research blossomed when he returned to Calcutta. He used his considerable technical skills, matched with a fertile mind, to study a wide range of reproductive physiology-pathology problems. From the list of Mukerji's publications I could pick out the following interesting lines of research carried out by him:

He was familiar with the pharmacological (mainly gonadotropins) methods of inducing ovulation and spermatogenesis in human subjects.

He was interested in innovative gynaecological surgery.

He also worked on experimental animals and was able to translate these findings to the human situation as exemplified by his work on finding the luteotropic effects of DHEA and testosterone in rats and human beings.

He demonstrated the presence of hCG-like substance in non-pregnant human endometrium both by biochemical isolation as well as by bioassay. He speculated on the possible role of the uterine hCG-like substance on foetal development – an interesting lead that has alas not been followed up.

More basic issues such as the androgenization of the female rat brain and acyclicity of menstrual cycles in women were also investigated by him. His studies showed that acyclicity of reproductive cycles as seen in amenorrhoeic women and neonatal androgenised rats was not primarily due to changes in the hypothalmo-hypophyseal system but in altered ovarian secretions because unilateral ovariectomy of such rats as well as wedge resection of polycystic ovaries in women restored cyclicity.

Another area that is of profound relevance today is his theory that emotional stress was the cause of polycystic disease. He postulated in 1970 that emotional stress was a contributory factor to the development of Stein-Levanthal syndrome or the polycystic ovarian disease leading to infertility. With the current availability of transvaginal ultrasonography, a significantly larger number of women are now being classified as having polycystic ovaries. Is this a reflection of the advent of the new investigative tool that has be-

come available? or is it a reflection of stress experienced by the modern female urbanite? It is only in recent times that stress has been recognized as a contributory factor to infertility and other reproductive disorders⁶.

Mukerji's presentation of his work at scientific meetings

A substantial amount of interest was generated in Mukerji's claim following his announcement over Calcutta Door-darshan. He was invited to present his findings at many scientific meetings. Mukerji has recorded these meetings in an official letter dated 1 December 1978, addressed to the Director of Health Services (DHS), West Bengal Government.

Mukerji presented his findings in the section on 'Ovum implantation' at the V International Congress on Hormonal Steroids held in New Delhi from 29 October to 4 November 1978. His presentation was chaired by B. B. Saxena of the Cornell Medical School and S. K. Manchanda of the Department of Physiology, All India Institute of Medical Sciences, New Delhi. The presentation was actively discussed by some eminent scientists of that time and who had attended the Delhi meeting such as, John Biggers and Kenneth Ryan from Harvard, Mettler from Kiel, and Bettendorf from Hamburg. Immediately after this meeting Mukerji gave a public lecture at the Gangaram Hospital, New Delhi. He was interviewed at great length by B. B. Saxena and G. P. Talwar in a special programme which was telecast by Delhi Doordarshan on 3 November 1978. Mukerji has gone on record of having discussed his findings with some of the leading scientists in reproductive sciences at that time in Delhi: B. K. Anand, G. P. Talwar and Somnath Roy.

Mukerji was invited by J. Nag Choudhary, Professor of Physiology to speak at the Satellite Symposium of the V International Congress on Hormonal Steroids in Varanasi. His talk was chaired by a well-known scientist, Udupa, the then Director of the Department of Surgical Sciences at the Banaras Hindu University.

Mukerji was invited by Gogoi, Professor of Obstetrics and Gynaecology, Gauhati Medical College to speak on his technique of embryo transfer. He was

awarded a 'MANPATRA' in recognition of what the Society thought to be an outstanding piece of work.

He was met by Ambassador Marshall Green, Coordinator of Population Affairs, US State Department, Washington on 6 November 1978 and later by Kessel, Population Division, University of North Carolina, USA to discuss the relevance of his work *vis-à-vis* the Population Problem.

He made a major presentation on his work at the Indian Science Congress in 1979 in Hyderabad.

Reaction of the medical fraternity

Tarun Banerjee, a leading gynaecologist of that time in the Calcutta Medical College, is reported to have stated that 'there should be a scientific discussion in detail about three methods, collecting ovum from the mothers ovaries, fertilization of the ovum and its development and pushing it back into the mothers uterus, which were very complex...'. (ref. 4). These are the only published criticism I could get hold of. I understand that similar doubts and skepticism were expressed by several others at that time which vitiated Mukerji's claim.

The brief press reports that appeared along with the announcement of Durga's birth^{1,3-5}, did address all the three issues raised by Tarun Banerjee but was not fully comprehended by the 'experts' of those times because of limited knowledge in this frontier area of research.

West Bengal Government's reaction to Mukerji's claim

The Government of West Bengal appointed an 'expert committee' under the Indian Medical Association (West Bengal Chapter) and the Bengal Obstetrics and Gynaecology Association to investigate into the claims made by Mukerji and his colleagues in the brief report sent to them on 19 October 1978.

The Committee was headed by a professor of radiophysics and assisted by a gynaecologist, a physiologist and a neurophysiologist. None of these committee members could have had any background or insight into the modern science of Reproductive Technologies, a subject upon which they were to hold an inquiry. One wonders the reasoning of the West Bengal Government for nominating a person from a totally alien field

to head this important committee.

This inquiry committee met on the 18 November 1978 to critically review the report given by Mukerji to the DHS (reproduced in an earlier part of this paper) but ended in a denouement of Mukerji's claim. Mukerji wrote to the DHS on 1 December 1978. Mukerji stated that the kind of inquiry instituted required adequate time for him to prepare the report. He had to hurriedly prepare his report for the inquiry committee at short notice (the report was prepared within two weeks of the announcement). With very sound reasoning, he did not reveal all his data because he wanted to 'publish these in recognized scientific journals after the reproducibility of the work is reasonably assured'. He went on to state: 'The final concentration of DMSO used before freezing as well as the exact indigenous method of cooling were deliberately omitted from the report, like (also) the steps for removal of DMSO before thawing. Certain essential intermediate steps, during the whole procedures also involving the use of undisclosed and enriched media were completely omitted. I had to be careful to guard our unpublished data, because by that time I became aware of the penetrating efficiency of the tentacles of the mass media.'

Areas of dominant research in the seventies

Population overgrowth *vis-à-vis* diminishing finite natural resources was the dominant thought of concern. The contraceptive pill and the Intra Utrine Device (IUD) emancipated the coital act from procreation. These discoveries gave impetus to seek out newer contraceptives through basic research. The eradication of small pox from the planet Earth in early seventies through vaccination encouraged the then Health Minister, Dr Karan Singh to believe that a contraceptive vaccine would be the answer to eradicate the bane of overpopulation. Funding for contraceptive research reached its nadir from the Government of India as well as from many international agencies. Major developments in contraceptive research occurred in the All India Institute of Medical Sciences; the Department of Zoology of the Delhi University; the National Institute of Family Planning, New Delhi; the

CDRI, Lucknow; the IRR, Bombay and the Indian Institute of Science, Bangalore. Those were heady days indeed when scientists not only in India but on a global level were vying with one another to be the first to produce a better alternative to the Pill and IUDs.

Not much attention was paid during this period to research being made by a handful of scientists around the globe including Subhas Mukerji. Very few people in the developing countries, which were beleaguered with population overgrowth, even considered pro-fertility research of being of any use. Conferences on reproductive sciences in the seventies attracted large number of participants talking about new information on how new contraceptives could be developed. There were hardly any papers on the new reproductive options. Research and development of the new reproductive options took place against such a background – without public interest, without public support and general ignorance for the need to carry out such research. Medically Assisted Reproductive Technologies (MARTs) were not a fashionable subject for research then as it is today.

Calcutta in the seventies

Calcutta has a hoary history of producing some of the brilliant scientists during the end of the last to the beginning of the present millennium. Calcutta lost most of its glory in more ways than one when the Capital was shifted to Delhi. Partitioning of SONAR BANGLA following Independence of India was another human tragedy with the influx of a massive refugee population from neighbouring East Pakistan. This downward trend in Calcutta's glory reached its lowest level in the seventies following the post-war entry of refugees from the newly created Bangladesh. There was serious economic crisis. This was the OH CALCUTTA era. Mukerji carried out his work under such dismal economic conditions. But as the famous saying goes, the lotus grows in a marshy tank, so also Mukerji's work grew under daunting conditions. One cannot but admire his tenacity and perseverance.

It is noteworthy that the seventies witnessed a bleak period in Indian history when a State of National emergency was promulgated and forced sterilizations were the order of the day in the

name of family planning. Anyone who was concerned with reproduction research spent all efforts to develop better contraceptives. Those who did not conform to the then National goals were summarily arrested and questions asked later.

Considering these abysmal conditions one can understand why not much attention was being given to the then unfashionable research being carried out by Mukerji and why he was so cautious and secretive about his work.

A critique of Mukerji's technique

The brief description given by Mukerji in his letter dated 19 October 1978 to the Director of Health Services, Government of West Bengal, the reports he gave over the television interviews and reported in the lay press describe how Mukerji carried out the procedure of *in vitro* fertilization.

Collection and evaluation of spermatozoa

Durga's father was found to have a low sperm count³⁻⁵, according to Mukerji who obviously was aware of the diagnostic value of semenograms as evidenced by the papers he presented^{7,8} much before the WHO laboratory manual for the examination of human semen came out in 1980. Mukerji also knew that such a condition can be effectively treated with gonadotropins⁹. Gonadotropin therapy is now routinely used to treat men with low sperm counts.

Ovarian stimulation

In his report dated 19-10-1978 to the DHS, Mukerji stated that he had treated Mrs Agarwal with hMG 76 ampoules given twice a day and on alternate days and starting from day 3 to day 9 of the cycle. She was given 6000 I.U. of hCG on day 11 of the cycle and she was subjected to oocyte aspiration some 48 h later. Mukerji was able to aspirate 5 follicles by this method. In today's context this ovarian protocol will not sound outrageous because controlled ovarian hyperstimulation is the standard procedure for all women subjected to IVF. However, until 1980 December 'conventional wisdom' in Britain, Australia and USA dictated that stimulated cycles

were unsuitable for oocyte collection and therefore oocyte aspiration was restricted to natural cycles¹⁰. It was only in 1981 that other scientists resorted to ovarian stimulation. The Australians, who were the next to announce the birth of IVF babies, began to use clomiphene citrate for ovarian stimulation¹¹ in 1981. The Norfolk group in the USA, who were the third to report the occurrence of an IVF baby, began to use with hMG and hCG in their IVF programme with success¹² in 1982. It is noteworthy that Mukerji was far ahead of his time in successfully using an ovarian stimulation protocol before anyone else in the world had thought of doing so.

Ovum pick-up for IVF was a problem during the early days. The British team had used a laparoscope to harvest oocytes. The advent of ultrasonography later on opened out a new avenue to aspirate oocytes transvesically under ultrasound guidance by making apercutaneous insertion of a long needle traversing the abdominal wall, the urinary bladder and finally the ovarian follicle. The advent of the transvaginal probe has made it possible to collect oocytes per vaginum and this is the standard procedure used now.

Mukerji's originality was that he was able to access the ovaries by a very simple operation on the wall of the vagina. Stimulated ovaries enlarge and drop down towards the Pouch of Douglas. A small incision on the posterior wall of the vagina would allow the ovaries to fall through this opening. This reminds one of how a biologist gains rapid access to the ovaries of rats by a very simple lateral, abdominal incision. The entire procedure was accomplished within a couple of minutes. Mukerji's research experience with rats and humans had helped him take this very simple and original approach of gaining access to ovaries by posterior colpotomy.

One wonders why this very simple approach did not gain popularity. After all today oocytes are aspirated per vaginum under ultrasound guidance.

In vitro culture techniques

The freshly aspirated oocytes were incubated for 4 hours before inseminating them with the husband's semen that was processed in protein-supplemented Tyrodes solution. This is exactly what is done even to this day in almost all

IVF programmes to accomplish *in vitro* oocyte maturation; processing semen is essential for 'sperm activation'. The oocytes were exposed to processed semen for a period of 24 hours and later incubated for another 72 hours in a mixture of cervical-uterine fluids. The use of such fluid is not described elsewhere. However, the use of a synthetic fluid, similar to that found in the human fallopian tube, has been described to be useful for *in vitro* embryo culture procedures.

The methods of *in vitro* fertilization and embryo growth are described in detail in Mukerji's letter to the DHS dated 19 October 1978 as well as in a publication in an obscure journal¹³. Mukerji stated '... It also appears that for cryogenic preservation of embryos with a relatively larger number of blastomeres (more than 8 cells) may be preferable.'

'Few pre-ovulatory human oocytes collected from a married woman by surgery were fertilized with spermatozoa from the husband and cleaved *in vitro* and subsequently frozen slowly to about 196°C after stepwise treatment with dimethyl sulphoxide. One such frozen embryo was subsequently thawed slowly and when transferred into the uterus of the woman apparently resulted in the production of a clinically normal female baby after normal period of gestation.'

Here is clear published evidence of how exactly Mukerji carried out his version of *in vitro* fertilization and embryo transfer.

Cryopreservation of embryos from mice, rabbits, sheep goats and cattle was reported between 1971 and 1979. The first report on the successful cryopreservation of four to eight cell human embryos appeared as late as 1981 and the first successful clinical outcome of the transfer of thawed human embryos was reported in 1983 by Trounson and Mohr¹⁴. A WHO Report¹⁵ states 'Embryo cryopreservation has now become a routine adjunct to IVF procedures, and various methods of freezing are employed. The method that has yielded the best results in terms of simplicity, efficiency and reproducibility is one that involves freezing of one- to three-day-old embryos (one to eight cells) in a controlled biological chamber that cools the embryos to sub-zero temperatures in the presence of a cryoprotectant 1,2-propanediol. Other cryoprotectants that

are used are dimethyl sulphoxide (the same cryoprotectant was used by Mukerji) and glycerol.

It may be noted that Subhas Mukerji reported the successful cryopreservation of a 8-cell embryo, storing it for 53 days, thawing and replacing it into the mother's womb, resulting in a successful and live birth as early as 1978 – a full 5 years before anyone else had done so. This small publication of Mukerji in 1978 clearly shows that Mukerji was on the right line of thinking much before anyone else had demonstrated the successful outcome of a pregnancy following the transfer of a 8-cell frozen-thawed embryo into human subjects transferring 8-cell cryopreserved embryos.

Controversies and debates following birth of test tube babies

Edwards and Steptoe's pioneering work attracted considerable public attention on a global scale. These have been eloquently described in the two books^{16,17}. The manner in which the test tube baby project was handled by the Edward-Steptoe team is a classical example of how a combination of transparency, scientific debate as well discussing moral, ethical, legal and religious issues can turn the tide from one of societal hostility to that of societal acceptance. Almost every aspect of Edwards work, starting from the *in vitro* culture of human eggs obtained from ovariectomized patients to *in vitro* fertilization, since the sixties to the late seventies was chronicled in peer-reviewed scientific journals, and debated intensely at public meetings. Edwards is very conscious of moral and ethical issues arising out of the new reproductive technologies. He has been careful to subject every aspect of his human experiments to institutional ethics committees, obtained their permission before actually starting of the experiments even though this meant his losing out on being the 'first ever' on several new technologies such as intrafallopian transfer of gametes and embryo cryopreservation. Perhaps no single individual has done so much for this field than Edwards. He is a trend setter on how research in new areas concerning humanity should be conducted. Today if MARTs is a respectful discipline, the credit should go the Edwards and his team mates.

Our own test tube baby project in

Bombay attracted a great deal of attention, including that of the Indian Parliament where a member had tabled a question in the house asking for details of this event. Fortunately, I had all the essential scientific documentary clearances and evidence in the form of the Approval of IRR's Scientific Advisory Committee, the Hospital Ethics committee's clearance and finally photographic documentations of the entire procedure. I was able to foresee such events well in advance and be prepared for such an eventuality as had occurred because 'I was able to look further because I could stand on the shoulders of great men before me' – in this case, Subhas Mukerji.

If Subhas Mukerji feared public criticism he was not alone. Edwards and Steptoe narrate how they were spurned by fellow scientists and how they were denied research funds. Zeilmaker in Holland, Howard Jones in the US and Trounson in Australia have all at some time or the other been criticized for their work in *in vitro* fertilization of human eggs. Indeed, Edwards describes in his books^{16,17} how he was able to silence the Press and even legally penalize them for misrepresenting his statements. All this makes very interesting reading.

Mukerji driven to put an end to his life

The DHS, in a letter dated 28 December 1978, specifically prescribed Mukerji from attending 'any conference in the future without prior permission from the competent authority'. Mukerji was invited by the Primate Research Centre of the Kyoto University, Japan, on 25 January 1979 to attend a closed meeting at their expense to discuss details of Mukerji's work. Mukerji applied to the DHS for permission, which was promptly denied vide their letter of 16 February 1979. The letter directed Mukerji not to leave the country without prior clearance from the Government. Subhas Mukerji shortly afterwards suffered a heart attack. His request for special leave was declined but his request for transfer was promptly accepted and, at 'pleasure of the Governor of West Bengal' he was transferred to the Regional Institute of Ophthalmology as Professor of electrophysiology on 5 June 1981. The Government preventing him from presenting his work at scientific meetings,

denying him leave to write up his results and the humiliation he was subjected to by his colleagues in Calcutta were some of the things that the sensitive Subhas Mukerji could not bear. His transfer to a department in which he had no expertise was the last straw on the proverbial camel's back for Mukerji. This transfer order was dated 5 June 1981. Mukerji gave up fighting the system and ended his life on 19 July 1981, 44 days after the transfer order was issued.

Much of Mukerji's work remained unpublished not because he did not have data but because he was not given a chance to do so by his administrative Ministry in the Government.

Why did Durga and her parents choose anonymity?

There remains the question as to why Durga's parents wished to remain anonymous when most parents of IVF babies all over the world came out with their story of how medical science and technology aided their infirmity. One must understand the Indian psyche which considers barrenness to be a curse. Unmarried girls are considered to be unfortunate and therefore it is the desire of most parents of girl children to find a suitable husband and have them settled in life as soon as possible. Durga's parents echo such sentiments; her mother was married at the age of 16 and could not have a child for next 16 years – almost for the entire period she lived before marriage. In my discussions with them it became obvious that they did not wish to have much publicity as this may adversely affect India's first test tube baby's chances of getting married. I was introduced to Durga by her parents at my request. She is a well-educated young woman and is aware of the origins of her birth. She was all for

advancement of science but was not prepared to be viewed as a curious object and subjected to the media intrusion into her or her parents private lives. Like Mukerji, before me, I too left Calcutta feeling obliged to respect their desire for privacy.

Conclusions

I have narrated my findings. I leave it to the reader to judge various issues on their merit. As far as I am concerned, Mukerji did reach great heights. His achievements in the biology of reproduction dwarf all other achievements of India in this field. Unfortunately, ignorance of the medical fraternity, bureaucratic arrogance and vindictiveness, led to the loss of one of our distinguished scientists. We also lost our claim to having been the first in the world to have succeeded in not only fertilizing human eggs *in vitro* but also having successfully cryopreserved the embryo, thawing it and leading to the birth of a healthy normal baby following the embryos replacement into the mothers womb. This situation is all too familiar to many of those who have tried to climb heights where only eagles dare to reach while lesser mortals exhibit the typical Indian Crab Syndrome which results in none of the crabs kept in a basket ever reaching the top because the remaining will pull it down.

I sincerely hope that the publication of this article will at least lead to some soul searching and result in posthumously crediting Mukerji for his brilliant achievements under very trying conditions.

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