Institute of Post Graduate Medical Education & Research
244, A.J.C. Bose Road, Kolkata – 700020.

IPGME&R Research Oversight Committee

(Institutional Ethics Committee)

Memo No. IPGME&R/IEC/2021/589

Date: 29.11.2021

Dr. Pradip Mukhopadhyay
Professor
Department of Endocrinology
IPGME&R, Kolkata

Dear Dr. Mukhopadhyay,

A meeting of the Institutional Ethics Committee of IPGME&R, Kolkata, was held on 27.11.2021 at 12:00 Noon in the Office of the Dean, IPGME&R, Kolkata. In this meeting the members considered the protocol of your project:

Evaluation of lipidomic signature in prediction of onset of polycystic ovary syndrome (PCOS).

The following additional documents were reviewed:

- Informed consent documents in English.
- Informed consent documents in Hindi.
- Informed consent documents in Bengali.

After deliberations and review the committee took the following decision regarding your project:

Approved

Kindly note the following:

- The committee understands that your study does not have any commercial sponsor.
- The study proposes to recruit undergraduate medical students at multiple sites. Students, in this setting, constitute a vulnerable population. Obtaining Institutional Ethics Committee approval for each participating medical college is mandatory. Further if any first year student is below 18 years of age at recruitment, then this should be done only after obtaining parental or legal guardian consent.
- The Committee recommends that an awareness and sensitization program may be done for interested students at each participating site before recruitment.

It is placed on record that the decision regarding your proposal was unanimous and therefore did not require any voting procedure. List of members who attended this meeting is provided on the next page. Members absent have reviewed the same documents and have not sent any note of dissent or objection regarding your proposal.

Additional points, if any, mentioned on Page 2 are also to be noted.

Continued on Page 2

Continued from Page 1

Additional points to be noted

- The Committee expects that any amendments to the Study Protocol, Informed Consent documents or other relevant documents would be brought to its notice.
- A brief project completion report is to be submitted to the IPGME&R Research Oversight Committee. If project duration exceeds 1 year from commencement, a brief annual progress report should also be submitted.
- IPGME&R Research Oversight Committee is registered with Central Drugs Standard Control Organization (CDSCO), Government of India, in consonance with Rule 122D of the revised Drugs & Cosmetics Rules 1945 – Registration No. ECR/35/Inst/WB/2013/RR-19. It functions in accordance with New Drugs and Clinical Trials Rules 2019 under the Drugs & Cosmetic Act and Indian Council of Medical Research (ICMR) guidelines.

List of institutional ethics committee members who attended the meeting on 27.11.2021

SN	Name & role in the committee	Gender	Designation
1	**Dr. Hemanta Kumar Majumder** [Scientist & Chairperson]	Male	Senior Scientist, Indian Institute of Chemical Biology, Kolkata
2	**Prof. Amal Kanti Das** [Basic Medical Scientist]	Male	Professor, Dept. Pharmacology, IPGME&R
3	**Prof. Bijay Kumar Majumdar** [Clinician]	Male	Consultant Plastic Surgeon; Former Head, Department of Plastic Surgery, IPGME&R
4	**Prof. Biman Kanti Ray** [Clinician]	Male	Professor, Dept. Neurology, Bangur Institute of Neuroscience, IPGME&R
5	**D. Amal Kumar Santra** [Basic Medical Scientist]	Male	Scientist, Formerly of Department of Gastroenterology, IPGME&R
6	**Dr. Bobby Paul** [Public Health Expert]	Female	Associate Professor & Head, Dept. of Preventive & Social Medicine, All India Institute of Hygiene & Public Health, Kolkata
7	**Dr. Sananda Pati** [Clinician – Pediatrician]	Female	Assistant Professor, Department of Pediatrics, IPGME&R
8	**Mr. Debdut Mukherjee** [Legal expert]	Male	Advocate, Calcutta High Court
9	**Mr. Arunangshu Shekhar Jana** [Social worker]	Male	Social worker, Mahendraganj, Dist. South 24 Parganas
10	**Dr. Nila Majumdar** [Lay person]	Female	Bengali teacher, Kolkata
11	**Prof. Avijit Hazra** [Pharmacologist & Member secretary]	Male	Professor, Department of Pharmacology, IPGME&R

Avijit Hazra 29/11/2021

Dr. Avijit Hazra – Member Secretary
IPGME&R Research Oversight Committee

Member Secretary
Institutional Ethics Committee
Institute of Postgraduate Medical
Education & Research (IPGME&R)
Kolkata – 700020

GOVERNMENT OF WEST BENGAL
Science & Technology and Biotechnology DEPARTMENT

Tel:

Fax:

Memo No : 1365(Sanc.)/STBT-11012(19)/27/2021-ST SEC Date: 21/03/2022

Sanction Order for Grant-in-Aid in Cash

Demand No. : 76 Department Code : BS Financial Year : 2021 - 2022

1. Sanctioning Authority: ASSISTANT SECRETARY,Science & Technology and Biotechnology
2. Recipient of Grant: IPGME & R, Kolkata.
3. Category of the recipient of Grant: Grantee Institution
4. Amount Sanctioned: Rs.855000/-

   Rupees Eight Lakh Fifty Five Thousand Only.
5. DDO Code :- CAFSTA003
6. DDO Designation: Sec. Officer, Science & Technology & Biotechnology Dept.
7. Department Code: BS-Science & Technology and Biotechnology
8. Head of Account Code :76-3425-60-200-010-31-02-V
9. Scheme Name Financial Assistance to other Scientific Bodies for undertaking Scientific
10. Name of the Treasury/PAO & Accounts office: Pay & Accounts Officer-III, Calcutta PAO-III
11. Type of Grant:- Recurring
12. Utilization Certificate Required or Not: Yes
13. Purpose of Grant : R&D project entitled- Evaluation of Lipidomic Signature in Prediction of Onset of Polycystic Ovarian Syndrome.
14. Applicable T.R Form No:- TR Form No.31
15. An amount of Rs.855000/-(Rupees Eight Lakh Fifty Five Thousand Only.) is hereby sanctioned for payment of Grant to the recipients as per Sl.No.2 from the Head of Account as stated in Sl.No.8 above against the Budget Provision of the Financial Year 2021 - 2022. The sanctioned amount will be payable through Transfer Credit into the LF/PL/Other Deposit Account/ECS/Cheque, as the case may be following the order issued by Finance Department in this regard.
16. Total released amount is within the Budget Provision of the Financial Year. 2021 - 2022
17. This order issues in exercise of the power delegated under Finance Department Memo. No. 250-FB Dt 30.07.2021with the concurrence of Finance Deptt.vide Gr. F.A. Branch U.O. No. 310/FA Date 17/03/2022
18. The Principal Accountant General (A&E), West Bengal and Pay & Accounts Officer/Treasury Officer and other concerned are being informed.
19. Remarks: Present release Rs. 8,55,000/- is the 1st installment of the total project cost of Rs. 24,30,000/- sanctioned for 3 year (s) work, will be transferred through e-Pradan system to Director, IPGME & R, Kolkata. A/C No.-11062764407 (SB), IFSC CODE-SBIN0001768, Mobile No.-9433070996.

ASSISTANT SECRETARY

Science & Technology and Biotechnology

Memo No: 1365(Sanc.)/STBT-11012(19)/27/2021-ST SEC Memo Date:21/03/2022

Copy forwarded for information and necessary action to:-

1. The Principal Accountant General (A&E), Treasury Buildings, Kolkata-700001
2. The Principal Accountant General (Audit), Treasury Buildings, Kolkata-700001
3. The Principal Accountant General (Receipt, Works &Local Bodies Audit),CGO Complex at Salt Lake,Kolkata-700091
4. Sec. Officer, Science & Technology & Biotechnology Dept.
5. Pay & Accounts Officer-III, Calcutta PAO-III
6. PSO.
7. Shri S.K. Chatterjee, SSO.
8. Accounts Officer, IPGME & R, Kolkata, 244, AJC Bose Road, Kolkata-700020.
9. Dr. Pradip Mukhopadhyay, P.I. of the project, IPGME & R, Kolkata, 244, AJC Bose Road, Kolkata-700020. (Strictly follow annexure-A).
10. Guard File. / Uploading this G.O. in the portal.

ASSISTANT SECRETARY

Government of West Bengal
Department of Science & Technology and Biotechnology
"Vigyan Chetana Bhavan", Salt Lake,
DD 26/B, Sector-I,
Kolkata - 700064.

Annexure-A

File No.: STBT-11012(19)/27/2021-ST

Name of the P.I. with Institute: Dr. Pradip Mukhopadhyay, P.I. of the project, IPGME & R, Kolkata.

General Guideline must be followed by the P.I.:

1. The selection of JRF/SRF shall be made as per guidelines of this Deptt. (Science & Technology).
2. The remuneration to the JRF/SRF & project Asst. Should be disbursed as per FD Memo No. 6261-F(Y) dt. 27.06.2011.
3. Follow FD Memo No. 5400-F(Y) dt. 25.06.2012 and Memo No. 3060-F(Y) dt. 11.06.2014 where applicable.
4. The UC along with the audited statement of expenditure should be obtained within prescribed time limit / before release of further installment of grant.
5. Follow the Budget break-up given below:

SUMMARY (in Rupees)

		1st year	2nd Year	3rd Year	Total
A					
1	Remunerations / Salaries				
	1 no JRF @25000/- PM for 1st & 2 nd yr. and @ Rs. 30,000/-PM for 3rd year.	300000	300000	360000	960000
2	Consumable (Chemicals,Reagent, kits etc.)	500000	600000	190000	1290000
3	Travel	25000	25000	25000	75000
4	Other Cost	30000	30000	45000	105000
B					
	Non-recurring / permanent Equipments/ software				0
Total		855000	955000	620000	2430000

305

Assistant Secretary to the Govt. of W.B.

GOVERNMENT OF WEST BENGAL

DEPARTMENT OF SCIENCE & TECHNOLOGY AND BIOTECHNOLOGY

VIGYAN CHETANA BHAVAN

DD-26/B, SECTOR I, SALT LAKE, KOLKATA - 700 064

Proposal at a Glance

1. Title of the project:

Evaluation of Lipidomic Signature in Prediction of Onset of Polycystic Ovarian Syndrome

2. Name of Principal Investigator (PI) and Co-PI (s) and their Online Registration ID number(s):

   PI- Prof. Dr. Pradip Mukhopadhyay Online Registration ID no.1241/PROF/M/OTH/21

   Co-PI 1- Prof. Dr. Sujoy Ghosh. Online Registration ID no.- 1244/PROF/M/OTH/21

   Co-PI 2- Prof. Dr. Debasish Bhattacharya. Online Registration ID no.1430/DIR/M/OTH/21

   Co-PI 3- Dr. Soumen Manna . Online Registration ID no.-1437/ASOP/M/OTH/21

3. Key words (ten maximum): PCOS, Metabolomics, Lipidomics

4. Broad Subject area of the Project Proposal: **Medical Sciences including Public Health**

5. **Type of Project Proposal**

   Research and technology development

6. Present status of research in the proposed field. Two seminal papers must be cited which have formed the basis of this research (100 words):

   We are not aware of any longitudinal study assessing the etiology of PCOS especially with reference to lipidomics.

7. Proposed Contribution by the PI(s) through this project with respect to the present status of research in the proposed field (100 words): PI and CO-PI will be responsible for documenting the clinical, biochemical and lipidomic assessment in this project.

8. Objectives (200 words): This proposal aims to longitudinally monitor a population of young adult women in nested case-control study design to identify changes in serum lipidome that can act as early marker for PCOS onset. Specific aims of the project are as follows: 1) Thorough physio-clinical evaluation including analysis of true adiposity, serum biochemistry, ovarian morphology and liver steatosis and fibrosis. 2) Characterization of differences in serum lipidome of PCOS and naive subjects. 3) Characterization of evolution of lipidomic signature during onset of PCOS in naive subjects.

9. Year wise deliverables: (200 words)

   - First year: Recruitment of JRF, train the JRF, procure consumables and software for lipiomics, and procure consumables for biochemical assays.
   - 2nd year: Lipidomic analysis using mass spectrometry and data analysis.
   - 3rd year: Completion of clinical data analysis and complete the project reports, manuscript for publication

10. Novelty of the Project (100 words):

    PCOS adversely affects not only metabolic and cardiovascular health but also psychological health of the patient. Therefore, identification of signatures that can be used as an early warning system is highly warranted for timely intervention to effectively manage the condition. Such signatures may be useful for largescale screening of vulnerable subjects. However, there has been a dearth of efforts to that end worldwide. Existing literature indicates to involvement of derangement of lipid metabolism in PCOS. A longitudinal study with nested case-control design on analysis of evolution of lipidomic signature can yield such signatures. Elucidation of molecular events associated with such early signatures of PCOS onset may also lead to identification of putative targets for novel therapeutic intervention.

11. Proposed collaboration: Saha Institute of Nuclear Physics Biophysics and Structural Genomics Division 1/AF Bidhan Nagar, Kolkata 700 064, India

12. Brief description (within 100 words) of how the project will help the State of West Bengal inthe fulfilment of its socio-economic objectives:

Women empowerment has been one of the top priorities of the state. Improvement of women's physical and psychological health is an essential component of this endeavour. Identification of signatures for risk prediction and early detection of PCOS would help in effective management of the condition. This would not only help to increase the physical and mental productivity of women but also significantly reduce the financial burden for healthcare.

13. Budget estimates (summary) with justification of manpower and permanent equipment **including whether the Project fellows will enrol for Ph.D** (in 200 words):

Items	BUDGET(In Rupees)			
Year	1st Year	2nd Year	3rd Year	**Total**
A. Recurring:	224400	224400	224400	740800
1. Remunerations				
2. Consumables	175000(sskm) 475000(SINP)	175000(sskm) 525000(SINP)	75000(sskm) 115000(SINP)	
3. Travel	40000	40000	40000	120000
4. Other costs	45000	45000	45000	135000
B. Non-recurring Permanent equipment/software				
Grand Total (A+B)	959400	1009400	527000	2495800

Date 31/03/2021
Place Kolkata

(Name and signature of the PI with official seal)
Prof. Dr. Pradip Mukhopadhyay
M.D., D.M. (Endo.)
Professor
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

(Name and signature of the Co-PI 1 with official seal)
Prof. Dr. Sujoy Ghosh
MD (Gen. Med.), D.M. (Endo.),
MRCP (UK), MRCPS (Glasgow)
Professor
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

(Name and signature of Co-PI 2 with official seal)
Director of Medical Education
Government of West Bengal
Swasthya Bhavan
Kolkata-700091

(Name and signature of Co-PI 3 with official seal)

গবেষণায় বাংলা (2021-22)

FORMAT FOR SUBMISSION OF DETAILED R & D PROJECT PROPOSALS (2020-21)
(TO BE FILLED BY THE APPLICANT)

A. Particular about the Project Proposal

1. Title of the project

Evaluation of Lipidomic Signature in Prediction of Onset of Polycystic Ovarian Syndrome.

Key words (ten maximum):PCOS, Marker, lipidomics

2. **Type of Project Proposal**

Research and technology development

3. **Subject Category of Project:** Medical Sciences including Public Health

4. **A brief description of how the project proposal will help the State of West Bengal in the fulfilment of its socio-economic objectives (in 300 words) :** Women empowerment has been one of the top priorities of the state. Improvement of women's physical and psychological health is an essential component of this endeavor. Identification of signatures for risk prediction and early detection of PCOS would help in effective management of the condition. This would not only help to increase the physical and mental productivity of women but also significantly reduce the financial burden for healthcare.

5. **Duration** (number of months):36months

6. **Total estimated cost** (In Rupees and in Words) :2495800-/-(twenty four lakh ninety five thousand eight hundred only.

7. **Name of Govt./ Govt. Sponsored University/ Institution to be considered for Funding** : Institute of Post Graduate Medical Education & Research Address: 244 AJC Bose Road, Kolkata -700020, India Telephone: +919830823183

8. **Name and details of the Govt./ Govt. Sponsored Collaborative Institute** (if any) Saha Institute of Nuclear Physics Biophysics and Structural Genomics Division, 1/AF Bidhan Nagar, Kolkata 700 064, India

9. **Bio Data of Principal investigator & Co-Investigator(s) justifying their Technical Competence to carry out the Project:**

(a) Name & Address of PI (b) Mobile No. & E-mail Address (c) Date of Birth

(d) Educational Qualifications (e) Area of expertise **[with all Details in Annexure V].**

10. Overall technical & intellectual capacity (to be mentioned for each PI and Co-PI separately)**:**

(a) Expertise available: Prof . Pradip Mukhopadhyay and prof. Sujoy Ghosh, Department of Endocrinology and Metabolism IPGME&R and SSKM Hospital, and Prof .Debashish Bhattacharya , gynecologist and director of medical education are routinely engaged in clinical diagnosis and treatment/management of PCOS and related metabolic syndrome. Clinical capacity of these physicians is among the best in this part of the country. Dr. Soumen Kanti Manna, Associate Professor at Biophysics and Structural Genomics Division, Saha Institute of Nuclear Physics, has extensive expertise of analysis of lipids and metabolites using mass spectrometry since his post-doctoral training. He has already established facility for metabolomic and lipidomic analysis. He is currently involved in at Biophysics and Structural Genomics Division, Saha Institute of Nuclear Physics has already developed facilities for studying metabolomics using the knowledge gathered during Post-doctoral training abroad. Thus the clinical, intellectual and infrastructural capacity necessary for carrying out the proposed project are available with the investigators

(b) List of ongoing and completed projects giving the following details:

Sl. No.	**Title of Project**	**Name of Funding Agency**	**Amount (Rs)**	**Date of Initiation & Duration**
1	A Study to compare & correlate the metabolic health(anthropologic & bio-chemical) between scheduled tribe population in under developed parts of the district of Birbhum with special reference to metabolic health awareness especially about diabetes: a population based observational studies.	WBDST	Rs. 16,10000/- (Sixteen Lakhs Ten Thousand Only)	Date of Initiation- 01/04/2015 Duration- 1 Year

(c) Instruments/ facilities available in the implementing Institute: (I)Clinical diagnosis, basic clinical laboratory facilities and set up and long standing expertise for biopsy: IPGME&R, SSKM Hospital (II)ELISA reader (III)laboratory facility will be available from SINP

11. **Whether you have received any sanction/project from DSTBT, GoWB earlier**? If yes and details attached.

12. Designation of the authority of your Institute who will act as D.D.O. in respect of the allotted amount, if any grant is sanctioned

Accounts officer, IPGMER

B.Technical details:

13. Format of proposal:

1.1 Introduction and Background (up to four pages):

1.1 1.1.1 Description of problem: **Description of problem/ Description of hypothetical idea**
Polycystic ovary syndrome (PCOS) is one of the most enigmatic yet highly prevalent diseases that affect almost one in every five women of reproductive age. The enigma is everywhere starting from the aetiology to definition to clinical manifestation and consequences of the disease.

Definition, Criteria for Diagnosis and Their Limitations:
PCOS may present with a number of clinical manifestations such as clinical hyperandrogenism (hirsutism), acne, alopaecia, biochemical hyperandrogenemia (elevated levels of testosterone and dihydroxyepiandrostenedione sulfate), oligomenorrhea, amenorrhea, anolvulation and polycystic ovarian morphology (PCOM) (1-3). In addition, PCOS has also been found to be associated with obesity, insulin resistance andhyperinsulinemia, elevated cholesterol and triglycerides, sleep apnea, depression and

anxiety (1, 2, 4). Patients may present with only a few of them. Widespread heterogeneity is observed in the types of symptoms presented by PCOS patients. Consequently, there are three existing definitions for PCOS. According to 1990 NIH–National Institute of Child Health and Human Development Conference of PCOS recommendations, major criteria for PCOS should include (in order of importance): hyperandrogenism and/or hyperandrogenemia, oligo-ovulation and the exclusion of other known disorders such as thyroid dysfunction, hyperprolactinemia, Cushing's syndrome, and virilizing tumors (5). In 2003, European Society of Human Reproduction and Embryology and the American Society of Reproductive Medicine jointly proposed (6, 7) diagnosis of PCOS to satisfy any two of the following: hyperandrogenism, ovulatory dysfunction and PCOM. In 2006, Androgen Excess and PCOS Society (AE–PCOS) Position Statement (8) mandated requirement of the presence of hyperandrogenism, which must be accompanied by evidence of ovarian dysfunction in the form of ovulatory dysfunction and/or PCOM. Although the broader 2003 recommendation, called Rotterdam criteria (6,7) is most widely accepted, all three definitions are valid at present. This often leads to significant variation in PCOS incidence in epidemiological studies. Most importantly, the narrower definitions may exclude PCOS patients that do not present clinical hyperandrogenism. Androgen excess is often considered essential component of PCOS. Although often considered an essential component of PCOS, only 80- 85% of women with clinical hyperandrogenism develop PCOS (9). This indicates contribution of other factors to pathogenesis. Detection of polycystic ovarian morphology (PCOM) by USG is also found to be inadequate to predict PCOS since a PCOS patient may be yet to develop PCOM while almost 20-30% women present polycystic ovary (10, 11). Although hirsutism serves as a very important feature, white and black women often tend to grow facial hair while, some patients, particularly, those of East Asian ethnicity may not manifest it (1, 12). Measurement of serum androgen levels also yield important clues in diagnosis. However, only 50-75% women with PCOS has been found to have elevated levels of testosterone and dehydroepiandrosterone sulfate(DHEAS) (13).

Absence of any concrete diagnostic protocol often delays diagnosis. This unwittingly exposes patients to complications like decline in reproductive health, cardiovascular events and cancer. **Thus, there is a crying need for developing methods for early diagnosis of the disease. The ability to screen young adults and identify subjects at risk of developing PCOS would greatly help in effective and timely therapeutic intervention.**

References:

1. *Goodarzi, MO et al Nat Rev Endocrinol. Apr;7(4):219-31 (2011)*
2. *Ecobar-Morreale, HF Nat Rev Endocrinol. May, 14: 270-84 (2018)*
3. *Azziz R Reprod Biomed Online. Jun;8(6):644-8.(2004)*
4. *Buckworth, J. & Hsu Y-T ACSM s Health & Fitness Journal 14(3):15-20 (2010)*
5. *Zawadzki, J. K. & Dunaif, A. in Polycystic Ovary Syndrome (eds Dunaif, A., Givens, J. R., Haseltine, F. P. & Merriam G. R.) 377–384 (Blackwell Scientific, Boston, 1992) 6. Fertil. Steril. 81, 19–25 (2004).*

7. Hum. Reprod. 19, 41–47 (2004).

8. *Azziz, R et al J. Clin. Endocrinol. Metab. 91, 4237–4245 (2006).*
9. *Azziz R et al J. Clin. Endocrinol. Metab. 89,453–462 (2004).*
10. *Clayton RN et al Clin. Endocrinol. (Oxf.) 37, 127–134 (1992).*
11. *Hasan MA & Killick SR Fertil. Steril. 80, 966–975 (2003).*
12. *Yildiz BO et al Hum. Reprod. Update 16, 51–64 (2010).*
13. *Huang A et al Fertil. Steril. 93,1938–1941 (2010).*

Epidemiology:

Data on incidence of PCOS is hugely influenced by the definition of PCOS followed in the respective study. PCOS incidence has been reported to vary from 2.2-26% worldwide (1-5). In India, only a handful of epidemiological studies have been reported on PCOS. The following table summarizes results of those studies. Table 1: Summary of Epidemiological Studies on PCOS in India

Study Design	Location	Sample size	Age range	Incidence (%)	PCOS definition	Non-obese PCOS (%)	Reference
Cross-sectional	Mumbai	778	15-24	22.5 10.7	Rotterdam NIH	71.8%	Joshi B et al Indian Journal of Endocrinology and Metabolism / May-Jun

							2014 / Vol 18 | Issue 3
Cross-sectional	Kanchipuram/Chennai	1068	18-24	6	Rotterdam	62%	Bharathi, RV Middle East Fertility Society Journal 22 (2017) 313–316
Cross-sectional	Bangalore	460	18-45	9.13	Rotterdam	-	R Nidhi et al J Pediatr Adolesc Gynecol 24 (2011) 223e227
Cross-sectional	Dehradun	170	16-30+	41	NIH	14%	Choudhary A et al. Int J Reprod Contracept Obstet Gynecol. 2017 Nov;6(11):4971-4975
Cross-sectional	Bhopal	500	17-24	8.4	Rotterdam	17%	Gupta M et al. Int J Community Med Public Health. 2018 Jan;5(1):95-100
Cross-sectional	Sevagram	200	15-34	50	Rotterdam	-	Chhabra S J Obstet Gynaecol. 2010 Jan;30(1):41-5.
Cross-sectional	Vellore	126	12-19	18	Rotterdam	-	Balaji, S et al Biomed Res Int. 2015;2015:158951.

As can be seen in the table, PCOS incidence varied widely from 6-50% among different studies. This calls for multi-centre studies involving larger sample size and uniform diagnostic criteria. Few studies (Bharathi, RV et al and Balaji S et al) have indicated higher incidence of PCOS in urban women. While stress and other life-style

related factors may contribute to a higher abundance as suggested in these articles, underreporting in rural set up due to stigma involved with consequences of PCOS may also contribute to this difference. One of the striking features of PCOS in India is that a significant percentage of PCOS patients are non-obese at diagnosis. However, it should be noted that all these studies stratify subjects based on BMI and/or waist circumference. **None of them analyzed the total body fat using technologies such as dual energy X-ray absorptiometry (DEXA), which truly represents the adiposity of the subject.**

References:

1. *Knochenhauer ES et al J Clin Endocrinol Metab 83:3078 (1998)*
2. *Michelmore KF et al Clin Endocrinol 51:779 (1999)*
3. *Asuncion, M J et al Clin Endocrinol Metab 85:2434 (2000)*
4. *Azziz, R et al J Clin Endocrinol Metab 89:2745 (2004)*
5. *Diamanti-Kandarakis EJ et al Clin Endocrinol Metab 84:4006 (1999)*

Long-term Complications:

Primary complications of PCOS are issues related to fertility. Women with PCOS suffer from disruption of menstrual cycles and some may eventually develop amenorrhea (1-4). The ovulation process is often seriously compromised in PCOS (1-3). Women with PCOS also suffer from higher risk of miscarriage, pre-eclampsia as well as obstetrical morbidity (3-6). Women with PCOS suffer from clinical manifestations of hyperandrogenism such as hirsutism, acne and alopecia (3, 4). PCOS has also been associated with anxiety and depression (7, 8). In addition, a significant association has been found between features of metabolic syndrome and PCOS, which is discussed in following section. Some studies have also revealed an increased risk of cancer in PCOS patients (3, 4, 9, 10).

References:

1. *Fertil. Steril. 81, 19–25 (2004).*
2. *Malik S et al Fertil Sci Res 1(1): 23-43 (2014)*
3. *Goodarzi, MO et al Nat Rev Endocrinol. Apr;7(4):219-31 (2011)*
4. *Palomba, S et al Int J Womens Health. 7: 745–763 (2015).*
5. *Kamalanathan S et al Indian J Endocrinol Metab. Jan-Feb; 17(1): 37–43 (2013)*

6. *Rai R et al Human Reproduction vol 15, 3, 612-15 (2000)*
7. *Hollinrake et al Fertil. Steril. 87, 1369–1376 (2007).*
8. *Kerchner, A et al Fertil. Steril. 91, 207–212 (2009).*
9. *Fearnley, EJ et al Cancer Causes and Control 21 (12) 2303-2308 (2010)*
10. *Danilidis A & Dinas K Hippokratia Apr-Jun; 13(2): 90–92 (2009).*

PCOS and Metabolic Syndrome:

In addition to hyperandogenism and fertility issues, women with PCOS frequently develops gestational diabetes (1), which is a risk factor for diabetes (2, 3). Incidence of type 2 diabetes is indeed high in women with PCOS (4,5). Hyperinsulinemia and insulin resistance is very common in PCOS. In fact, these have been postulated as one of the key pathological factor in PCOS and PCOS treatment commonly involves metformin, which is an insulin sensitizer and inhibitor of hepatic glucose production. Existing evidence indicate that insulin may contribute by stimulating ovarian androgen production and decreasing serum sex hormone-binding globulin (SHBG) concentrations (6-8). Hyperinsulinemia may also directly influence folliculogenesis (9). A significant association between obesity and PCOS has been well-documented. PCOS incidence increases to 10-35% in obese women (10-12). Association between PCOS and metabolic syndrome have also been reported in India women (13-14). Understandably, PCOS patients has been found to be at risk for cardiovascular complications (15-17). In fact, earlier study has shown that CVD risk increases in PCOS independent of obesity (18). Androgens, which are elevated in PCOS, have also been implicated in lowering the serum HDL/LDL ratio and increasing cardiovascular risk in post-menopausal women (19). However, cause-effect relationship between PCOS and metabolic syndrome remains unclear. One of the reasons is that most of the studies on the issue are cross sectional in nature with age range of women spanning across the reproductive age. This brings into play other factors that may contribute to metabolic syndrome, which is on the rise all over the world. **Therefore, longitudinal monitoring of PCOS-naive young cohorts in terms of actual body fat distribution and onset of PCOS-related symptoms are essential to glean information on causal relationship.**

References:

1. *Lo JC et al Diabetes Care Aug; 29(8): 1915-1917 (2006).*
2. *Ben-Haroush, A et al Diabetic Medicine 21, 103 –113*
3. *Butte NF et al Am J Clin Nutr. 2000; 71: 1256S–1261S*
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Lipid Metabolism and PCOS:

Hyperandrogenemia is one of the defining biochemical features of PCOS. Androgens such as testosterone and DHEAS, which are used as a measure of hyperandrogenism, are synthesized from DHEA. Cholesterol is converted by P450scc to pregnonelone, which is further converted to DHEA by P450c17. Cholesterol biosynthesis involves mevalonate pathway starting from acetyl CoA. It is interesting to note that *de novo* lipid biosynthesis also starts from acetyl CoA. Lipid metabolism through beta-oxidation, in turn, ends at acetyl CoA, which can then enter TCA cycle to produce energy. So, androgen and cholesterol biosynthesis shares common biochemical intermediate of lipid metabolism. Androgens have also shown to activate de novo lipogenesis through SREBP1 in prostate cancer cells (1, 2). Interestingly, hyperandrogenemia was found to be associated with dyslipidemia in obese women irrespective of PCOS status (3).

Lipids, such as, free fatty acids, ceramides and arachidonic acid metabolites play an important role in regulation of inflammatory processes. PCOS patients are generally found to have higher C-reactive protein (CRP) in serum compared to controls. They are also found to have higher level of IL-18 and monocyte chemoattarctant protein 1 (MCP-1) (4-6). Another study also revealed low levels of chronic inflammation in PCOS (7). These indicate to association of inflammation with PCOS. Since obesity is also high in PCOS, some tend to dispute the role of inflammation in PCOS (4). Bhatt, S et al reported lack of any association between single nucleotide polymorphisms in genes involved in inflammatory processes and PCOS (8). However, contrary to the title of their paper, lack of association with SNPs alone cannot rule out involvement of inflammatory pathways-functional investigations are required. In fact, in a recent study, EPA was found to reduce the expression of SREBP1 with concomitant reduction in IL-18, TNFα, MCP-1 (9) in mouse model of PCOS. SREBP1 expression was found to be upregulated in PCOS patients (10). Interestingly, insulin was found to upregulate the expression of SREBP1c and its target gene fatty acid synthase in granulosa cells (11). Given that hyperinsulinaemia is abundant in PCOS patients, this study indicates to a role of derangement of lipid metabolism in PCOS pathogenesis. In addition, a recent study revealed the presence of progesterone as well as P450c17, the key enzyme for androgen biosynthesis, in adipocytes taken from biopsy samples of adipose tissue (12). It also showed secretion of androstenedione, an intermediate in androgen biosynthesis, from these adipocytes *in vitro*. Insulin was found to elevate secretion of the intermediate. Androgens, on the other hand, have been shown to influence proliferation and differentiation, insulin sensitivity, adipokine signalling and lipid metabolism at a systemic level (13-14). In a mouse model of PCOS, testosterone was found to increase intestinal triglyceride secretion as well as increased absorption cholesterol and fatty acids (15). This effect was associated with modulation of expression of lipogenic and steroidogenic genes in mouse intestine. **All these indicate to a nexus between hyperinsulaemia, androgen biosynthesis and systemic derangement of lipid metabolism in PCOS. It is essential to longitudinally monitor adiposity, androgen levels and changes in lipidomic signature in nested case-control design to glean information on the causal nature of this nexus in PCOS. This may yield signatures that precede clinical manifestation of PCOS.** Given that PCOS, particularly, in India is often observed in subjects that are categorized as non-obese based on BMI and/or waist circumference, techniques such as DEXA should be used to score true adiposity of subject. A more accurate analysis of adiposity is warranted to investigate any connection between systemic disruption of lipid homeostasis and PCOS. **Signatures of systemic disruption of lipid homeostasis, which can manifest itself in serum lipidome, would be useful for early intervention to alleviate the consequences of PCOS. They may also yield clues to identify novel therapeutic targets for PCOS, which currently have no cure**.

Hypothesis: Longitudinal evolution of systemic lipidomic signature can reflect onset of PCOS.

References:

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1.1.2 Review of existing literature/patents etc. The lack of adequate understanding of underlying mechanism is a challenge for any advancement of PCOS treatment. The absence of any universally accepted diagnostic

criteria PCOS further complicates the issue. This results in not only in underreporting or late reporting but also misdiagnosis and symptomatic treatment. Several studies have attempted to identify putative biomarkers for PCOS in biofluids to aid in accurate diagnosis using metabolomics (1-4). Recently, two studies on metabolomic analysis involving Indian subjects have been reported (5,6). Few studies have also explored change in systemic lipidomic signature associated with PCOS.

Lipidomic analysis in PCOS:

Sun et al first reported changes in plasma lipid profile of PCOS patients using NMR in 2012(2). 34 PCOS (average age 26.9) and 36 controls (average age 27.2) were analyzed in the cross sectional study. Decrease in glycerophosphocholine/choline was observed in the PCOS patients. However, since NMR was, identity of these lipids remained elusive to the study. In 2015, Houla et al (7) reported use of LC-MS, which is much more informative on the identity of lipids, to analyze lipidomic changes plasma samples of PCOS patients. In the cross sectional study involving women aged 18-40 years, 40 PCOS and 40 non-PCOS controls were recruited. Significant changes in phospholipids, sphingomyelins, di- and tri- acylglycerols were observed. However, the average BMI of PCOS patients (29.5) were significantly higher than that of controls (25.4), which calls for a more guarded approach in associating changes in lipid composition to PCOS alone. Moran, L et al (8) examined correlation between features of PCOS and lipidomic changes in a cross-sectional study involving women with (n = 64) or without PCOS (n = 92) aged 18-45. The changes in lipid composition correlated most with central obesity and free androgen index. But even in this study both body weight and BMI of PCOS patients were significantly higher than control. Li S et al (9) reported analysis of the changes in lipids including poly-unsaturated fatty acid metabolites in 32 newly diagnosed PCOS patients compared to 34 non-PCOS subjects. Results indicated an opposing effect of insulin and androgen on bioactive metabolites. However, the BMI of the control obese and obese PCOS subjects were significantly different in this study. In 2018, Jove M et al (10) reported analysis of plasma lipidome of 20 lean healthy controls and 14 PCOS patients. Significant downregulation of glycerophospholipids, glycerolipids and sphingolipids were observed suggesting a widespread alteration in lipid metabolism which might influence cellular signalling in PCOS patients.

While these studies indicated changes in lipid metabolism associated with PCOS, several of them failed to account for confounding factors such as difference in BMI and/or age. In addition, all of these studies were single-time point cross-sectional in nature. Therefore, they do not yield any information on evolution lipidomic signature during pathogenesis. Longitudinal nested case-control study is essential not only to identify any early signature for risk prediction or diagnosis but also to hypothesize on and investigate into the causal relationship between derangement of lipid metabolism and PCOS. It should be noted that neither any longitudinal nor any cross-sectional sectional lipidomic analysis has ever been reported in Indian PCOS patients.

References:

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Jove M et al Oncotarget 9(4): 4522-36 (2018).

1.1.3 **Reasons for taking up the project**.

PCOS has been shown to affect up to one in every five women worldwide. However, there is a paucity of epidemiological data and it is suspected to be underreported in India. More importantly, due to the social stigma associated with some of the consequences, often it is diagnosed late or not reported. This eventually adversely affects not only metabolic and cardiovascular health but also psychological health of the patient. Therefore, identification of signatures that can be used as an early warning system is highly warranted for timely intervention to effectively manage the condition. Such signatures may be useful for large- scale screening of vulnerable subjects. However, there has been a dearth of efforts to that end worldwide. Existing literature indicates to involvement of derangement of lipid metabolism in PCOS. A longitudinal study with nested case-control design on analysis of evolution of lipidomic signature can yield such signatures. Elucidation of molecular events associated with such early signatures of PCOS onset may also lead to identification of putative targets for novel therapeutic intervention.

1.1.4 Relevance to state priorities and fulfilment of socio-economic objectives of the Government.

Women empowerment has been one of the top priorities of the state. Improvement of women's physical and psychological health is an essential component of this endeavour. Identification of signatures for risk prediction and early detection of PCOS would help in effective management of the condition. This would not only help to increase the physical and mental productivity of women but also significantly reduce the financial burden for healthcare

1.1.5 Financial resources committed by the applicant/ host Institution: None

1.1.6 Whether this project or similar project(s) have been taken elsewhere in the State/ Country.

1.1.7 Please provide links of previous such work /research taken place.

1.1.8 How this present work is unique from the others such work done in this area so far

1.1.9 Novelty of the idea [Explain how your idea is innovative and how it is differentfrom the existing idea/ products/ processes in your area of interest]

1.1.10 Please provide necessary inputs on the list of patents that appear to cover any part of the project/ technology, if any. If so, please mention patent number, patent title and patent assignee.

1.1.11 Number of research paper/article expected to be published in any journal inconnection to this project? (If yes, furnish details)

1.1.12 Number of book(s)/chapter(s) expected to be published in any journal in connection to this project? (If yes, furnish details. Workshops, Seminars etc. not to be counted or listed)

1.1.13 Number of outreach programme expected be done to disseminate the probable outcome of this project?

1.1.14 Number of seminar/symposium/conference expected to be attended in connection with this project at State, National or International?

1.2 Hypothesis and aims and objectives (up to one page):

This proposal aims to longitudinally monitor a population of young adult women in nested case-control study design to identify changes in serum lipidome that can act as early marker for PCOS onset. Specific aims of the project are as follows:

1)Thorough physio-clinical evaluation including analysis of true adiposity, serum biochemistry, ovarian morphology and liver steatosis and fibrosis.
2)Characterization of differences in serum lipidome of PCOS and naive subjects.
3)Characterization of evolution of lipidomic signature during onset of PCOS in naive subjects**.**

1.3 Significance of the project (up to one page):

This project will involve application of modern tools for thorough analysis of patient physiology and status of PCOS. It will also involve application of cutting edge chromatography and mass spectrometry platforms for detailed characterization of lipidome. Success of the project will be of

immediate help to clinicians and patients in terms of screening and diagnosis of PCOS. In addition, the results may also yield clues to identify novel therapeutic targets for PCOS.

1.4 Research design, methodology, timelines and milestones (up to ten pages):

Study Design:
Longitudinal nested case-control, hospital-based.

Study settings
OPD of Department of Endocrinology and Metabolism IPGME&R and SSKM hospital.

Study population
Freshers admitted in MBBS course at IPGME&R and SSKM hospital. We aim to recruit 200 subjects.

Sampling methods
All voluntarily consenting adults will be enrolled and clinically evaluated as per Rotterdam criteria to designate them as
PCOS or non-PCOS cases.

Inclusion criteria
All voluntarily consenting freshers with age > 18.
Exclusion criteria
Lack of consent to undergo longitudinal monitoring, presence of any chronic infection, type I diabetes, eating disorder, ongoing medication connected to lipid metabolism (such as statins), addiction to tobacco or alcohol and any life- threatening condition. Untreated Hypothyroid, Hyperprolactemia, NCCAH.

Overview of the Workflow:

Approximately 200 young adult subjects will be enrolled and examined for PCOS incidence as per Rotterdam criteria in addition to comprehensive physio-clinical, radiological and biochemical evaluation. This exercise will be repeated for all subjects every year.

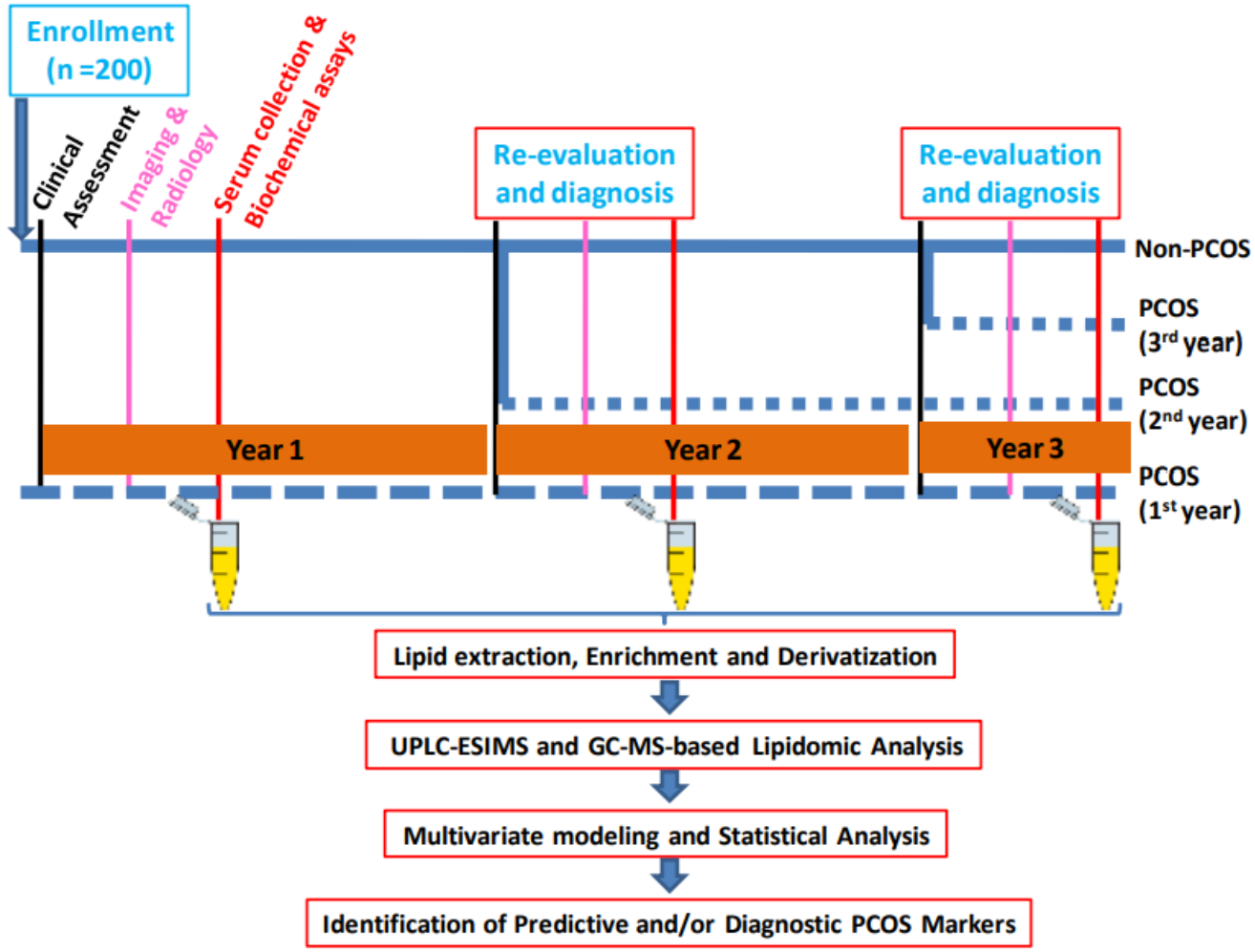

Figure 1: Schematic representation of overall plan of work for identification of early markers of PCOS using serum lipidomics.

Serum samples collected during this exercise will be subjected to lipidomic analysis using Ultra-performance liquid chromatography (UPLC)-electrospray ionization mass spectrometry (ESI-MS) as well as gas chromatography coupled with mass spectrometry (GC-MS). These data will be combined and mined using multivariate statistical analysis to identify features of interest. This will be further subjected to rigorous statistical analysis for robustness of association of signatures with PCOS.

Study Techniques:

Clinical assessment:
Subjects will be assessed to record body weight, BMI, waist circumference (WC), WHR, , blood pressure, body fat, hepatic steatosis and fibrosis by Fibroscan analysis. Any family history of PCOS and information on ongoing medication or medication within 1 month preceding clinical assessment will be recorded. Diagnosis of PCOS will be based on Rotterdam Criteria, i.e., presence of any two of the following features: hyperandrogenism (hirsutisim, acne, alopecia), ovulatory dysfunction (oligo-ovulation, anovulation) and PCOM (by USG) while excluding presence of thyroid dysfunction, hyperprolactinemia, Cushing's syndrome, and virilizing tumors.

Sample collection:
Serum will be used for lipidomic analysis since an earlier analysis revealed that although most of the lipids were present at similar levels in both plasma and serum, serum showed higher level of oxidative lipid metabolites. Serum samples will be collected from subjects fasting overnight. 0.5 ml serum will be divided into 100µL aliquots in 2 ml screw-cap tubes and stored at -80°C until further analysis. Rest of the serum sample will be sent immediately for biochemical assays mentioned below. 1 ml serum Stored at -80C in 100µL aliquots in 2 ml screw-cap tubes until further analysis.

References:
1. Wedge DC et al Anal. Chem. 83, 17, 6689-6697 (2011)
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Biochemical Profiling:
A part of the serum samples will be used to analyze hepatokine, cytokine, adiponectin, leptin, HbA1c, androgen (testosterone and DHEAS) levels along with LFT, CRP, Insulin, HOMA-IR, fasting glucose and lipid profile.

Lipidomic Analysis:
Lipid extraction: 0.5 ml pre-chilled MeOH/chloroform (2:1) mixture containing internal standards will be added to the tube containing 100 µL frozen serum sample. The mixture will be vortexed for 30 sec. 0.4 ml of ice-cold water will be added to the mixture to enable phase-separation. Sample will be mixed vigorously at room temperature for 10 minutes and centrifuged 20 mins at 14 krpm at 4°C. The lower organic layer will be collected in glass tube and dried under nitrogen flow. The sample will be reconstituted in 100µL internal chloroform/MeOH (1:1) containing internal standards for MS quality control. For specific lipid classes such as phospholipids and oxolipins, sample clean-up and enrichment will be performed using 96-well Oasis HLB solid-phase extraction plates.

Analysis of lipid composition: Lipids comprise of diverse class of molecules with each class consisting several distinct members that vary widely in their abundance and chemical properties. This makes analysis of lipid composition quite a challenging task. However, advances in chromatography, particularly, introduction of ultraperformance liquid chromatography coupled with high-resolution mass spectrometry has enabled significant coverage of the lipidome. In this study ultraperformance liquid chromatography (UPLC; Acquity UPLC, Waters Corp.) coupled with electrospray ionization mass spectrometry (ESIMS; Xevo G2 qTOF MS, Waters Corp) will be used for analysis of complex lipids. However, fatty acids and sterol-related compounds are not easily ionizable in ESIMS. Therefore, gas chromatography coupled with mass spectrometry (GC-MS) will be used to analyze composition of fatty acid and sterol-related compounds.

(A) ***UPLC-ESIMS Analysis:*** Lipid extract will be diluted in acetonitrile/isopropanol/water (1:2:1) and and transferred to glass sample vials for ESIMS analysis. Lipids will be separated on a reverse phase (C18) column prior to introduction to ESIMS. Samples will be run in a randomized manner with intermittent injection of pooled and authentic standard mixture samples for quality control.

Chromatograms will be aligned, deconvoluted and binned to extract features. Identification of features will be performed through analysis of MS/MS fragmentation pattern and comparison with authentic standards (whenever available).

(B) ***GC-MS Analysis:*** Lipid extract will be mixed with internal standards for derivatization and extraction. Methyl esters of fatty acids will be prepared via esterification using Methanolic HCl. Methyl esters will be extracted using hexane, evaporated to dryness under nitrogen and reconstituted in hexane containing internal standard for GC-MS quality control. For steroids, samples will be derivatized using MSTFA containing 0.5% TMSI. Compounds will be separated on a HP5-MS or DB5 column with helium as the carrier gas in gas chromatograph (Agilent 7890B) and ionized through electron impact ionization and analyzed using a single quad mass spectrometer (Agilent 5977B). Total ion chromatogram will be aligned and deconvoluted to extract features and identify changes in composition. Identification of compounds of interest will be through analysis of fragmentation pattern, matching against NIST Library and comparison with authentic standards (whenever available).

Data mining: Data redundancy often leads to model over fitting in multivariate analysis. Such redundancy may arise due to in-source fragmentation and adducts in mass spectrometry. Inter-feature correlation will be examined across samples to identify covariant features. In case, they appear within same retention time window, raw chromatograms will be analyzed to identify putative adducts or fragments. They will be excluded from further analysis. Principal component analysis (PCA) will be used to examine any segregation of lipidomic signature and their correlation with phenotypes of interest (PCOS and sub-features of PCOS). Supervised analysis (PLS-DA and OPLS-DA) will be used to identify features that could predict phenotypes of interest. Iterative 'leave-one-out' cross validation (number of iteration
> 20% of the size of the nested cohort) will be used to validate the model. For univariate analysis non-parametric statistical test assuming unequal variance will be employed given the limited sample size. Unpaired Mann-Whitney 'U' test with Bonferroni correction for multiple testing will be used identify lipids (say, set 'A') that shows significant difference in abundance between controls and cases at a given time point. Paired Mann-Whitney test with Bonferroni correction will be used to identify lipids (say, set 'B') that shows significant change in abundance with disease onset in naive subjects. Molecules (say, set 'C') that shows similar pattern of change with time in all three groups, i.e, subjects that present PCOS at beginning, those that develop PCOS during the study and those who never develop PCOS, will be excluded from further analysis to identify putative biomarkers. Rest of the molecules that are common in both sets (A and B) and shows similar pattern of change associated with disease status will be tested as potential biomarkers related to PCOS. In addition, the correlation between lipidomic signatures and non-PCOS clinical or biochemical parameters (such as, body weight, BMI, WC, body fat, fasting glucose, insulin concentration, liver fibrosis score, etc) will be examined. Receiver operating characteristic (ROC) analysis will be performed to examine the sensitivity and specificity of these candidate biomarkers for PCOS diagnosis. In case, there are significant number of new cases of PCOS in both 2nd and 3rd year, cases up to 2nd year will be used to identify consensus lipidomic changes associated with PCOS as described above. Rest of the cases will be used to prospectively validate PCOS markers through ROC analysis. In addition, the ability of baseline abundance of such molecules to predict PCOS incidence at a later time point will be examined using ROC analysis. This would help to identify a multivariate signature that could help to predict PCOS risk in naive subjects.

2. Work plan & time schedule:

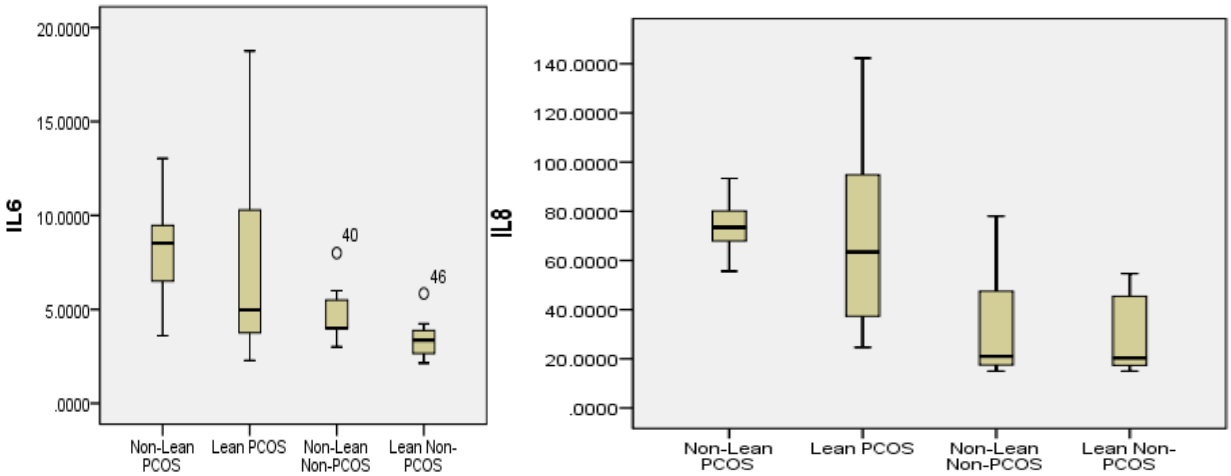
Phase-wise plan of action up to post project activities detailing time schedule milestones may clearly be stated.

Time	Activities/work plan	Percent of total activities
0-6 months	Recruitment of JRF, train the JRF, procure consumables and software for lipidomics, procure consumables for biochemical assays.	5%
12-18 month	Procure consumables etc	
24-30 month	Procure consumables etc	
1-3 month	Recruitment of subjects, clinical evaluation, serum sample collection, biochemical assays and diagnosis	10%
13-15 month	Repeat clinical evaluation, serum sample collection, biochemical assays	10%
25-27 month	Repeat clinical evaluation, serum sample collection, biochemical assays	10%
3-34 month	Lipidomic analysis using mass spectrometry, data analysis	55%
32-36 month	Completion of clinical data analysisand manuscript preparation. Completion of lipidomic data analysis, manuscript submission Completion of the project reports and submission	10%

1.5 Preliminary data (up to one page):

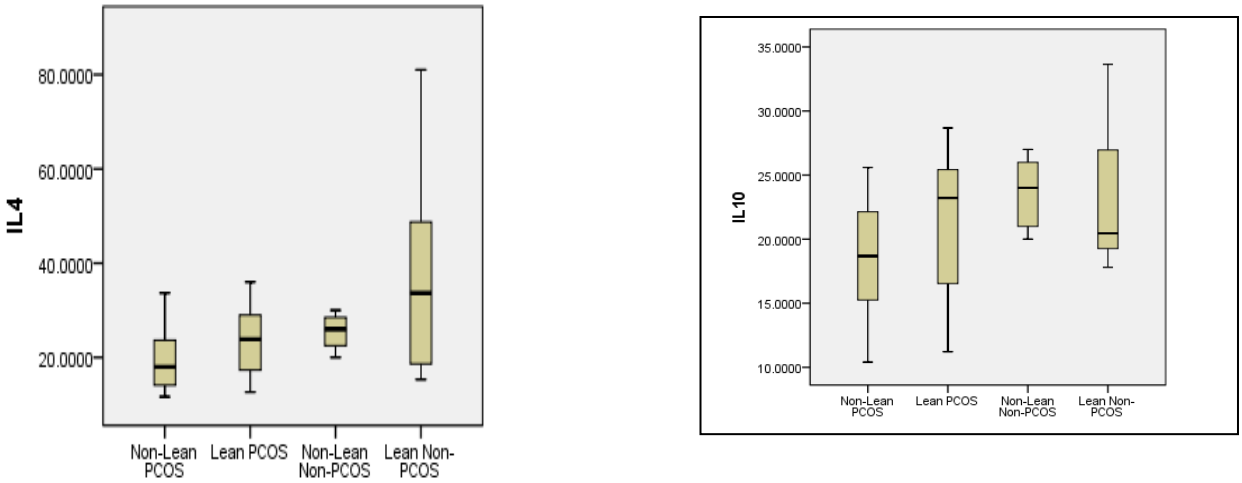
We conducted a cross sectional, observational study conducted in Gynecology and Obstetrics OPD and Endocrinology OPD of a tertiary care hospital. Women attending the above-mentioned departments with suggestive symptoms were evaluated and selected as cases after satisfying inclusion and exclusion criteria. It was a one and half year's study conducted between December 2015 and May 2017. There were four groups of patients, non-obese PCOS [NOP] (BMI =/< 23 Kg/m2), overweight or obese PCOS [OP] (BMI > 23 Kg/m2), overweight or obese Non-PCOS[ONP] (control group) and non-obese Non-PCOS [NONP] (control group)].

Pro-inflammatory cytokines:



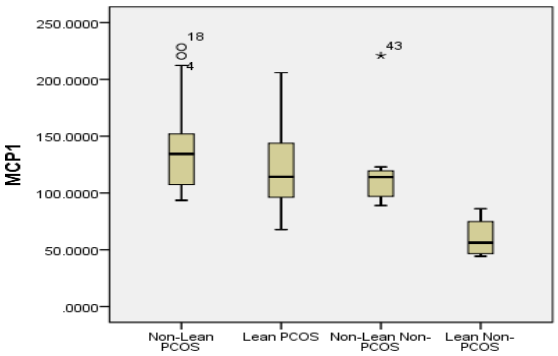
Significance is found only between groups 1 and 4 on post hoc analysis of **IL6** values across groups ($p<0.05$).Significance is found between groups 1 and 4, groups 2 and 4, groups 1 and 3 on post hoc analysis of **IL8** values across groups ($p<0.05$).

Anti-inflammatory Cytokines:



Significance is found only between groups 1 and 3, groups 1 and 4 on post hoc analysis of IL4 values across groups *($p<0.05$.* No Significance is found between groups on post hoc analysis of IL10 values across groups .

Adipokines:



Significance is found between groups 1 and 4 and groups 2 and 4 on post hoc analysis of MCP1 values across groups ($p<0.05$) .

1.6 Year wise "Activity Landmark" of the Project (1st year/ 2nd year/ 3rd year):

First year: Recruitment of JRF, train the JRF, procure consumables and software for lipiomics, and procure consumables for biochemical assays.

2nd year: Lipidomic analysis using mass spectrometry and data analysis.

3rd year: Completion of clinical data analysis and complete the project reports, manuscript for publication

1.7 Year wise deliverables output (preferably point-wise and quantified):

14. **Challenges & constraints**:

The exact number of PCOS cases at the beginning of the study may be inadequate. In that case, additional subjects from neighbouring hospitals will be recruited. A validation cohort should also be also included in the study, particularly, in case of cross-sectional analysis. Since this longitudinal study has a nested case-control design, the new cases that are diagnosed at later time points will help to test and validate signatures identified at the beginning. Paired statistical analysis of the time series data would significantly help to weed out spurious associations. This is described in the data mining section below. However, it is desirable to have an independent cohort for validation of the results and we would like to involve other hospitals in study once a set of putative markers are identified through this study. Abundance of different lipid molecules are known differ by orders of magnitude. Particularly, phospholipids are very abundant in serum and may mask other low abundance lipids such as bioactive arachidonic acid metabolites during analysis. In order to address the issue, phospholipids will be depleted by passing samples through commercially available phospholipid-binding resin. Platform to platform variability in analysis is often a challenge in translation. To address the issue, in addition to mass spectrometry-based analysis, lipids will further be analyzed using commercially available kits.

This can help to readily validate putative PCOS biomarkers across multiple centres and translate the results into clinically relevant diagnostic assay. This study also offers the opportunity to monitor these subjects further and evaluate the prognostic potential of lipidomic signatures with respect long-term complications of PCOS.

15. Work plan & time schedule:

Time	Activities/work plan	Percent of total activities
0-6 months	Recruitment of JRF, train the JRF, procure consumables and software for lipidomics, procure consumables for biochemical assays.	5%
12-18 month	Procure consumables etc	
24-30 month	Procure consumables etc	
1-3 month	Recruitment of subjects, clinical evaluation, serum sample collection, biochemical assays and diagnosis	10%
13-15 month	Repeat clinical evaluation, serum sample collection, biochemical assays	10%
25-27 month	Repeat clinical evaluation, serum sample collection, biochemical assays	10%
3-34 month	Lipidomic analysis using mass spectrometry, data analysis	55%
32-36 month	Completion of clinical data analysisand manuscript preparation. Completion of lipidomic data analysis, manuscript submission Completion of the project reports and submission	10%

16. Output and Translational Outcome of the project: The proposed study aims to identify signatures for early diagnosis of PCOS using serum lipidomics. It also aspires to test the ability of lipidomic signatures to identify PCOS-naive subjects at imminent risk of PCOS development. Currently, there is no reliable biomarker for PCOS diagnosis or risk analysis. Identification of such biomarkers will immensely help patients and clinicians in early diagnosis and timely intervention to ameliorate the long-term complications of PCOS. In addition, identification of subjects at risk may be useful in effective life-style management and/or interventions

17. **Likely impacts** (please quantify in case of measurable parameters). Identification of biomarkers of PCOS in this study and subsequent validation in independent cohort would have significant impact on patients and clinicians in terms of screening, diagnosis and therapeutic management of the disease

18. Parameters for monitoring effectiveness of the project [Please describe in detail the Key Performance Indicators (KPIs) by which the success of the project can be measure]

The effective implementation of the project can be monitored by success in manpower and patient recruitment, procurement of consumables, patient work-up, sample collection, analysis, data generation and analysis. Although it has high translational potential, the project is exploratory and basic science in nature. Therefore data presentation at national/international conferences and publication in peer-reviewed journals would also reflect effectiveness of the project.

19. Suggested post project activities viz. application areas/field trials/ working with the Line Departments of the State Government etc.

Signatures identified in this study as candidate biomarkers for PCOS will be tested in independent cohorts in collaboration with other hospitals in West Bengal. Hospitals will be selected both in and outside Kolkata so that robustness of these signatures against changes in habitat, life-style and sample handling can be tested

B. BUDGET ESTIMATES: SUMMARY

Items	**BUDGET** (In Rupees)			
Year	**1st Year**	**2nd Year**	**3rd Year**	**Total**
A. Recurring: a. Remunerations b. Consumables c. Travel d. Other costs	224400	224400	252000	740800
B. Non-recurring Permanent equipment/ software *				
Grand Total (A+B)				

* (Total requirements may be mentioned in detail mentioning their availability with the Institute of the PI/ Co-PI and requirements from DSTBT, GoWB)

**Please provide brief justification for each Head of expenditure (100 words for each). In case of purchase of equipment/ software, the PI will have to certify that the said equipment/ software is not available in the Institute. Equipment/ software proposed for purchase using project funds should be adequately justified and documented to reveal how the equipment/ software will be used to fulfil the objectives of the project.

DETAILED BUDGET FOR REMUNERATIONS (In Rupees)

	Budget			
Designation (Number of persons)	1st Year	2nd Year	3rd Year	Total
1 JRF	224400	224400		
1 SRF			252000	
Total				740800

DETAILED BUDGET FOR TRAVEL (In Rupees)

	Budget			
Item	1st Year	2nd Year	3rd Year	Total
Travel 1. Local*	5000 5000 5000	5000	5000	15,000
2. Out station*	35000	35000	35000	105000
Total				120000

*Details with breakup and justification regarding the number of tours in respect of field work/ any tour related to project work indicating tentative cost for each item needs to be clearly mentioned.

DETAILED BUDGET FOR OTHER COSTS (In Rupees)

	Budget			
Item	1st Year	2nd Year	3rd Year	Total
a. Contingencies	45000	45000	45000	135000
b. Others				
Total				

DETAILED BUDGET FOR PERMANENT EQUIPMENT/ SOFTWARE (In Rupees)

Budget		
Sl. No.	Estimated cost	Name of equipment*
1.	Not applicable	
2.		
Total		

*Please provide justification and documents for each of the equipment(s) along with quotation from reputed vendor. Please also provide an endorsement that the equipment is not available in the Institute. No Desktop PC, Laptop, UPS, External HDD, Printer, Cartridge, Ink, Scanner, Work Station, Software, Refrigerator or any Capital items is allowed from any part of the Budget.

Other Project (s) Submitted for evaluation

Sl. No.	Title of Project	Name of Organization	Status
	Not applicable		

Attachments:

1) Detailed list of publication made so far in the proposed area of work (books and papers/articles in standard referred national and international journals).
3) List of patents and their present status.
3) A soft copy of the entire proposal.
4) Annexure - I to VII (as applicable)

1. I declare that I shall abide by all the guidelines, rules and regulations of the Department of Science and Technology and Biotechnology, Government of West Bengal regarding financial assistance to R & D project and shall acknowledge the funding authority in all publications made out of the sanctioned project. I shall also include the Department of Science and Technology and Biotechnology (DSTBT), Government of west Bengal, as a joint applicant for any intellectual Property/ Patent arising out of the sanctioned project and the Royalty will be shared as may be decided by DSTBT on commercialization/ transfer/ sale of technology or product. I also declare that I do not have any objection if my final project report/findings/papers etc. are shared by DSTBT-GoWB with any other line Department(s) for the benefit of the people of the State.

(Name and signature of the PI with official seal)

Prof. Dr. Pradip Mukhopadhyay
M.D., D.M. (Endo.)
Professor
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

(Name and signature of the Co-PI 1 with official seal)

Prof. Dr. Sujoy Ghosh
MD (Gen. Med.), D.M. (Endo.),
MRCP (UK), MRCPS (Glasgow)
Professor
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

(Name and signature of the Co-PI 2 with official seal)

Director of Medical Education
Government of West Bengal
Swasthya Bhavan
Kolkata-700091

(Name and signature of the Co-PI 3 with official seal)

27/03/21

Date.....

Place.....

(Signature of the Head of the Institution with official seal)

Director
IPGME & R, Kolkata

Government of West Bengal

Office of the Director

Institute of Post Graduate Medical Education and Research, Kolkata

244 Acharya Jagadish Chandra Bose Road, Kolkata – 700 020

Annexure-I

ENDORSEMENT FROM THE HEAD OF INSTITUTION

Project Title: **Evaluation of Lipidomic Signature in Prediction of Onset of Polycystic Ovarian Syndrome.**

It is certified that the Institute welcomes participation of Dr. Pradip Mukhopadhyay as the Principal Investigator and Dr. Sujoy Ghosh, Dr. Soumen Manna, Dr. Debasish Bhattacharya as the Co-Principal Investigator will assume the responsibility of the fruitful completion of the project (with due intimation to DSTBT, GOWB).

1. Certified that the equipments, software, other basic facilities and such other administrative facilities as per terms and conditions of the grant, will be extended to investigator(s) throughout the duration of the project.
2. Institute assumes to undertake the financial and other management responsibilities of the project.
3. **I undertake that the UC and audited SOE along with Progress Report will be submittedin time failing which DSTBT may stop release of next instalment.**
4. **I accept the term that the decision for rejection of the project submitted, at any stage, will be at the sole discretion of DSTBT, GoWB.**

Place. Kolkata

Date. 27/03/2021

27/03/21

Name and Signature of Head of the Institution with Seal

Director
IPGME & R, Kolkata

Remarks:

In regard to research proposal emanating from scientific institutions/laboratories under various scientific Departments, the Head of the Institution is to provide a justification indicating clearly whether the research proposal falls in line with the normal research activities of the institution or not, and if no, the scientific reasons which merit its consideration by Department of Science and Technology & Biotechnology, Government of West Bengal.

Annexure- II

CERTIFICATE FROM THE INVESTIGATOR(S)

Project Title: **Evaluation of Lipidomic Signature in Prediction of Onset of Polycystic Ovarian Syndrome.**

1. I/We agree to abide by all the terms & conditions and guidelines of the DSTBT, GoWBgrant.

2. I/We did not submit this or a similar project proposal elsewhere for financial support.

3. I/We declare that this R&D project proposal is a new one and unique of its kind. This type of project has not been conducted elsewhere so far as my knowledge is concerned. The project proposal is original and the outcome will usher new light in this particular field.

4. I/ We declare that the following has been submitted to DSTBT for previously funded R&D project by DSTBT: (i) the final report, (ii) achievement of completed project against deliverables stated at the time of project submission, (iii) utilization certificateand audited statement of expenditure, (iv) information on publications made in reputed journals/ high impact journals, (v) patentable items, (vi) translational values, (vii) benefits to the State Government/ common man.

5. In case any item of the project proposal is found to be plagiarized, I/We shall be liablefor the consequences.

6. I/We have explored and ensured that equipment and basic facilities available within the Institution will be used as and where required for the purpose of the project. I/We shall not require financial support under this project for procurement of the items already available.

7. I/We undertake that the permanent equipments will be kept within the institution and the same will be made available to other users of the Institution also.

8. I/We undertake that **Intellectual Property Rights** arising out of the R & D Project work (if any) will be intimated to Department of Science and Technology & Biotechnology (DSTBT), Govt. of WB and will be filed jointly in the credit of the DSTBT, GOWB and the implementing organization as per above mentioned terms and conditions.

9. **I/We undertake that the UC and audited SOE along with Progress Report will be submitted in time failing which DSTBT may stop release of further instalment.**

10. **I/We accept the term that the decision for rejection of the project submitted, at any stage, will be at the sole discretion of DSTBT, GoWB.**

Name and Signature of Principal Investigator with Seal

Prof. Dr. Pradip Mukhopadhyay
M.D., D.M. (Endo.)
Professor
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

Name and Signature of Co-PI 1 with Seal

Prof. Dr. Sujoy Ghosh
MD (Gen. Med.), D.M. (Endo.),
MRCP (UK), MRCPS (Glasgow)
Professor
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

Name and Signature of Co-PI 2 with Seal

Director of Medical Education
Government of West Bengal
Swasthya Bhavan
Kolkata-700091

Name and Signature of Co-PI 3 with Seal

Annexure- III

DECLARATIONS

2. I declare that I have last received funds from DSTBT, GoWB on.....
for an amount of Rs 16,10000/- Sixteen Lakhs tenthousand only
(in figures and words).

3. I declare that I do not have any objection if my final project report/findings/papers etc. are shared by DSTBT-GoWB with any other line Department(s) for the benefit of the people of the State.

4. Utilisation Certificate (UC), Audited Statement of Expenditure (SOE) & Final Report submission date of the previous project of the PI funded by DSTBT, GoWB, if any:
UC: 2597 dt 20/09/2016 Audited SOE: .....
Final Report: .....

I/We declare that I shall abide by all the guidelines, rules and regulations and Terms and Conditions as mentioned in Guidelines for R & D Project Proposals (2020-21) of the Department of Science and Technology and Biotechnology, Government of West Bengal regarding financial assistance to R & D project and shall acknowledge the funding authority in all publications made out of the sanctioned project. I shall also include the Department of Science and Technology and Biotechnology (DSTBT), Government of west Bengal, as a joint applicant for any intellectual Property/ Patent arising out of the sanctioned project and the Royalty will be shared as may be decided by DSTBT on commercialization/transfer/ sale of technology or product. I also declare that I do not have any objection if my final project report/findings/papers etc. are shared by DSTBT-GoWB with any other line Department(s) for the benefit of the people of the State.

Signature:	**Signature:**
Date:	**Date:** 27/03/21
Name of Principal Investigator / Co-Principal Investigator with Official Seal: Prof. Dr. Pradip Mukhopadhyay M.D., D.M. (Endo.) Professor Dept. of Endocrinology & Metabolism I.P.G.M.E & R/S.S.K.M Hospital, Kolkata	**Name of Head of the Institution with Official Seal:** Director IPGME & R, Kolkata

Annexure-IV

BANK & OTHERS DETAILS OF THE APPLICANT INSTITUTION FOR RECEIVING GRANT

Name of the Organization	Institute of Post Graduate Medical Education and Research, Kolkata
Account number & name of the Account holder as per Bank Passbook/Cheque Book	A/c no.- 11062764407
	A/c name- Director, Institute of Post Graduate Medical Education and Research, Kolkata.
Type of Account (Savings or Current A/c)	Savings
Name of the Bank	State Bank of India
Name of the Branch with Branch address	(01768) Elgin Road (Calcutta) 91B, Chowringhee Road,Calcutta, West Bengal,700020.
IFSC code of the Branch	SBIN0001768
Mobile Phone Number of the PI	9433070996
PAN / TAN of the Account holder	AAGI0388G
	CALI01943E
File Number (for Office use)	

30.03.21

Date:

Signature of Authorized Person with seal

Accounts Officer
IPGME & R, Kolkata

Enclosures: Cancelled Cheque / Photo Copy of first page of Bank Pass Book

GOVERNMENT OF WEST BENGAL
INSTITUTE OF POST GRADUATE MEDICAL EDUCATION AND RESEARCH
A.J.C. BOSE ROAD, KOLKATA-700020.

BANK & OTHERS DETAILS OF THE APPLICANT INSTITUTION FOR RECEIVING GRANT

Name of the Organization	**INSTITUTE OF POST GRADUATE MEDICAL EDUCATION AND RESEARCH, KOLKATA**
Account number	**11062764407**
Name of the Account holder	**DIRECTOR, INSTITUTE OF POST GRADUATE MEDICAL EDUCATION AND RESEARCH, KOLKATA**
Type of Account	**SB**
Name of Bank	**STATE BANK OF INDIA**
Name of the Branch with Branch address	**(01768) ELGIN ROAD (CALCUTTA) 91B, CHOWRINGHEE ROAD, CALCUTTA, WEST BENGAL, 700020.**
IFSC code of the Branch	**SBIN0001768**
MICR code of the Branch	**700002031**
PAN Card / TAN/ GST Number of the Account holder	**AAAGI0388G CALI01943E 19CALI01943E1DU**
Phone Number of the concerned official	**033-2204-1120**

Date 5.10.20

Signature of Authorized Person with seal
Accounts Officer
IPGME & R, Kolkata

Enclose:

* Cancelled Cheque / Photo Copy of first page of Bank pass Book

भारतीय स्टेट बैंक
State Bank Of India

(01768) - ELGIN ROAD (CALCUTTA)
91B, CHOWRINGHEE ROAD, CALCUTTA
WEST BENGAL 700020
Tel: 33-22231237 IFS Code: SBIN0001768

D D M M Y Y Y Y

PAY R.I.B., Kolkata

या धारक को OR BEAR

रुपये RUPEES Ten Thousand only

अदा करें ₹ 10,000/-

A/c No 11062764407

VALID UPTO ₹ 10 LACS AT NON-HOME BRANCH FOR NON-CASH TRANSACTION ONLY

70446726011

SB ACCOUNT

PREFIX:
0523700219

DIR INST OF POST GRADUATE MEDICAL EDUCATIOI
RESEAR

MULTI-CITY CHEQUE Payable at Par at All Branches of SBI

Please sign above

⑈409492⑈ 700002031⑆ 00042511⑈ 31

Annexure-V

BIO DATA OF PRINCIPAL INVESTIGATOR &CO-PRINCIPALINVESTIGATOR(S) [to fill separately by PI and Co-PI(s)]

1. **Name: PRADIP MUKHOPADHYAY**
2. **Designation: Professor**
3. **Department: Dept. of Endocrinology and Metabolism**
4. **Organization/Institution name: Institute of Postgraduate Medical Education & Research. Kolkata**
5. **Address: 244, A.J.C Bose Road Kolkata-700020 Pin: 700020**
6. **e-mail:pradip.mukherjee@gmail.com**
7. **Mobile: 94330-70996**
8. **Date of birth:2nd February, 1964**
9. **Sex (M/F): M**
10. **Category (Gen/SC/ST/OBC): Gen**
11. **Academics:**

Sl. No.	Institution Place	Degree Awarded	Year	Field of Study
1.	N.R.S Medical College Kolkata	MBBS	1986	Medicine and Surgery
2.	Institute of Postgraduate Medical Education& Research Kolkata	MD	1993	General Medicine
3.	Institute of Postgraduate Medical Education & Research Kolkata	DM	2002	Endocrinology

12. **Position and Employment** (Starting with the most recent employment)

Sl. No.	Institution Place	Position	From (Date)	To (Date)
1.	Institute of Postgraduate Medical Education & Research Kolkata (Dept. of Endocrinology)	Professor	14.11.2019	Till date
2.	Institute of Postgraduate Medical Education & Research Kolkata (Dept. of Endocrinology)	Associate Professor	16.7.2013	13.11.2019.
3.	Medical College Kolkata (Dept. of Endocrinology)	Associate Professor	25.1.2012	15.7.2013
4.	Institute of Postgraduate Medical Education & Research Kolkata (Dept. of Endocrinology)	Assistant Professor	23.9.2009	24.1.2012

13. Honours and Awards, Books, patents Received:

1. Stood 1st in Madhyamik Examination in the district of Birbhum,West Bengal, with letter marks in six subjects in the year 1979.

2. Stood 1st in Higher Secondary Examination in the district of Birbhum in the year 1981.

3. Recipient of National Scholarship.

4. Honours in 1st MBBS, 1983.

5. Stood 1st in the examination conducted by West Bengal Public Service Commission in the year 1993

14. Others (please specify):

(Membership of Scientific Societies):

1. Hony. Secretary, Endocrine Society of Bengal 2014 till date
2. Life Member, Diabetic Association of India.
3. Treasurer, Research Society for the Study of Diabetes in India ,WB
4. Life Member, Association of Physicians of India.
5. Life Member, Endocrine Society of India.
6. Life Member, Research Society for the Study of Diabetes in India (RSSDI)
7. Life Member, Endocrine Society of Bengal.

15. Publications (Use separate sheets if necessary)

a. Selected Peer-reviewed publications (Ten best publications in chronological order)

1. Chakraborty P, Mukhopadhyay P, Bhattacharjee K, Chakraborty A, Chowdhury S, Ghosh S. Periodontal Disease in Type 1 Diabetes Mellitus: Influence of Pubertal Stage and Glycemic Control. EndocrPract. 2021 Jan 21:S1530-891X(21)00016-1.
2. Ghosh I, Mukhopadhyay P, Das K, Anne M B, Ali Mondal S, Basu M, Nargis T, Pandit K, Chakrabarti P, Ghosh S. Incretins in fibrocalculous pancreatic diabetes: A unique subtype of pancreatogenic diabetes. J Diabetes. 2020 Nov 28.
3. Neogi S, Mukhopadhyay P, Sarkar N, Datta PK, Basu M, Ghosh S. Overt and Subclinical Adrenal Insufficiency in Pulmonary Tuberculosis. EndocrPract. 2020 Dec 14:S1530-891X(20)48391-0.
4. Dutta S, Tarafdar S, Mukhopadhyay P, Bhattacharyya NP, Ghosh S. Plasma cell free DNA to differentiate malignant from benign thyroid nodules. J ClinEndocrinolMetab. 2021 Jan 21:dgab030.
5. Ghosh S, Pramanik S, Biswas K, Bhattacharjee K, Sarkar R, Chowdhury S, Mukhopadhyay P. Levothyroxine Absorption Test to Differentiate Pseudomalabsorption from True Malabsorption. Eur Thyroid J. 2020 Jan;9(1):19-24.
6. Mandal S, Mukhopadhyay P, Banerjee M, Ghosh S.Clinical, Endocrine,Metabolic Profile, and Bone Health in Sheehan's Syndrome. Indian J EndocrinolMetab. 2020 Jul-Aug;24(4):338-342.
7. Pramanik S, Mukhopadhyay P, Ghosh S. Total T4 rise in pregnancy: a relook? Thyroid Res. 2020 Jul 31;13:14.
8. Dutta S, Tarafdar S, Kar SS, Das U, Basu K, Mukhopadhyay P, GhoshS.Comparison between Sonographic Features and Fine Needle AspirationCytology with Histopathology in the Diagnosis of Solitary Thyroid Nodule.De D,Indian J EndocrinolMetab. 2020 Jul-Aug;24(4):349-354.
9. Basu M, Pandit K, Banerjee M, Mondal SA, Mukhopadhyay P, Ghosh S Profile ofAuto-antibodies (Disease Related and Other) in Children with Type 1Diabetes..Indian J EndocrinolMetab. 2020 May-Jun;24(3):256-259.
10. Roy A, Maiti A, Sinha A, Baidya A, Basu AK, Sarkar D, Sanyal D, Biswas D,Maisnam I, Pandit K, Raychaudhuri M, Sengupta N, Chakraborty PP,Mukhopadhyay P, Raychaudhuri P, Sahana PK, Chatterjee P, Bhattacharjee R,Dasgupta R, Saraogi RK, Pal SK, Mukhopadhyay S, Mukhopadhyay S, GoswamiS, Chowdhury S, Ghosh S. Kidney Disease in Type 2 Diabetes Mellitus andBenefits of Sodium-Glucose Cotransporter 2 Inhibitors: A Consensus Statement.;Working Group of the Endocrine Society of Bengal.DiabetesTher.2020 Oct 6.
11. Pandit K, Mukhopadhyay P, Chatterjee P, Majhi B, Chowdhury S, Ghosh S.Assessment of Insulin Resistance Indices in Individuals with Lean and ObeseMetabolic Syndrome Compared to Normal Individuals: A Population Based. Study. J Assoc Physicians India. 2020 Oct;68(10):29-33. PMID: 32978922.
12. Sujoy Ghosh, SubhodipPramanik, Kaushik Biswas, KingshukBhattacharjee, Rajib Sarkar, Subhankar Chowdhury, PradipMukhopadhyay. Levothyroxine Absorption Test to Differentiate Pseudomalabsorption from True Malabsorption. Eur Thyroid J. DOI: 10.1159/000504218.
13. Sowrabha Bhat, PradipMukhopadhyay, ArpitaRaychaudhury, Subhankar Chowdhury, Sujoy Ghosh. Predictors of hypopituitarism due to vasculotoxic snake bite with acute kidney injury. Pituitary. https://doi.org/10.1007/s11102-019-00990-8
14. Ravindra Shukla, Asish Kumar Basu, Biplab Mandal, PradipMukhopadhyay, AnimeshMaity, Satyam Chakra borty and Praveen Kumar Devrabhai.11β Hydroxy steroid dehydrogenase–1 activity in type 2 diabetes mellitus: a comparative study. BMC Endocrine Disorders 2019; 19:15. https://doi.org/10.1186/s12902-019-0344-9

15. Sharma S.K, Ajmani AK, Khosla P, Mukhopadhyay P, Bhatia G., Prakash K.G, Chhaya G, Supe PD, Pavithran V, Bora H , Jain R , Ingole S , Shah A. (2018) Immunogenicity, Safety and Efficacy Comparison of Wockhardt's Biosimilar Insulin Glargine—Glaritus^{R} with Reference Product—Lantus^{R}: Study Protocol & Early Data Trends. Open Journal of Endocrine and Metabolic Diseases , 8, 157-166. https://doi.org/10.4236/ojemd.2018.88016
16. Chakraborty PP, Ray S, Biswas D, Baidya A, Bhattacharjee R, Mukhopadhyay P, Ghosh S, Mukhopadhyay S, Chowdhury S. A Comparative Study between Total Contact Cast and Pressure Relieving Ankle Foot Orthosis in Diabetic Neuropathic Foot Ulcers. Journal of Diabetes Science and Technology December 2014. J Diabetes SciTechnol published online.
17. DayanidhiMeher, Deep Dutta, Sujoy Ghosh, PradipMukhopadhyay, Subhankar Chowdhury, SatinathMukhopadhyay. Effect of a mixed meal on plasma lipids, insulin resistance and systemic inflammation in non-obese Indian adults with normal glucose tolerance and treatment naı¨ve type-2 diabetes. Diabetes Research and Clinical Practice.2014.
18. Deep Dutta, Indira Maisnam, Sujoy Ghosh, **PradipMukhopadhyay**, SatinathMukhopadhyay, Subhankar Chowdhury. Marcus-Gunn Jaw Winking Syndrome and Gustatory Sweating in Long Standing Poorly Controlled Diabetes: A Case Report. International Journal of Clinical Medicine, 2012, 3, 40-42.
19. PrabirLahiri, Utpal Chaudhuri, Anjan Kr Dasgupta, S.N.Ray, S.Saha, **P.Mukherjee**. Insensitivity to the alpha 2-adrenergic blocker yohimbine hydrochloride & occurrence of spontaneous platelet macro aggregation (SPMA) in diabetes. *Platelets*. 2005; 16(2):111-5.
20. Neuroendocrine Carcinoma of the Thyroid Causing Adrenocorticotrophic Hormone-Dependent Cushing's Syndrome. Deep Dutta , SatinathMukhopadhyay, Indira Maisnam, Sujoy Ghosh , **PradipMukhopadhyay**, SubhankarChowdhury . Thyroid. 2013 Jan; 23(1):120-3.
21. Association of different eGFR methods, Calcium metabolism and anemia in Diabetic Chronic Kidney Disease: an Indian perspective (experience) Anirban Sinha, Deep Dutta, Ankit Shrivastav, **Pradip Mukhopadhyay**, SatinathMukhopadhyay, Subhankar Chowdhury.DiabetologiaCroatica 2012 ; 41-4,
22. Diabetes and Primary Infertility in Young Males: Do Not Forget Cystic Fibrosis. ParthaPratim Chakraborty, Sayantan Ray, Rana Bhattacharjee, Sujoy Ghosh, **PradipMukhopadhyay**, SatinathMukhopadhyay, Subhankar Chowdhury. Clinical Diabetes journals. VOLUME 33,NUMBER 2, SPRING
23. First Presentation of Diabetes as Diabetic Ketoacidosis in a Case of Friedreich's Ataxia .ParthaPratim Chakraborty, Sayantan Ray, Rana Bhattacharjee, Sujoy Ghosh, **PradipMukhopadhyay**, SatinathMukhopadhyay, and Subhankar Chowdhury Clinical Diabetes journals. VOLUME 33,NUMBER 2, SPRING 2015.
24. Bilateral adrenal myelolipoma in Cushing's disease: a relook into the role of corticotropin in adrenal tumourigenesisParthaPratim Chakraborty, Rana Bhattacharjee, **PradipMukhopadhyay**, Subhankar Chowdhury. BMJ Case Rep 2016. doi:10.1136/bcr-2016-21496.
25. Houssay phenomenon –hypopitutarism leading to remission of diabetes. SubhodipPramanik, Rana Bhattacharjee, **PradipMukhopadhyay** and Sujoy Ghosh. Clinical Medicine 2016 Vol 16, No 3: 294–6

b. Five recent publications relevant to the proposed area of work: No

13. Details of Completed and Ongoing Research projects supported by DSTBT and other funding agencies (if any) (to be mentioned separately for both the PI & Co-PIs)

Sl. No.	Title of Project	Name of Funding Agency	Amount (Rs)	Date of Initiation & Duration
1	A Study to compare & correlate the metabolic health(anthropologic & bio-chemical) between scheduled tribe population in under developed parts of the district of Birbhum with special reference to metabolic health awareness especially about diabetes: a population based observational studies.	WBDST	Rs. 16,10000/- (Sixteen Lakhs Ten Thousand Only)	Date of Initiation- 01/04/2015 Duration- 1 Year

14. Justification of Professional Competence to carry out the Project. PI and CO-PI are experienced in clinical aspect and management of PCOS and LEAN PCOS as a faculty in the Dept. of Endocrinology, IPGME&R,SSKM Hospital.

15. Ethical Approval (if the project involves humans or animals), whether obtained: Applied for Institutional Ethics

16. Whether this project has already been submitted for grant elsewhere: No

Signature of Principal Investigator/ Co-Principal Investigator(s)

with official seal

Prof. Dr. Pradip Mukhopadhyay
M.D., D.M. (Endo.)
Professor
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

Date: 31/03/2021

Recommended and Forwarded

(Head of the Department/Institution of the PI and Co-PI, as the case may be)

Prof. (Dr.) Subhankar Chowdhury
D.T.M&H, M.D., D.M. (Endo.), M.R.C.P (UK)
Professor & HOD
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

BIODATA OF CO-PRINCIPAL INVESTIGATOR

NAME: **SUJOY GHOSH**

Designation : Professor

Department:Department of Endocrinology & Metabolism

InstituteName :Institute of Post Graduate Medical Education & Research, Calcutta India since December 2014

ADDRESS:P-7, Beleghata Main Road, (top floor)Calcutta

PIN: 700085

E MAIL:drsujoyghosh2000@gmail.com

TELEPHONE(OFFICE):22235076 Mobile:919674625823

DATE OF BIRTH: 29th December 1971

Sex:Male

Category:Gen

Academics:

Sl No	Institution Place	Degree Awarded	year	Field of study
1.	Nilratan Sircar Medical College & Hospital, Calcutta. University of Calcutta	MBBS(**Stood 4th** Gold Medal-Anatomy 1st Certificate Physiology)	1997	Medicine
2.	University of Calcutta.	M.D.(**Stood 1st** Tarunanga Nath Ghosh Memorial Award)	2001	Internal Medicine
3.	University of Calcutta.	D.M. (Post-doctoral) **Stood 1st**	2005	Endocrinology
4.	Edinburgh & Glasgow	F.R.C.P	2012	

ADDITIONAL QUALIFICATIONS

Specialty Certificate of Endocrinology & Diabetes (U.K.) 2009

Fellow of Indian College of Physicians 2012

Fellow of American College of Endocrinology 2013

M.R.C.P: Royal college of Physicians UK

M.R.C.P.S: Royal college of Physicians & Surgeons Glasgow

Specialty certificate of Diabetes & Endocrinology: Royal college of Physicians UK

Position and Employment(Starting with the most recent employment)

Sl No	Institutional place	position	From(Date	To(Date)
1.	Department of Medicine & Endocrinology unit).The Ayr Hospital,University of Glasgow	Clinical Teacher & Clinical Researcl Fellow		
2.	INSTITUTE OF POST GRADUATE MEDICAL EDUCATION & RESEARCH, CALCUTTA, INDIA	POSTDOCTORAL FELLOW (SUPERSPECIALITY TRAINING), ENDOCRINOLOGY	15th May 2002	14th May 2005

- **ACADEMIC DISTINCTIONS/AWARDS**
- **Stood 1st in D.M. (post doctoral) in Endocrinology**, May 2005.
- **Stood 1st in M.D. (Internal Medicine)** 2001.
- Winner of Tarunanganath Ghosh Memorial Award 2001 for having secured highest marks in M.D. (Internal Medicine).
- Winner of Sukumar Mukherjee & Bijoya Mukherjee Medal from Association of Physicians of India for having secured highest marks in aggregate in M.D. (Internal Medicine) 2001.
- Winner of College Scholarship for academic excellence in all semester examinations
- **Stood 4th in the University in MBBS** examinations.

RESEARCH AWARDS

- **Best Research paper in Endocrinology 2009. European Endocrine Conference. Istanbul April 2009.**
- **1ST Prize for best poster presentation at the Triennial Conference of Royal College of Physicians and surgeons, Glasgow November 2008.**
- **1st Prize for best research presentation. Royal Medico-Chirurgical society of Glasgow 2007.**
- **Runners up- Eli-Lily Abracadabra award, London March 2009. For Best clinical research in Diabetes.**
- **Finalist: 50th Annual research competition of Scottish Society of Physicians, October 2008.**
- **Finalist: Annual Research Competition of Royal Medico-Chirurgical society of Glasgow 2009.**
- **2nd Runners up for best research in Endocrinology. A.V.Gandhi memorial award. India. 2006**

- Stood **first** in India in the neurology session for presentation of **scientific paper** in Annual conference of India, held in Jaipur, 2000.

PUBLICATIONS:

CONTRIBUTION IN BOOKS:

BOOKS

Ghosh S, Collier A, Varikarra M, Palmer S. Fundoscopy made Easy. Elseiver Publishers

Ghosh S, Collier A. Churchill's Pocket Book of Diabetes, 2nd Edition, Churchill Livingstone Publishers

Ghosh S et all Endocrinology Protocols: (in press): Blackwell-John Wiley

BOOK CHAPTERS:

Ghosh S, Collier A. Amiodarone induced thyroid dysfunction. Chapter X. Pages 165-186. Thyroid Hormones: Functions, Related Diseases and Uses. Edited by Francis S. Kuehn and Mauris P. Lozada. Nova Biomedical Books, New York. ISBN: 978-1-60741-080-5.

Chatterjee S, Ghosh S. Endocrine emergencies. The Protocol Book, 3rd Edition. Jaypee Brothers.

Dutta D, Ghosh S. Pharmacotherapy in obesity: the quest for the magic bullets. E-Book "Anti-Obesity Drug Discovery and Development". Bentham, eBooks, Boston USA

Ghosh S et al. Pathogenesis of Diabetic Cardiomyopathy: Indian College of Physicians Monograph

Goswami S, Ghosh S. Diabetic complications: Current Challenges and opputurtunities. Hypoglcaemic complications of diabetes.

PUBLICATION IN JOURNALS

1.Deep Dutta, Indira Maisnam, Sujoy Ghosh, Satinath Mukhopadhyay and Subhankar Chowdhury. Syndrome of Extreme Insulin Resistance (Rabson-Mendenhall Phenotype) with Atrial Septal Defect: Clinical Presentation and Treatment Outcomes

2.Anubhav Thukral, Chitra Selvan, Partha Pratim Chakraborty, Ajitesh Roy, Soumik Goswami, Rana Bhattacharjee, Sujoy Ghosh, Satinath Mukherjee, Subhankar Chowdhury. "Case Studies in Insulin Therapy: The Last Arrow in the Treatment Quiver", Clinical Diabetes,Volume 31, Number 4,2013, 175-178

3.Deep Dutta, Manoj Kumar, Rajesh Jain, Anubhav Thukral, Dibakar Biswas, Sujoy Ghosh, Satinath Mukhopadhyay, Subhankar Chowdhury. "Metastatic Adenocarcinoma Arising from

Fibrocalcific Pancreatic Diabetes", Images in Endocrinology, JAFES, Vol.28 No.2 November 2013, Pages 165-166.

4.Sanyal T, Ghosh S, Chowdhury S, Mukherjee S. Can a faulty injection technique lead to a localized insulin allergy? Indian J Endocrinol Metab. 2013 Oct;17(Suppl 1):S358-9. doi: 10.4103/2230-8210.119621.

5.Chitra S, Ghosh S, Mukhopadhyay S. Insulin Pumps, JIMA November 2013
Mukhopadhyay S, Sengupta N, Ghosh S. Clinical experience with insulin detemir, biphasic insulin aspart and insulin aspart in people with type 2 diabetes: Reseults from the West Bengal cohort of the A1chieve study. Indian Journal of Endocrinology and metabolism, 2013, Vol 17, Suppl 2.

6.Anubhav Thukral, Chitra selvan, PP Chakraborty, Ajitesh Roy, Soumik Goswami, Rana Bhattacharjee, Sujoy Ghosh, Prof Satinath Mukerjee, Prof. Subhankar Chowdhury.

Case studies in Insulin Therapy: The Last arrow in the Quiver.
Chitra Selvan, Ghosh S, Kalra S, Zargar A H. Endocrinology Training in India, IJEM 2013.

7.Chakraborty PP, Ghosh S. Online Risk Engines in Endocrinology, IJEM 2013
Dutta D, Choudhuri S, Mondal SA, Maisnam I, Reza AH, Ghosh S, Chowdhury S, Bhattacharya B, Mukhopadhyay S.Diabetes Res Clin Pract. 2013 Mar;99(3):e37-41. doi: 10.1016/j.diabres.2012.12.007. Epub 2013 Jan 5.

8.Debmalya Sanyal, Sujoy Ghosh. ESICON 2012: The best of Indian Endocrinology: Indian Journal of Endocrinology and Metabolism Volume 16 | Supplement 2 (ESICON 2012, Kolkata) | 2012: S 136.

9.Collier A, Ghosh S, McGlynn B, Hollins G. Prostate cancer, androgen deprivation therapy, obesity, the metabolic syndrome, type 2 diabetes, and cardiovascular disease: a review. Am J Clin Oncol. 2012 Oct;35(5):504-9.

10.Chan HW, Ashan B, Jayasekera P, Collier A, Ghosh S. A new class of drug for the management of type 2 diabetes: Sodium glucose co-transporter inhibitors: 'Glucuretics'. Diabetes Metab Syndr. 2012 Oct;6(4):224-8.Kolkata) | 2012: S 312-314

Research Support: Ongoing Research Projects (As Principal Investigator)

Project title	Start date	Completion date	Project cost	Sponsoring organization
A study on the association between chronic periodontitis and diabetes	2016	2018	23lakh	Wb-dst

Ethical Approval (if the project involves humans or animals), whether obtained:Applied

Whether this project has already been submitted for grant elsewhere: No

Signature of Principal Investigator

official seal

Prof. Dr. Sujoy Ghosh
MD (Gen. Med.), D.M. (Endo.),
MRCP (UK), MRCPS (Glasgow)
Professor
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

Date: 31/03/2021

RecommendedandForwarded
(HeadoftheDepartment)

Prof.(Dr.) Subha[illegible]
[illegible], M.D., D.M. (Endo.), [illegible]
Professor & HOD
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

Curriculum-Vitae

Name : **Prof (Dr) DEBASIS BHATTACHARYYA**
Date of Birth : 16.09.1958
Father's Name : Late Mr. Gour Bhattacharyya
Contact Address : 41C, R.N. Das Road, Kolkata 700 031, India.
Phone No. : Mobile : +91 94330 33333
E-mail: prof.db.1958@gmail.com ;
Marital Status: Widower (one daughter).
Present Posting: Director of Medical Education, Dept. of H&FW, Govt. of West Bengal from 18.07.2019
Past Postings: Medical Superintendent cum Vice Principal, IPGM&R- SSKM Hospitals, from 16.09.09 to 17.08.10
Principal, Malda Medical College & Hospital, Malda, West Bengal from 17.08.2010 to 05.04.2012
Principal, College of Medicine & Sagore Dutta Hospital, Kolkata, West Bengal from 07.04.2012 to 23.06.2015
Principal, NRS Medical College, Kolkata, West Bengal from 23.06.2015 to 13.04.2017
Director of Medical Education, Dept. of H&FW, Govt. of West Bengal from 13.04.2017 to 25.07.2018
OSD in the Rank of DME, Dept. of H&FW, Govt. of West Bengal from 25.07.2018 to 18.07.2019

Academic Qualification & Awards

1: **M.B.B.S.** 1982. ***First*** (Gold Medal) in G&O, (Cal National MC), Calcutta University.
2: **D.G.O.** 1986. ***Fourth,*** (Chittaranjan Seva Sadan), Calcutta University.
3: **M.D. (G&O)** 1988. ***Fourth*** (Armed Forces MC) University of Poona.
4: **D.N.B. (G&O)** 1990. National Board of Examinations, New Delhi.
5: **Ph.D. (G&O)** 2003. University of Poona, on "Tumour Marker (ER & PgR) Study in Ca Cx"

Teaching Experience

1: As **Lecturer** in the Dept. of G&O from 27.01.1989 to 31.08.1989. at Pravara Rural Hospital & Medical College under Poona University.
2: As **Lecturer** in the Dept. of G&O from 01.02.1990 to 30.11.1994. at K.E.M. Hospital & Research Centre under B J Medical College, Poona University.
3: As **Associate Professor** in the Dept. of G&O from 01.12.1994 to 31.01.1995. at K.E.M. Hospital & Research Centre, under B J Medical College, Poona Univ.
4: As **Associate Professor** in the Dept. of G&O from 30.05.2000 to 23.05.2004 at Burdwan Medical College & Hospital, West Bengal.
5: As **Professor** in the Dept. of G&O from 24.05.2004 to 09.04.2008 at Burdwan Medical College & Hospital, West Bengal.
6. As **Professor** in the Dept. of G&O from 16.04.2008 to 16.09.2009 at RG Kar Medical College & Hospital, West Bengal.
7. As **Professor** in the Dept of G&O from 16.09.2009 to 17.08.2011 at IPGME&R and SSKM Hospital, Kolkata, West Bengal.
8. As **Professor** in the Dept of G&O from 17.08.2010 to 05.04.2012 at Malda Medical College & Hospital, Malda, West Bengal.
9. As **Professor** in the Dept of G&O from 07.04.2012 to 23.06.2015 at College of Medicine & Sagore Dutta Hospital, Kolkata, West Bengal.
10. As **Professor** in the Dept of G&O from 23.06.2015 to 13.04.2016 NRS Medical College & Hospital, Kolkata, West Bengal.

Examiner

Undergraduate & Postgraduate Examiner of Calcutta, Burdwan and Ranchi University.
Examiner of National Board of Examinations for DNB (G&O).
Ph.D. Examiner Jadavpur University, Kolkata , Burdwan University

Research Experience

Ph.D. Guide Jadavpur University, Kolkata , Burdwan University & WBUHS

Patent

No: 199335 (620/CAL/ 2000) dated 08.11.2000 for
"An Apparatus for Direct Enlarged Visualization of Macroscopic Creatures and Organs."

Total Number of Paper Publications:

International Journals: Eighteen **National Journals: Thirty**

(Prof (Dr) Debasis Bhattacharyya)

Soumen Kanti Manna

Designation Associate Professor
Department: Biophysics & Structural Genomics Division
Organization/Institute Name: Saha Institute of Nuclear Phvsics. Kolkata, India
Address: Block - AF, Sector - 1, Bidhan nagar, Kolkata, West Bengal 700064
Phone: +91 33 23374632 (Ext 4626)

Education:

Degree	Year	Subject	Institute
Ph. D.	2008	Chemical Sciences	Tata Institute of Fundamental Research
M. Sc.	2002	Chemistry (Inorganic)	University of Calcutta
B. Sc.	2002	Chemistry (Hons)	R. K. M. R. College, Narendrapur

Training and Employment:

2014- Associate Professor 'E', Saha Institute of Nuclear Physics, Kolkata
2014 Visiting Scientist, UM-DAE Center for Excellence in Basic Sciences, Mumbai
2008-2013 Postdoctoral Fellow, National Institute of Health, USA

Awards and Other Special Scientific Recognitions (*selected*):

2015 Ramanujan Fellowship, DST, India
2014 Young Investigator Award, MSACL EU-2014, Austria
2014 Young Investigator Award, MSACL-2014, USA
2013 Young Investigator Award, MSACL-2013, USA
2012 Fellows Award for Research Excellence (FARE) 2013, NIH, USA
2011 Director's Intramural Innovation Award, NCI, NIH, USA
2010 Fellows Award for Research Excellence (FARE) 2011, NIH, USA

Patent/Innovation:

2014 International Patent Application No. PCT/US2014/012758
(for the discovery of early noninvasive biomarkers of colorectal cancer)
2013 US Patent Application No. 61/845,055
(for the discovery of noninvasive biomarkers of lung cancer)
2011 US Patent Application No. 61/507,573
(for genetic background-independent noninvasive ALD biomarkers using mouse model)

Research Area:

Metabolomics, Proteomics, Mass Spectrometry, Hepatobiliary Diseases and Cancer

Reserch Funding/Grants:

Project title	Funded by	Funds Sanctioned	Year	Role
Effect of dietary supplementation of St. Johns Wort extract on physiological	Office of Dietary Supplements	96300	2011	Principal Investigator

function and colorectal carcinogenesis: A system level analysis of underlying molecular events.	Research, NIH			
Analysis of metagenomic and metabolomic signatures of colorectal cancer using a mouse model.	Office of Director, NCI	10000	2011	Co-Principal Investigator

Publications (*Selected*):

A. Research Articles

1. Patel D, Thompson MD, **Manna SK**, Krausz KW, Zhang L, Nilbuol N, Gonzalez FJ, Kebebew E. Unique and novel urinary metabolomic features in malignant versus benign adrenal neoplasms. ***Clin Cancer Res*** (accepted, 2017).
2. Golla S, Golla JP, Krausz KW, Manna SK, Simillion C, Beyoglu D, Idle JR, Gonzalez FJ. Metabolomic Analysis of Mice Exposed to Gamma Radiation Reveals a Systemic Understanding of Total-Body Exposure. ***Radiation Res*** (accepted, 2017).
3. Chen Y., Singh S., Matsumoto A., **Manna S. K.,** Abdelmegeed M. A., Golla S., Murphy R. C., Dong H, Song B. J., Gonzalez F. J., Thompson D. C., Vasiliou V. Chronic Glutathione Depletion Confers Protection against Alcohol-induced Steatosis: Implication for Redox Activation of AMP-activated Protein Kinase Pathway. ***Sci Rep.*** 2016 Jul 12;6:29743. PMID: 27403993
4. **Manna, S. K**., Golla, S., Golla, J. P., Tanaka, N., Cai, Y., Takahashi, S., Krausz, K. W., Matsubara, T., Korboukh, I., Gonzalez, F. J., St. John's Wort Attenuates Colorectal Carcinogenesis in Mice through Suppression of Inflammatory Signaling. ***Cancer Prev Res (Phila).*** 2015 Sep;8(9):786-95. PMID: 26069204
5. Mathé, E., Patterson, A. D., Majda, H., **Manna, S. K.,** Krausz, K. W., Bowman, E. D., Shields, P. G., Idle, J. R., Smith, P. B., Anami, K., Kajandjian, D. J., Hatzakis, E., Gonzalez, F. J. Harris, C. C. Non-invasive urinary metabolomic profiling identifies diagnostic and prognostic markers in lung cancer. ***Cancer Res.*** 2014 Jun 15;74(12):3259-70. PMID: 24736543
6. **Manna, S. K.,** Tanaka, T, Krausz, K. W., Majda, H., Xue, X., Matsubara, T. Bowman, E. D., Fearon, E. E., Harris, C. C., Shah, Y. M., and Gonzalez, F. J. Biomarkers of coordinate metabolic reprogramming in colorectal tumors in human and mice. ***Gastroenterology*** 2014 May;146(5):1313-24. PMID: 24440673.
7. Johnson, C. H., **Manna, S. K.**, Krausz, K. W., Bonzo, J. A. Hollingshead, M. G., Gonzalez, F. J. Global metabolomics reveals urinary biomarkers of breast cancer in a MCF-7 Xenograft Mouse Model. ***Metabolites*** 2013; 3 (3); 658-672
8. Cheng J., Cheng C., Kristopher, K. W., **Manna, S. K.**, Scerba, M., Friedman, F. K., Luecke, H., Idle, J. R., Gonzalez, F. J. Identification of 2-Piperidone as a biomarker of CYP2E1 activity through metabolomic phenotyping. ***Toxicol Sci.*** 2013 Jun 28. PMID: 23811823.
9. **Manna, S. K.,** Krausz, K. W., Bonzo, J., Idle, J. R. and Gonzalez, F. J. Metabolomics reveals aging-associated attenuation of noninvasive radiation biomarkers in mice: potential role of polyamine catabolism and incoherent DNA damage-repair**.** ***J Proteome Res.*** 2013 May 3;12(5):2269-81. PMID: 23586774.

10. Bi, H, Krausz, K. W., **Manna, S. K.,** Li, F., Johnson, C. H., and Gonzalez, F. J. Optimization of harvesting, extraction and analytical protocols for UPLC-ESI-MS-based metabolomic analysis of adherent mammalian cancer cells. ***Anal Bioanal Chem.*** 2013 Jun;405(15):5279-89. PMID: 23604415.
11. Singh, A., Happel, C., **Manna, S. K.,** Acquaah-Mensah, G., Carratero, J., Kumar, S., Nasipuri, P., Krausz, K. W., Dewi, R., Wakabayashi, N., Boros, L. G., Gonzalez, F. J., Gabrielson, E., Wong, K. K., Girnun, G., Biswal, S. Nrf2 regulates miR-1 and miR-206 to drive tumorigenesis. ***J Clin Invest.*** 2013 July 1; 123(7): 2921–2934. PMCID: PMC3696551
12. Matsubara, T., Tanaka, T., Krausz, K. W., **Manna S. K.,** Kang, D., Anderson, E. R., Luecke, H., Patterson, A. D., Shah, Y. M., and Gonzalez, F. J. Metabolomics identifies an inflammatory cascade involved in dioxin- and diet-induced steatohepatitis. ***Cell Metab.*** 2012 Nov 7; 16(5):634-44. PMID: 23140643
13. Qu, A., Shah, Y. M., **Manna, S. K.**, Gonzalez, F. J. Disruption of endothelial Peroxisome Proliferator-activated Receptor γ accelerates diet-induced atherogenesis in Low-density Lipoprotein Receptor-null mice. ***Arterioscler Thromb Vasc Biol.*** **32**(1):65-73 (2012). PMID: 22015658
14. **Manna, S. K.,** Patterson, A. D., Yang, Q., Krausz, K. W., Idle, J. R., Fornace A. J. and Gonzalez, F. J. UPLCMS-based urine metabolomics reveals indole-3-lactic acid and phenyllactic acid as conserved biomarkers for alcohol-induced liver disease in Ppara-null mouse model. ***J Proteome Res.*** **10**: 4120-33 (2011). PMID: 21749142
15. **Manna, S. K.,** Patterson, A. D., Yang, Q., Krausz, K. W., Li, H., Idle, J. R., Fornace A. J. and Gonzalez, F. J. Identification of noninvasive biomarkers for alcohol-induced liver disease using mass spectrometry-based urinary metabolomics and the Ppara-null mouse **J. Proteome Res.** 9: 4176-88, (2010). PMID: 20540569

B. Reviews and Book Chapters

1. **Manna, S. K.**, Thompson, M., Gonzalez, F. J. "Noninvasive biomarkers of alcoholic liver disease in mouse model" in *Biological Basis of Alcohol-Induced Cancer* (edited by Vasilis Vasiliou, Samir Zakhari, Helmut K. Seitz, Jan B. Hoek, published by Springer). Adv Exp Med Biol. 2015;815:217-38. PMID: 25427910
2. Sen, S., **Manna, S. K**., Mazumdar, S. "Oxidation of Unnatural Substrates by Engineered Cytochrome P450cam" in *"Iron-containing Enzymes: Versatile Catalysts of Hydroxylation in Nature"* (edited by Samuel P de Visser and Devesh Kumar, published by Royal Society of Chemistry, 2011. ISBN: 978-1-84973-181-2).

Ethical Approval (if the project involves humans or animals), whether obtained:-
Human Ethical approval will be available with the coordinator of the project in IPGMER, SSKM Hospital Kolkata.

Whether this project has already been submitted for grant elsewhere: No

Annexure–VI

DETAILSOFEARLIERSANCTION/PROJECTFUNDINGRECEI VEDFROMDST/DHESTBT/ DSTBT, GOWB

1. G.O.No.&Date: 1158(Sanc.)ST/P/S&T/9G-28/2014

2. Titleofproject/programme(s)sanctioned earlier inchronologicalorder: **A study to compare and correlate the metabolic health(anthropologic and biochemical) between scheduled tribe population in underdeveloped parts of the district of Birbhum with special reference to metabolic health awareness especially about diabetes : a population based observational studies.**

3. Amount sanctioned in each case: 16,10,000

4. Whetherthefollowinghavebeensubmitted:

   a. Thefinalreport,

   b. Achievement against deliverables stated at the time of projectsubmission,

   c. Utilizationcertificateand auditedstatementofexpenditure,

   d. Information on publications made in reputed journals/ high impactjournals. Yes

   e. Patentableitems,

   f. Translationalvalues,

   g. BenefitstotheStateGovernment/commonman

   (Please furnish forwarding letter no. & date of submission of final reportalongwith asummary offinal report): Yes (1/3/2021)

5. WhetherUC&auditedStatementof expendituresubmitted

   (Pleasefurnishforwarding letterno.& datealongwith acopy ofthesame): Added

6. Please indicate the follow up action taken on the earlier work funded byDSTBT: published in 5 IndianJourn

Mukhopadhyay

SignatureofPrincipalInvestigator/ Co-PrincipalInvestigator(s)withofficialseal

Date:

Prof. Dr. Pradip Mukhopadhyay
M.D., D.M. (Endo.)
Professor
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

Government of West Bengal
Department of Science & Technology and Biotechnology
Vigyan Chetana Bhavan, Salt Lake, Kolkata – 700064

Project Completion Certificate

Memo No. 314/ST.P/S&T/9R-28/2014 Date: 01.03.2021

This is to certify that the R& D Project titled A Study to compare and correlate the metabolic health (anthropologic and biochemical) between scheduled tribe population in underdeveloped parts of the district of Birbhum with special referance to metabolic health awareness especially about diabetes : a population based observational studies." sponsored by the Department of Science & Technology and Biotechnology, Government of West Bengal has successfully completed on10.11.2017 (date of submission of last UC, Audited SoE, Report and deposit of unutilised amount by TR-7, if any)

By Dr. Pradip Mukhopadhyay, Asso. Prof., Department of Endocrinology, IPGMER & SSKM Hospital, , 244 B, A JC Bose Road, Kolkata- 700020

Signature of the Convener

(Name and Designation of the Convener)

Swapan Kumar Chatterjee
Senior Scientific Officer
Deptt. of Science & Technology and Biotechnology
Government of West Bengal

Annexure VII

CHECKLIST

(Please write yes or no against each point)

1. Whether following included in the project proposal:
   a. Introduction and Background (up to four pages),
   b. Hypothesis and aims and objectives (up to one page),
   c. Significance of the project (up to one page)
   d. Research design, methodology, timelines and milestones (up to ten pages) and
   e. Preliminary data (up to one page).
2. Govt./ Govt. Aided: Yes/No
3. Soft Copy of the entire Project (in single PDF format only): Submitted/ Not Submitted.
4. Bank A/c Details of Institute of the PI where fund may be placed with IFSC & MICRCODE and cancelled cheque: Submitted/ Not Submitted.
5. Is there any other ongoing Project associated with DSTBT, GoWB or any other State orCentral Govt.: Yes/ No (If yes, please furnish details with File/G.O. Number, if available)
6. Quotations for instruments asked for: Submitted/ Not Submitted.

ENCLOSURES REQUIRED TO BE SUBMITTED WITH THE PROPOSAL (PLEASEFOLLOW DEPARTMENTAL PORTAL VIGYANSATHI):

a) Endorsement from the Head of the Institution on Letter head for both the PI and all Co- PIs as per prescribed format (Annexure-I). Certificate from Principal Investigator (PI) and all Co-Principal Investigators (Co-PIs) as per prescribed format (Annexure- II).

b) Undertaking and/ or MOU (as applicable) from the PI and Co-PI(s) on Patent and IPR sharing with DSTBT, GOWB as mentioned under general terms and conditions.

c) Declaration by the PI and Co-PI.

d) Bank details of the PI's Institute are to be furnished as per the attached format (Annexure-IV).

e) Bio Data of PI and all Co-PIs as per prescribed format (Annexure-V).

(Name and signature of PI with official seal)

Prof. Dr. Pradip Mukhopadhyay
M.D., D.M. (Endo.)
Professor
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

(Name and signature of Co-PI 1 with official seal)

Prof. Dr. Sujoy Ghosh
MD (Gen. Med.), D.M. (Endo.),
MRCP (UK), MRCPS (Glasgow)
Professor
Dept. of Endocrinology & Metabolism
I.P.G.M.E & R/S.S.K.M Hospital, Kolkata

(Name and signature of Co-PI 2 with official seal)

Director of Medical Education
Government of West Bengal
Swasthya Bhavan
Kolkata-700091

(Name and signature of Co-PI 3 with official seal)