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Editorial

Editorial-Possible Clinical Applications of Bone Morphogenetic Proteins (BMP) in Enhancement of Outcomes of Assisted Reproductive Technology (ART)

Kulvinder Kochar Kaur[1]*, Gautam Allahbadia[2] and Mandeep Singh[3]

[1]*Scientific Director, Dr Kulvinder Kaur Centre for Human Reproduction, Jalandhar, Punjab, India*

[2]*Scientific Director, Ex-Rotunda-A Centre for Human Reproduction, Mumbai, India*

[3]*Neurology Consultant Neurologist, Swami Satyanand Hospital, Jalandhar, Punjab, India*

***Corresponding Author:** Kulvinder Kochar Kaur, Scientific Director, Dr Kulvinder Kaur Centre for Human Reproduction, Jalandhar, Punjab, India.

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Bone morphogenetic proteins (BMP) are growth factors possessing multiple functions that belong to the transforming growth factor beta (TGF-β) superfamily. With the use of cellular as well as molecular genetic strategies recent research work pointed that the intraovarian BMP's act in the form of potent functional controllers of function of the follicles of the ovary. The interaction occurs in a bidirectional way amongst the oocytes along with the somatic cells that surround them is essential for the formation of normal follicles as well as maturation of the oocytes. The studies with regards to results with the use of human biological materials revealed the expression of BMP 's or GDF's along with their respective receptors along with their molecular signaling in the basic cells (oocytes, cumulus/granulosa cells (GCs) along with theca/stroma cells) of the ovarian follicles right through formation. On the existence of recombinant BMP's/GDF's besides generation the physiological functional part of human intraovarian BMP 's/GDF's were demonstrated in every angle of function of ovary varying from i) follicle generation ii) steroidogenesis iii) cell-cell contact iv) oocytes maturation v) ovulation and luteal function. Moreover, interaction between these ovarian controllers &endocrine signaling system. Impairment or natural mutations amongst the BMP system might result in multiple female reproductive diseases. With the development of recombinant BMP, synthetic BMP inhibitors, gene therapy, gadgets meant for BMP ligand concealment, has seen to it that the BMP pathway has become a possible therapeutic target in certain pathological disorders concerning fertility. Initiation of Cumulus cells (CC) occurs from the granulosa cells (GCs) that are undifferentiated, which differentiate into mural GCs (MGCs) along with CCs during antrum generation in the follicles by the allocation of location. CCs represent cells that are supporting cells with regards to oocytes from the milieu, that aids in oocytes growth along with maturation in the follicles. There is existence of bidirectional connections amongst oocytes with the aim of attaining maturation along with embryonic competence regarding development subsequent to fertilization. The surges of gonadotrophins (FSH along with LH), result in formation of extracellular matrix (ECM) in CCs, with CCs going via cumulus expansion for aiding in meiosis getting resumed. The ultimate function of CCs is that their implication in the completion of oocytes meiotic maturation as well as ovulation, fertilization in addition to embryonic generational competence besides pregnancy (Figure 1 and 2). Hence getting insight in the function of CCs during follicular generation might aid in anticipation of oocytes quality followed by embryonic generational competence as well as pregnancy results in addition to field of assisted reproductive technology (ARTs) for the therapy of infertility [1]. One practical approach is Cumulus culture and cumulus aided embryo transfer increases pregnancy rates in patients undergoing *invitro* fertilization [2]. Other potential Clinical applications is in case of *vitro* activation (IVA) for patients with primary ovarian insufficiency (POI) along with ovarian impairment as well as DOR [3]. Further clinical applications need to be explored depending on this complex physiology in escalation of ART outcomes.

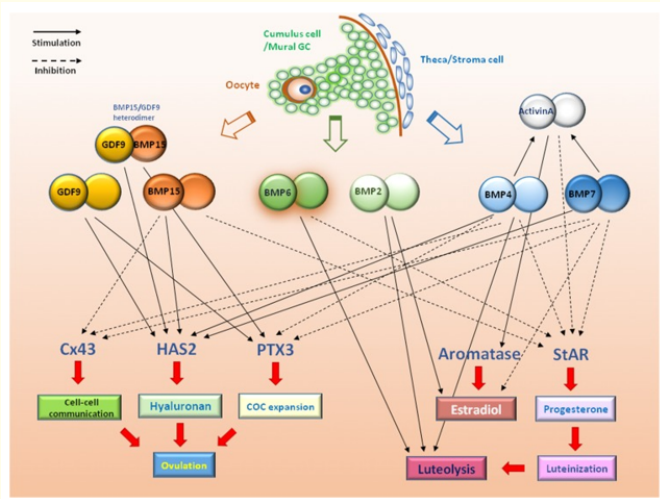

Figure 1: *Courtesy ref no-1- Schematic diagram summarizing functional roles of BMPs and GDF9 in the human ovary. The potential physiological roles of intra-ovarian BMPs in regulating human ovarian functions, including steroidogenesis, activin production, cumulus-oophorus complex formation and expansion, cell-cell communication, ovulation and luteolysis are shown. BMP: Bone Morphogenetic Protein; COC: Cumulus-Oophorus Complex; Cx43: Connexin 43; GC: Granulosa Cell; HAS2: Hyaluronan Synthase Type 2; PTX3: Pentraxin 3; StAR: Steroidogenic Acute Regulatory Protein.*

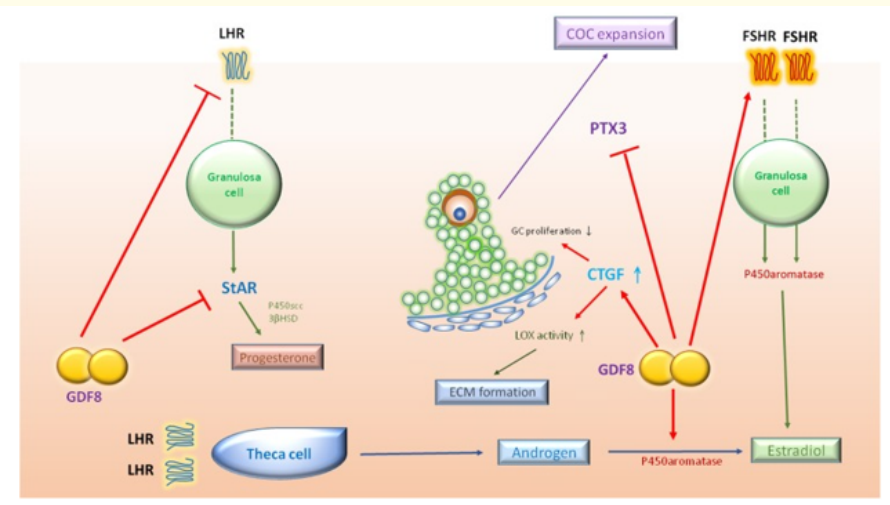

Figure 2: *Courtesy ref no-1- Schematic diagram summarizing potential roles of GDF8 in a human growing follicle. In this follicular microenvironment, the locally produced GDF8 may promote aromatase/estradiol and FSHR expression, suppress StAR/progesterone and LHR expression and down-regulate PTX3 expression. In addition, GDF8 induces the expression of CTGF, which contributes to the suppression of GC proliferation and the increase in LOX activity. 3βHSD: 3β-Hydroxysteroid Dehydrogenase; CTGF: Connective Tissue Growth Factor; ECM: Extracellular Matrix; LOX: Lysyl Oxidase; P450scc: P450 Side-Chain Cleavage Enzyme; PTX3: Pentraxin 3; FSHR: FSH Receptor; LHR: LH Receptor.*

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