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EDITOR'S COMMENTARY

# Personalizing reproductive medicine—a biological or technocratic imperative?

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The year 2016 was an extraordinary one when it comes to achievements in reproductive medicine and biology. Of the many truly remarkable discoveries and accomplishments, a short list well worth keeping in mind would have to include gene editing technology forging its way into the realm of human embryo biology; revelation of the epigenetic code enacted and manipulated during the production of human primordial germ cells; ex vivo spermatogenesis becoming an experimental reality; and in a remarkable closing act, scientists from Japan announce their success in recapitulating the entire process of oogenesis in mice under in vitro conditions. Taken together, the melding of advances in technology and basic mammalian reproductive biology from the past year alone portends a proximate future of reproductive medicine raising many questions as to how the field of human ARTs, in principle and practice, will appear to the next generation of patients and practitioners alike.

In preparing for the impending landscape makeover in reproductive medicine, JARG recognizes the continuing role it serves as educators of our followers regarding the impact of leading edge scientific breakthroughs on patient care in the treatment and management of human infertility. Towards this end, we introduce an initiative aimed at providing young scientists and clinicians an opportunity to gain experience as reviewers, authors, and editors. The background and approach to achieving this objective are described in the article by Goldman et al., ("2017 in-training initiative of the Journal of Assisted Reproduction and Genetics: the JARG Young Investigator Forum"; DOI 10.1007/s10815-016-0857) with the expectation that clinical and basic science fellows will take full advantage of the mentoring talents available at JARG as we enable the development of a cadre of future specialists in the areas of reproductive medicine and biology.

Our issue this month provides our readership with a selection of articles focused on the past, present, and future of human ARTs with special emphasis on diagnostic genetics.

Accordingly, Patrizio and Silber proffer a perspective that is decidedly "retro" as we venture into what is fast becoming a brave new world of reproductive medicine. Searching for new and improved measures of human ARTs matters only if we face a hard and fast fact about human fecundity: compared to our mammalian counterparts on the phylogenetic ladder, we hominids, at least from past and present accounts, are hardly "robust reproducers." In their article "Improving IVF: is there a limit to our ability to manipulate human biology?" (10.1007/s10815-016-0828), emphasis is placed on the impact of embryo selection strategies as we know them today against the backdrop of how few human oocytes ever make the baby-competent stage under natural conditions. That the performance of our own genetic machinery, with or without the compounding factor of age, is suspect as causative for much of the reproductive incompetence human biology exhibits is an unavoidable reality. And placing the blame on our gametes and their meiotic infidelities seems no longer to be an adequate explanation for our genetic frailty. Once more, the implications of genetic instability in human embryos resurfaces in the ongoing debate regarding aneuploidy and mosaicism in the context of embryo selection ("Mosaicism: throwing the baby out with the bath water?" 10.1007/s10815-016-0819).

As Vega and Jindal point out, ART laboratory practices do vary between clinics. Despite widespread efforts to standardize protocols and exercising self-imposed rigorous training norms, inter-laboratory variability could account for much of

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the ongoing discourse surrounding the matter of embryonic mosaicism and the potential role environmental conditions play in either inducing post-fertilization aneuploidy or enabling its likelihood with prolonged embryo culture. The fact of the matter is, as they posit, if the dialogue is to be broadened with respect to the many technologies poised to enter the arena of reproductive medicine, principles of fundamental biology in their original and updated versions should be the focus of our attention before adopting methodologies that may or may not improve not only ART outcomes but also the health of offspring brought into this world.

Personalizing reproductive medicine is upon us and, it could be argued, forms the substance for the many acknowledged treatment strategies requiring adjustments in patient care and management that have emerged over the past 20 years. However, in 2017 terms, "personalizing" acquires a more discriminating definition implying, for example, the use of genetic signatures and potential technological interventions aimed at preventing, ameliorating, or rehabilitating medical conditions recognized to compromise a couple's fecundity. The drive to invoke personalized medicine in a practical sense will again require accepting the inadequacies of our current diagnostic and technical capabilities and concomitantly integrating the biological underpinnings of human reproduction for which there is resistance to recognize.

One example of the delicate balance between the biological and technocratic imperatives is addressed in the review article by Lee and Kiessling entitled "Early human embryos are naturally aneuploid—can that be corrected?" (DOI 10.1007/s10815-016-0845). Whether one's inclination is to view the prevalence of aneuploidy in human embryos to be a matter of "good, bad, or indifferent," our readers will find their treatment of basic biology as thorough and up-to-date as it relates to determinants of early pregnancy outcome in humans. And in recognizing the unusual properties of the cell cycle in preimplantation embryos, culprits at some level in the propagation of aneuploidy, a glimpse into the future is offered by suggesting the utility of drugs or mRNAs to supplement and/or enhance checkpoint control as a rectifying technocratic intervention on human zygotes. Stay tuned for what has all the signs of yet another year of progress into human reproductive biology and its technological manipulation!

Finally, we welcome this month three new members of the Editorial Board in Ronit Abir, Barbara Luke, and Deepak Modi, each of whom enrich the JARG family with their unique areas of expertise.