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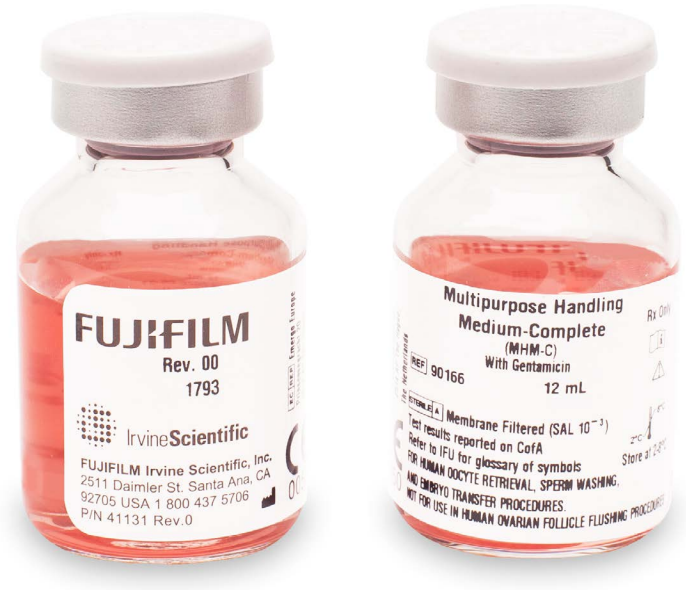
Case Study: Focus on Sperm to Achieve Better Pregnancy Rates

Improving sperm count recovery and motility rates with optimizing pH balance

Introduction

With male infertility on the rise, pH and buffering capacity are playing an even more important role in the physicochemical processes that govern sperm quality, viability, and motility. For fertility clinics, optimizing sperm performance can be a key differentiating factor in achieving better pregnancy rates for their patients. In an effort to minimize variables impacting sperm, Jayant G. Mehta, Ph.D., Lab Director at Queen's Hospital in Romford, UK, recently conducted a compelling study of Multipurpose Handling Medium (MHM) and its impact on sperm performance.



Controlling the variables

Achieving high pregnancy rates is the number one priority for embryology labs and fertility clinics. Affected by multiple and changing variables at every step, successful intrauterine insemination (IUI) pregnancy is delicate and complex, and there is much room for improvement. Something as simple as increasing a lab's overall sperm motility numbers by a few percentage points can result in additional successful pregnancies.

Dr. Jayant Mehta, an accomplished expert in andrology, collaborated with other andrologists to identify new products and procedures to help control the variables that can negatively affect sperm during preparation and fertilization.

Jayant G. Mehta, PhD.

- Sub-Fertility Lab Director & Quality Control Manager at Queen's Hospital in Romford, Essex, UK
- Annually runs about 300 cycles in a purely andrology unit for IUI
- Founding member of the Association of Clinical Embryologists (ACE), UK
- Co-author of Male Infertility: Sperm Diagnosis, Management and Delivery, 2014. JP Medical Publishers

> Managing the pH balance is critical–even subtle changes in the environment can significantly impact the kinetics and viability of the sperm.
>
> *Jayant G. Mehta, PhD, Lab Director and Quality Control Manager, Queen's Hospital. Romford, UK*

The Challenge

"Managing the pH balance is critical and challenging, as we sometimes need to work outside the incubators, and even the slightest environmental changes can greatly impact the kinetics and viability of the sperm," explains Dr. Mehta.

The optimal preparation objective for IUI is to obtain the largest population of fertilizable sperm. However, sperm is cycled through multiple steps prior to IUI, and maintaining a precise and stable pH balance is challenging because even minor environmental fluctuations can damage the sperm.

Recognizing this as a specific opportunity to increase his clinic's pregnancy rates, Dr. Mehta sought advice and obtained evidence from his andrology peers on how to better preserve the integrity of his samples. Consultation and discussion with fellow andrologist, Jean Louis Spach, Senior Technical Application Scientist at FUJIFILM Irvine Scientific, led Dr. Mehta to a review of his lab's use of sperm separation, wash and culture media, and the need to compare performance between media from different manufacturers.

"We agreed that maintaining the temperature of the sperm, actually both gametes, can minimize variances in pH and optimize fertilization," Spach recalls. "Our research shows that a mix of buffers provides the best measure of protection for cell stability, and Dr. Mehta was very enthusiastic when he heard about the recent regulatory approval of MHM as the first dual-buffer medium.

Dr. Mehta wanted to run a test immediately and suggested including a density gradient product in the study," says Spach. "It's this kind of peer collaboration that, when proven, yields new performance benchmarks for the entire industry."

The density gradient selected for the study was ISolate from FUJIFILM Irvine Scientific, which has been shown to yield a higher concentration of motile sperm post-centrifugation, and provide a higher sperm count, better curvilinear velocity, and a higher percentage of normal forms.

FUJIFILM Irvine Scientific's MHM was also used in the study. MHM is the first IVF medium to combine two buffers, MOPS and HEPES. With its optimal buffering capacity, MHM provides a safe and secure environment to optimize cell growth and maintain pH across a broad range of temperatures.

Dr. Mehta and Mr. Spach believe that this versatile product - formulated for procedures such as oocyte handling, ICSI (intra-cytoplasmic sperm injection), embryo transfer, and gamete washing - is ideal for maintaining pH balance during the washing, culturing, and transfer of sperm.

Data courtesy of Dr. J. G. Mehta,
Laboratory Director,
Queen's Hospital, Romford, UK

> Our research shows that a mix of buffers provides the best measure of protection for cell stability
>
> *Jean Louis Spach,*
> *Senior ART Technical Application Specialist*

The Study

Dr. Mehta developed the following objectives for the study:

1. Compare two sperm wash media to determine 24-hour survival rates
2. Compare two gradient separation media to determine motility rates

Each sperm sample in the study was divided in two to ensure a controlled comparison. Data was also collected and organized by patient age. While only 60 samples were evaluated, Dr. Mehta and Mr. Spach believe the study demonstrates a significant trend that is compelling enough for fertility experts to consider and study in their own labs.

"Ideally, our industry should conduct expanded testing, to include larger sample sizes and survival rates over extended time periods. They should also include highly-sensitive pH meters to enhance our understanding of what happens to the sperm throughout all the processes it undergoes," suggests Dr. Mehta.

Jean Louis Spach,
Senior ART Technical Applications Specialist for Europe

Methods

Semen samples of more than 3 mL, sperm count of more than 40 million per mL and sperm progressive motility of greater than 50% were included in the study. The samples were liquefied for 20 minutes at 37°C. Discontinuous gradients were prepared (40% and 80% of ISolate and the competitor gradient) and allowed to stand on a heating block at 37°C. Samples were then divided into two equal parts, each with a minimum volume of 1.5 mL.

Results

Higher mean sperm count recovery with ISolate

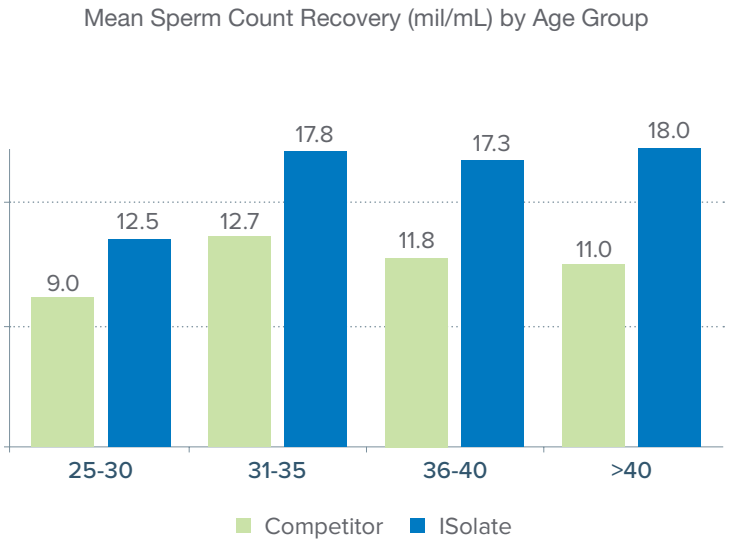


Figure 1. Dr. Mehta's ISolate separation comparison yielded at least 5 mil/mL greater mean sperm count recovery in each age category compared to the competitor gradient medium studied.

More pregnancies with ISolate and MHM

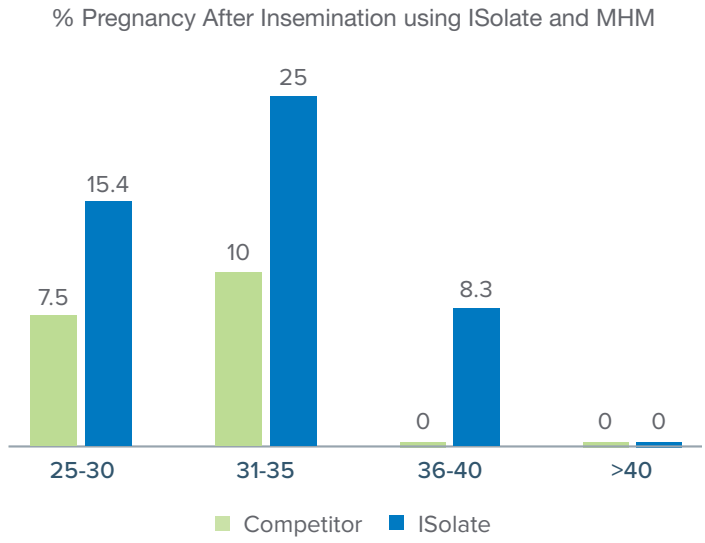
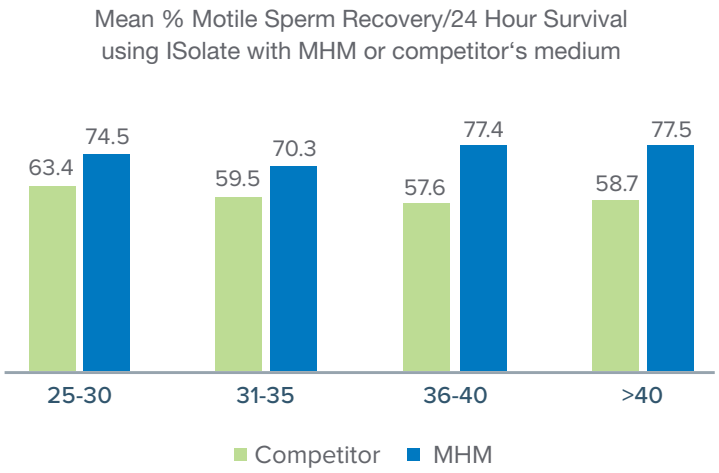


Figure 2. The combination of ISolate and MHM resulted in at least a 10% pregnancy increase compared to other combinations of media in the study.

Higher mean percentage of motile sperm with MHM



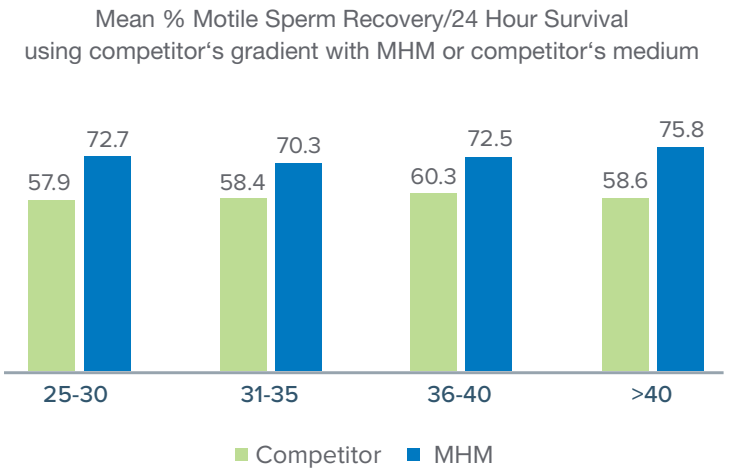


Figure 3. MHM-washed sperm had the highest mean percentage of progressive motile sperm at 24 hours across all age categories, by a difference of 14–15%.

Conclusions

The study clearly demonstrated that the added security of the dual-buffers in MHM, combined with ISolate, resulted in better quality sperm collection and survival rates in Dr. Mehta's lab, and helped them achieve a 10% increase in pregnancy rates.

"Sperm accounts for 23 chromosomes in the embryo–if sperm is impacted, changed or damaged in any way, a successful pregnancy is at greater risk," said Dr. Mehta. "With this in mind, additional focus on providing a buffered and stable environment for sperm throughout the process should yield greater advantages. In this case, a dual-buffered medium offers a more complete solution."

With the increasing incidence of male infertility rates, Dr. Mehta suggests that labs more closely examine ways they can improve their sperm collection and handling, thereby increasing pregnancy rates.

Mr. Spach added, "The field of andrology is highly specialized, and while it is growing due to the increasing incidence of male infertility, we recognize that most IVF labs do not have a full time andrology expert on staff. The versatility of the dual-buffered MHM medium, corroborated by Dr. Mehta's study, should provide most labs with the peace of mind that their sperm samples will be well-protected from pH variation and better prepared for fertilization."

For more information

MHM was formulated with help of Dr. Jason Swain, board-certified High-Complexity Clinical Laboratory Director at Fertility Lab Sciences in Colorado. To obtain samples, additional research data, or technical information about FUJIFILM Irvine Scientific products such as MHM and ISolate, visit our website www.irvinesci.com

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