

# Stable Incubator pH Reduces Potential Stress to Embryos

*US fertility clinic monitors carbon dioxide concentration to maintain specific pH environment in its embryo incubators.*

Boston IVF is one of the most experienced fertility clinics in the United States. It has assisted with more than 30,000 pregnancies since 1986, including several “firsts” in its region, such as the first pregnancy from a donor egg, first baby resulting from injection of a sperm into an egg, and first birth resulting from a frozen egg.

Boston IVF’s history of successful outcomes is supported by its world-class laboratory and research program and its long association with Harvard Medical School in assisted reproductive technology and in vitro fertilization (IVF) research. Today, all ten of Boston IVF’s directors and staff physicians hold faculty positions at Harvard Medical School.

Boston IVF manages their embryo culturing and handling processes meticulously to simulate the ideal in vivo environment that causes the least stress to the embryo and produces the most-wanted result – pregnancy.

## Critical Days for Embryo Cultivation

Boston IVF practices strict lab protocols during the critical window of fertilization, embryo cultivation, and embryo transfer. (See sidebar.) During this process, the embryo is contained in a droplet of nutrient solution and placed in a culture dish. A layer of oil is added to cover the

nutrient solution as a buffer from external variables. The culture dish is placed in an incubator programmed to maintain the specified environment optimal for embryo growth.

The three most important variables are temperature, humidity, and pH. Temperature is measured and maintained by the incubator’s thermostat, an independent thermostat, and the incubator’s heating system. Humidity is maintained by keeping a pan partially filled with water that is visually inspected daily. Unlike temperature and humidity, pH is measured and regulated indirectly by monitoring and adjusting the concentration of carbon dioxide.

According to Pam LeGrow, Boston IVF Embryology Supervisor, pH is the most difficult to control.

“We need to maintain a very narrow range of pH. It needs to be maintained at 7.2 to 7.3 for optimal growth. The pH level is obtained

*Vaisala GM70 is used to verify the CO<sub>2</sub> level in incubators.*



by regulating the concentration of carbon dioxide.”

CO<sub>2</sub> and pH have an inverse relationship; as CO<sub>2</sub> concentration decreases, pH increases. “We need the pH levels to be as specific as we can get. That means we need the CO<sub>2</sub> concentration to be specific too,” LeGrow adds.

Boston IVF used various CO<sub>2</sub> portable measurement devices in the past.

“Gas analyzers using fluids can be very subjective. The fluid can go bad quickly and the reading can be way off. We also tried a digital infrared measurement device from a local company, but the units required a lot of calibration, and when we contacted them with our questions and problems, they provided poor service,” LeGrow says.

### Less Calibration Results in More Stable pH

Boston IVF sought to improve the accuracy and reliability of its CO<sub>2</sub> measurement devices – and switched to the Vaisala CARBOCAP® Hand-Held Carbon Dioxide Meter GM70.

“The Vaisala staff visited, provided great detail, and demonstrated the units. They’ve instructed us and shared their expertise. We’re now using two Vaisala GM70s with pumps for our 20 incubators,” LeGrow says, adding:

“Before we started using the GM70s, we were making unnecessary calibrations that produced unwanted fluctuations and potential stress to the embryos. But now, because the daily readings are so consistent with the GM70s, we calibrate less. That’s what we want, a stable environment that puts the least stress on embryos.”

### Accuracy When it Matters Most

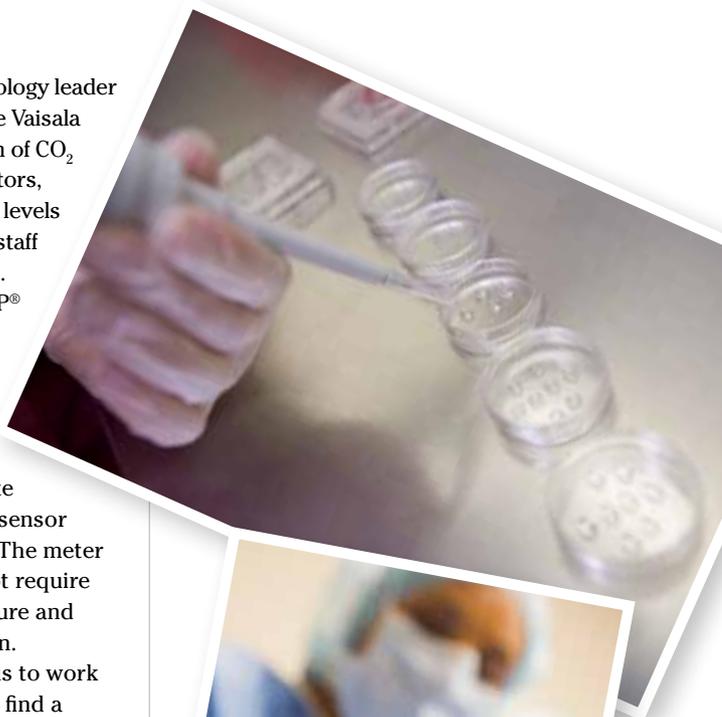
The accuracy and reliability of independent measurement devices is critical in highly specified and regulated incubator and chamber applications,

such as IVF labs. For technology leader Boston IVF, switching to the Vaisala GM70 led to less calibration of CO<sub>2</sub> concentration in its incubators, resulting in more stable pH levels and less time spent by the staff on unnecessary calibration.

The Vaisala CARBOCAP® silicon-based, non-dispersive infrared sensor is very stable over time because it has a built-in reference measurement which helps to compensate for the possible effects of sensor aging and contamination. The meter is easy to use and does not require any calculations for pressure and temperature compensation.

“It was rewarding for us to work closely with Boston IVF to find a solution for their need for accuracy, reliability, and ease of use,” says Steve Santoro, Vaisala Regional Sales Manager.

“What they do everyday for their patients is so important. Everyone wants the outcome to be the best it can be. Vaisala delivers the most accurate carbon dioxide sensors for these controlled environments, so our products can contribute to the best-case outcome,” he concludes.



### Day 0 to Day 3 in the In Vitro Fertilization Lab at Boston IVF

#### Day 0 Fertilization

Sperm are added at a rate of 12,500 sperm for each female reproductive cell – or oocyte – or one sperm is injected into one oocyte by intracytoplasmic sperm injection (ICSI). Fertilization is assessed 18 hours later.

#### Day 1 Cleavage

Embryos are separated into individual droplets of nutrient solution specifically designed for this phase of cell division, called cleavage.

#### Day 2 Cleavage Assessment

Each embryo is assessed for quality and growth to 2 to 4 cells.

#### Day 3: Embryo Transfer

A good quality embryo of 6 to 8 cells is transferred to a woman’s uterus. A pregnancy test is given 11 days later.