

Serum Substitute Supplement (SSS™)



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SSS™ Improves Blastocyst Development and Implantation Rates

Supplementation of embryo culture media with a source of protein has been established as necessary to obtain high rates of in vitro embryo development and pregnancy. In the 1980's, maternal serum was often used to supplement embryo culture medium, despite the problems associated with this approach. By the late 1980's, many labs had experimented with different serum fractions such as Human Serum Albumin (HSA), Plasmanate and Plasmatein. In 1994-95, research in the lab of Dr. Thomas (Rusty) Pool, with assistance from Paul Weathersbee and Irvine Scientific, led to the introduction of a new product called Synthetic Serum Substitute (SSS). This product consisted of HSA supplemented with another serum fraction rich in the glycoproteins, alpha and beta globulin^{1,2}. SSS was found to provide the best results by many labs³, and quickly became the standard for protein supplementation.

With the improvements in embryo culture medium developed since the late 1990's, a pertinent question was whether the glycoproteins provided by SSS were still of value to optimal embryo development. To address this question, a study by Marius Meintjes et al.⁴ was designed to determine if the addition of SSS to a sequential medium containing 5% HSA would improve the frequency of implantation and live births.

In this study, 528 patients over a two year period were randomized into two groups; one utilizing the control medium (G1/G2 with 5% HSA) and the other utilizing the same medium supplemented with 10%SSS. Embryos were transferred on Day 2-3 or Day 5, depending on the number and quality of the embryos. Approximately 25% of the transfers from each group were on day 2-3, and the remaining 75% of the transfers from each group were on day 5, when one or two blastocysts were transferred. The average number of embryos transferred was not significantly different between the two groups. The relatively large sample size of 528 patients was utilized to permit the detection of a statistically significant conclusion.

When transfers were performed on day 2-3, there was no significant difference between the two groups in terms of implantation rate or live births. However, when embryos were cultured to the blastocyst stage, supplementation with SSS resulted in a highly significant increase in the rate of implantation (57.3% vs. 49.9%, P=0.048) and an 11% increase in live births (68.4% vs. 57.4%, P=0.017), as shown in Table V of their publication.

The influence of HSA and SSS on implantation and live birth rates when the embryo transfer occurred on Day 2-3 or Day 5. (Meintjes et al. Hum. Reprod. 2009; 24:782-789.)

Day of transfer	Implantation			Live Births		
	HSA supplemented	HSA + SSS supplemented	P value ^a	HSA supplemented	HSA + SSS supplemented	P value ^a
Day 2-3	55/181 (30.4%)	48/151 (31.8%)	0.515	30/67 (44.8%)	24/57 (42.1%)	0.888
Day 5	199/399 (49.9%)	241/420 (57.3%)	0.048	112/195(57.4%)	143/209 (68.4%)	0.017

^a General linear models for proportions, controlling for day of transfer, patient age and the number of embryos per transfer.

The authors were led to the conclusion, based on this data, that the ability of embryos to implant and lead to live births when cultured in 5% HSA alone was impaired by “suboptimal protein supplementation” during days 3-5 compared to embryos cultured in the presence of SSS. The utilization of SSS supplementation during blastocyst culture thus significantly improves the likelihood that the transfer of a single blastocyst will lead to success in terms of live birth rate.

References:

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2. Weathersbee PS, Pool TB, Ord T. Synthetic serum substitute (SSS): a globulin-enriched protein supplement for human embryo culture. *J. Assist. Reprod. Genet.* 1995; 12: 354-360.
3. Gardner DK, Lane M. Embryo Culture Systems, in *Handbook of In Vitro Fertilization*, Second Ed, Trounson AO and Gardner, DK, eds, CRC Press 2000, p. 227.
4. Meintjes M, Chantilis SJ, Ward DC, Douglas JD, Rodriguez AJ, Guerami AR, Bookout DM, Barnett BD, Madden JD. A randomized controlled study of human serum albumin and serum substitute supplement as protein supplements for IVF culture and the effect on live birth rates. *Hum. Reprod.* 2009, 24:782-789

