

# Abstract Details

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## Abstract title:

High culture media oxidative profile as a biomarker of good quality embryos: a non-invasive tool to select the embryo to transfer.

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### Study question:

Is the spent embryo culture media oxidative profile, provided by Thermochemiluminescence (TCL) Analyzer<sup>TM</sup>, a good biomarker of embryo quality?

### Summary answer:

Although each culture media shows different oxidative status, good quality embryos remain having higher oxidative parameters, which indicate more extensive oxidative metabolism.

### What is known already:

Novel non-invasive strategy TCL (Carmel Diagnostics, Israel), based on spent culture media analysis, proved to provide additional valuable data to morphology and morphokinetic analysis in the selection of the best embryo for transfer. In particular, the assessment of the embryo's oxidative profile with the Thermochemiluminescence (TCL) Analyzer<sup>TM</sup> suggests a new approach in determining embryo's quality or viability and subsequent implantation potential.

### Study design, size, duration:

A total of 683 spent embryo culture media from 174 *in vitro* fertilization (IVF) cycles, incubated and monitored with the time-lapse incubator Embryoscope®, were collected for analysis from May 2017 to December 2018.

### Participants/materials, setting, methods:

Oxidative status of 15 µl/embryo of culture media was measured with the use of the TCL assay, as photons emitted per second (**cps**) amplitude after 55 seconds (**H1**), 155 seconds (**H2**) and 255 (**H3**), in a 300-second period. The **Ratio**, as the slope of the three parameters, and the **Average** were also calculated. Different culture media were assessed. Oxidative data was normalized with a smoothing algorithm (**sm**) and analyzed by the statistical test ANOVA.

### Main results and the role of chance:

Different oxidative profile was noticed among the media culture included ( $p < .001$ ). The average of the TCL parameters (**AVEHsm**) were (cps): 81.38 for Cook® (n=367), 114.29 for Genea Biomedx®, (n=228), 68.20 cps for Irvine Scientific® (n=42) and 95.79 cps for Life Global® (n=39). Despite using different culture media, transferred and vitrified embryos (V) remain showing higher values for the oxidative parameters than no viable embryos (NV): **H1sm**= 85.88 for NV vs. 88.70 for V, **H2sm**= 87.82 for NV vs. 91.03 for V and **H3sm**=93.78 for NV vs. 98.17 for V. Regarding day 5 quality embryos, according to ASEBIR classification criteria, oxidative stress level decreased as the embryo quality got worse: **AVEHsm**=**95.56 cps** for embryos of type A (n=47); **94.04 cps** for embryos of type B (n=269); **92.70 cps** for embryos of type C (n=125) and **72.52 cps** for embryos of type D (n=26). This therefore implies high quality embryos have a more extensive oxidative metabolism exerting an oxidative load on their surrounding media.

### Limitations, reasons for caution:

No balanced sample size was assessed in different media culture neither in embryo quality. Oxidative status database will increase while using TCL to pursue an accurate optimal range for oxidative parameters. Additionally, present study would require a prospective validation for its routine clinical use.

**Wider implications of the findings:**

The fair correlation between TCL oxidative results, embryo quality proves its application as a clinical biomarker. A more accurate selection of the best embryo, especially in good-quality embryo cohorts, would determine IVF success.

**Trial registration number:**

None

**Keywords:**

Thermochemiluminescence (TCL)

Oxidative profile

Biomarker

embryo quality

Culture media