LH hormone regulate ovarian function by two mechanism – bond to granulosa cells induce ovulation, luteinisation and C.luteum progesterone production, and in theca cells stimulate androgen production lately used for estrogen synthesis. Role of LH in controlled ovarian stimulation is still doubtful, many studies found no difference in results of IVF with or without LH addition to FSH. Mainly benefit of exogenous LH in ovarian stimulation is related to patients with severe LH depression in long protocol, to poor responders and patients age over 35-late reproductive age.

Treatment of poor responders and selection of adequate stimulation protocol is still matter of debate without proper solution. Many stimulation protocols are tested in order to increase IVF success rate, but depleted ovarian reserve could not be increased. Androgen priming was offered as one of solution, either androstenedione pills taking for at least 6 week before stimulation, or testosterone patches use. Most of studies didn’t show oocytes number increase, but many of them presented higher clinical pregnancy rate, related to better oocyte quality. On the other hand some RCT show no difference in result. Still, systemic use of androgens for local effect in target organ is clinically unproven.

New protocol was developed for young poor responders in SISMER group, using idea of LH paracrine ovarian function related to production of androgens in theca cells. A total of 43 women age under 38 selected according Bologna criteria (at least two previous cycles with poor ovarian response – cancelation or less than 3 oocytes collected) were included in RCT. They were randomized in two groups: group A (control group) received 400 IU FSH per day (17 long protocol, 4 protocol with GnRH antagonist), second group B (new protocol) receiving modified long protocol with LH priming before stimulation start: during agonist GhRH down regulation last 4 days out of 14 days agonist regimen received 150 IU r-LH daily, followed by 400 r-FSH stimulation. All women had normo-ovulatory cycles, both ovaries, normal uterine cavity and normal karyotype. Patients’ age did not differ between the two groups as well as the infertility factor’s distribution. In group A, more cycles were cancelled compared to group B (43% versus 23%), but the difference was not statistically significant. In most of the egg retrievals (19/29), the numbers of eggs collected still remained in the range of poor response (≤3oocytes) but a higher number of oocytes were collected in group B compared to group A. The levels of circulating androgens at the start of FSH stimulation did not differ between the two groups.

The fertilization rate was similar in the groups, but a higher percentage of 2 PN oocytes showed subsequent cleavage in group B compared to group A, leading to a higher number of cycles to be transferred in the LH group (77%versus 48%, P < 0.05). The morphology of the transferred embryos seems very similar in the two groups, but their potential to implant seemed to be improved by the LH priming (28% versus 6%, P = 0.06). The live birth rate per patient was significantly higher in group B compared with group A (32% versus 5%, P < 0.05). The second part of study includes data from the overall results in 65 patients treated with the new protocol compared to their previous performance with conventional cycles (historical control). Both in the RCT and in the historical control study, LH pre-treatment was able to decrease the cancellation rate, to improve the in vitro performance, and to significantly increase the live birth rates. Conclusions. LH pretreatment improved oocyte quantity and quality in young repeated poor responders selected in accordance with the Bologna criteria. In this study, it was clear that LH pretreatment, in repeated poor responders, produced a small increase in the number of oocytes retrieved but a relevant improvement
of their quality. Young poor responders may thus benefit from the use of this new stimulation protocol, although further studies are needed to support these clinical results.

**Conflict of Interests**
The authors declare that there is no conflict of interests regarding the publication of this paper.