

(МАРК), а также сокращение площади трансзональных проекций (Amargant et al., 2023).

ЗАКЛЮЧЕНИЕ

Цитокины и факторы роста играют решающую роль в фолликулогенезе *in vivo*, регулируя пролиферацию/дифференцировку клеток, выживание/атрезию фолликулов и созревание ооцитов. Это объясняет позитивное влияние экзогенных цитокинов и факторов роста на созревание ооцитов в составе ОКК в условиях *in vitro*. По-видимому, большая часть эффектов цитокинов и факторов роста на созревание ооцита опосредована клетками кумулюса, однако в ряде случаев (например, для представителей семейства EGF) можно предполагать

и прямое воздействие на ооциты. Большинство изученных цитокинов и факторов роста способствуют экспансии кумулюса, повышают темпы пролиферации и снижают темпы апоптоза кумулюсных клеток, а также влияют на их транскрипционный профиль. Благодаря такой модуляции активности клеток кумулюса, добавление в среду цитокинов и ростовых факторов повышает не только долю ооцитов, достигших стадии МП, но и качество этих ооцитов, а также эмбрионов, полученных в результате их оплодотворения. Таким образом, добавление в среду цитокинов и факторов роста можно считать одним из основных путей повышения эффективности ИВМ, однако исследования данной проблемы далеки от своего окончательного завершения.

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