

Assessment of Changes in the Function of Interstitial Cells of Cajal and Fecundity During Chronic Salpingitis: An Experimental Study

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ABSTRACT

Background and Aim: Chlamydial infection is a sexually transmitted disease which is caused by *Chlamydia trachomatis*. Experimentally clarifying the functional and morphological changes of oviduct by chlamydial infection which is the cause of infertility will contribute to establish a new treatment way for diagnosing and treating infertility. We conducted this study to clarify the changes of the function of interstitial cells of Cajal and fecundity in chronic salpingitis white rat models which are made by infecting its vaginal cavity with *Chlamydia*. **Methodology:** We developed chronic salpingitis model by injecting $1 \times 10^7/50 \mu\text{L}$ *Chlamydia* into vaginal cavity of each rat. Pregnancy was induced, 4 weeks after infection. The 8th, 13th, 18th day we assessed the function of interstitial cells of Cajal by amplifying and measuring bioelectric potential with microelectrode on oviduct and assessed fecundity by counting the number of fetuses in uterus and judging life or deaths of fetuses. **Results:** The function of interstitial cells of Cajal and fecundity in chronic salpingitis white rat models were significantly destroyed compared with those in normal. **Conclusion:** The function of interstitial cells of Cajal and fecundity in chronic salpingitis white rat models which are made by infecting its vaginal cavity with *Chlamydia* are significantly destroyed compared with normal rats.

Keywords: Chlamydial infection, Chronic salpingitis, Interstitial cell of Cajal, Fecundity.

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INTRODUCTION

Chlamydial infection is a sexually transmitted disease which is caused by *Chlamydia trachomatis*.^[1,2] Accruing to serum reaction, *Chlamydia trachomatis* is divided into A-C types which cause conjunctivitis trachomatis and L₁-L₃ types which cause inguinal lymphogranuloma and D~K types which cause genitourinary infection.^[3,4] Chlamydial infection is spread through contact such as sexual life. The first affected area in women is uterocervical canal and this infection spreads to endometritis and salpingitis and even to abdominal cavity and upper abdomen.^[5,6]

Experimentally clarifying the functional and morphological changes of oviduct by chlamydial infection which is the cause of infertility will contribute to establish a new treatment way for diagnosing and treating infertility. We have conducted this study to clarify the changes of the function of interstitial cells of Cajal

and fecundity in chronic salpingitis white rat models which are made by infecting its vaginal cavity with *Chlamydia*.

METHODOLOGY

Female Wistar rats with 160-180 g in body weight were used as experimental animals.

Materials

Microelectrode with 0.5-3 μm in diameter of its point and 2-3 cm in length, bioelectric potential amplifier (MG-42), dissection equipment.

Procedure

Induction of Chlamydial infection

We anaesthetized female wistar rats with 160-180 g in body weight and injected $1 \times 10^7/50 \mu\text{L}$ *Chlamydia* into vaginal cavity of each rat.

Induction of pregnancy

After 4 weeks of infection, we let one female rat which is assessed as cycle 1 and cycle 2 in examination of estrous cycle and two



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male rats copulate. The next day we examined if there is a sperm or vaginal plug and set this day as the first day of pregnancy.

Assessment of function of interstitial cells of Cajal

On 8th, 13th, 18th day of pregnancy, female rats were sacrificed by dislocating cervical vertebrae and assessed the function of interstitial cells of Cajal by amplifying bioelectric potential with microelectrode on oviduct. When the frequency band of slow wave is 20~30Hz and slow wave potential is 0.3~0.4 mV, measure the impulse of the interstitial cells of Cajal.

Assessment of fecundity

On 8th, 13th, 18th day of pregnancy, female rats were sacrificed by dislocating cervical vertebrae and opened abdomen and counted the number of fetuses and assessed life or death of them. The fetal movements were assessed by stimulating them with a dull stick. Pregnancy rate was the number of pregnant female rats to one of copulated female rats.

RESULTS

Influence on function of interstitial cells of Cajal

Table 1 shows that frequency of slow wave in model group was significantly decreased compared with control group on 8th, 13th, 18th day of pregnancy ($p < 0.01$). Table 2 shows that slow wave potential of model group was significantly decreased compared to control group on 8th ($p < 0.05$), 13th ($p < 0.05$) and 18th ($p < 0.01$) day of pregnancy.

Table 3 shows that there was no significant difference between formation rate of control group and model group even though formation rate of model group was decreased compared with control group. Table 4 shows that pregnancy rate of model group (51.4%) was significantly decreased compared with control rate (85.7%) ($p < 0.01$). Table 5 shows that average number of fetuses of each pregnant female rat in model group was significantly decreased compared with one in normal group on 8th, 13th, 18th day of pregnancy ($p < 0.01$).

Table 1: Changes of frequency of slow wave according to course of pregnancy (\pm SE, Hz).

Group	Course of pregnancy		
	8 th day	13 th day	18 th day
Control (n=5)	29.5 \pm 0.5	22.1 \pm 0.3	28.1 \pm 0.3
Model (n=5)	13.5 \pm 0.4**	11.2 \pm 0.5**	12.6 \pm 0.3**

**indicates $p < 0.01$.

Table 2: Changes of frequency of slow wave potential according to course of pregnancy (\pm SE, mV).

Group	Course of pregnancy		
	8 th day	13 th day	18 th day
Control (n=5)	0.30 \pm 0.05	0.32 \pm 0.03	0.31 \pm 0.03
Model (n=5)	0.15 \pm 0.04*	0.16 \pm 0.04*	0.08 \pm 0.01**

*indicates $p < 0.05$; **indicates $p < 0.01$.

Table 3: Changes of formation rate of vaginal plug (\pm SE).

Group	Total number of female rats	Number of female rats with vaginal plug	Formation rate (%)
Control	35	32	91.4
Model	35	29	82.9

Table 4: Changes of pregnancy rate(\pm SE).

Group	Total number of female rats	Number of female rats with pregnancy	Pregnancy rate (%)
Control	35	30	85.7
Model	35	18	51.4**

**indicates $p < 0.01$.

Table 5: Changes of average number of fetuses (\pm SE, average number of fetuses/a pregnant female rat).

Group	Total number of female rats	Course of pregnancy		
		8 th day	13 th day	18 th day
Control	30	5.6 \pm 0.5	5.4 \pm 0.5	5.2 \pm 0.6
Model	18	2.8 \pm 0.3**	2.5 \pm 0.4**	2.5 \pm 0.3**

**indicates $p < 0.01$ (Comparison with normal group).

DISCUSSION

Chlamydial infection is a sexually transmitted disease which is caused by *Chlamydia trachomatis*.^[1,2] *Chlamydia trachomatis* is gram-negative coccus-like micro-organism belonging to *Chlamydia* and proliferates only in hosts and growth cycle is unique.^[3,4] Constant infection by pathogens of sexually transmitted disease like *Chlamydia* and gonococcus results in dangerous sequelae such as infertility, ectopic pregnancy, chronic pelvic pain, parahepatitis among women. 75% of the fallopian tube disease is thought to be due to anamnesis of asymptomatic *Chlamydial* infection and those who are under 25 years old with risk of *Chlamydial* infection and other asymptomatic women are recommend to have a medical examination regularly.^[5,6] Experimentally clarifying the functional and morphological changes of oviduct by *chlamydial* infection which is the cause of infertility will contribute to establish a new treatment way for diagnosing and treating infertility. We have conducted this study to clarify the changes of the function of interstitial cells of Cajal and fecundity in chronic salpingitis white rat models which are made by infecting its vaginal cavity with *Chlamydia*.

According to our study results the frequency of slow wave of interstitial cells of Cajal in model group infected by *Chlamydia* was significantly decreased compared with one in normal group ($p < 0.01$). The slow wave potential of interstitial cells of Cajal in model group is significantly decreased compared with normal group ($p < 0.05$, $p < 0.01$). These show that *Chlamydial* infection affects the function of interstitial cells of Cajal which is responsible for peristalsis of oviduct.

Further, the formation rate of model group infected by *Chlamydia* was slightly decreased compared with one of normal group but pregnancy rate in model is significantly decreased compared with one in normal group ($p < 0.01$). On the other hand, average number of fetuses of each female rat in model group is

significantly decreased compared with one in normal group on 8th, 13th, 18th day of pregnancy ($p < 0.01$). This shows that *Chlamydial* infection's influence on sexual function is a little but significant on fecundity like pregnancy and even though female rats become pregnant, it affects the growth of fetus in uterus and decreases the number of fetuses. In the case of people, *Chlamydial* infection may be the causes of infertility due to impaired fertilization, fallopian pregnancy. Therefore, it is important to take a measure on *Chlamydial* infection, most of which are asymptomatic in order to preserve the function of fallopian duct and increase the pregnancy rate and birth rate. We may need further research for measure on *Chlamydial* infection.

CONCLUSION

The function of interstitial cells of Cajal and fecundity in chronic salpingitis white rat models which are made by infecting its vaginal cavity with *Chlamydia* are significantly destroyed compared with normal rats.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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