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

Yong-Chol Hong[1], Gyong-Rim Kim[2], Jun-Il Kang[3], Jong-Hwa Jin[4], Ji-Yong Jong[5], U-Il Jong[6,*]

Abstract

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. ***Background****: Chlamydial infection is a sexually transmitted disease which is caused by Chlamydia trachomatis. 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 recommended to have a medical examination regularly. 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.* ***Objects and Methods****: We anaesthetized female wistar rats with 160-180g in body weight and injected 1×10^7/50μL Chlamydia into vaginal cavity of each rat to make chronic salpingitis models. 4 weeks after infection, we let male and female rats copulate and examined the intravaginal content to confirm if there is a sperm or vaginal plug and set this day as the first day of pregnancy. The 8^{th}, 13^{th}, 18^{th} 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.*

Keywords: Chlamydial infection, chronic salpingitis, interstitial cell of Cajal, fecundity, rat model

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 L_1-L_3 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

*Author for Correspondence
U-Il Jong
E-mail: pmed1@ryongnamsan.edu.kp

[1]Pyongyang University of Medical Sciences, Ryonhwa Dong, Central District, Pyongyang, Democratic People's Republic of Korea

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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.

OBJECTS AND METHODS

Objects

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

Materials

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

Methods

Method of Chlamydial infecting

We anaesthetized female Wistar rats with 160-180g in body weight and injected 1×10^7/50μL Chlamydia into vaginal cavity of each rat.

Method for Causing Pregnancy

4 weeks after infection, we let one female rat which is assessed as cycle 1 and cycle 2 in examination of estrous cycle and two male rats copulate. The next day we examined the intravaginal to confirm if there is a sperm or vaginal plug and set this day as the first day of pregnancy.

Examination Method

Assessment of Function of Interstitial Cells of Cajal

On 8th, 13th, 18th day of pregnancy, we killed female rats 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 0.3~0.4mV, measure the impulse of the interstitial cells of Cajal.

Assessment of Fecundity

On 8th, 13th, 18th day of pregnancy, we killed female rats by dislocating cervical vertebrae and opened abdomen and counted the number of fetuses and assessed life or death of them. When we slightly stimulated the fetuses with dull stick, alive fetus moved but dead one didn't move. 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. Changes of frequency of slow wave according to course of pregnancy ($\overline{X}$ ±SE, Hz).

Group	Course of pregnancy		
	8th day	*13th day*	*18th day*
Normal	29.5±0.5	22.1±0.3	28.1±0.3
Model	13.5±0.4**	11.2±0.5**	12.6±0.3**

***; p<0.01(Comparison with normal group), n=5*

Table 1 shows that frequency of slow wave in model group is significantly decreased compared with one in normal group on 8th, 13th, 18th day of pregnancy (P<0.01).

Table 2 shows that slow wave potential of model group is significantly decreased compared with one of normal group (P<0.05, P<0.01).

Table 2. Changes of frequency of slow wave potential according to course of pregnancy ($\overline{X}$ ±SE, mV).

Group	Course of pregnancy		
	8th day	*13th day*	*18th day*
Normal	0.30±0.05	0.32±0.03	0.31±0.03
Model	0.15±0.04 *	0.16±0.04 *	0.08±0.01 * *

**; p<0.05, **; p<0.01(Comparison with normal group), n=5*

Influence on Fecundity

Table 3 shows that there was no signification difference between formation rate of normal group and one of model group even though formation rate of model group is decrease compared with one of normal group.

Table 3. Changes of formation rate of vaginal plug ($\overline{X}$ ±SE).

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

Table 4. Changes of pregnancy rate($\overline{X}$ ±SE).

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

***; p<0.01(Comparison with normal group)*

Table 4 shows that pregnancy rate of model group (51.4%) is significantly decreased compared with one of normal rate (85.7%) (P<0.01).

Table 5. Changes of average number of fetuses ($\overline{X}$ ±SE, average number of fetuses/a pregnant female rat).

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

***; p<0.01(Comparison with normal group)*

Table 5 shows that average number of fetuses of each pregnant female rat in model group is significantly decreased compared with one in normal group on 8th, 13th, 18th day of pregnancy(P<0.01).

DISCUSSION

Chlamydial infection is a sexually transmitted disease which is caused by Chlamydia trachomatis [1,2]. Chlamydia trachomatis is gram-negative coccus-like microorganism 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, Para hepatitis 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 having 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 is 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.

Next, the formation rate of model group infected by Chlamydia is 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 8^{th}, 13^{th}, 18^{th} 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 measures on Chlamydial infection [7–10].

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.

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