Topic-Setting Program to Advance Cutting-Edge Humanities and Social Sciences Research

(Global Initiatives)

Progress Report

(Summary of Final Report)

[Have innovation and environmental chemicals increased infertility?]

Core-Researcher: **Shoko Konishi**
Institution: **The University of Tokyo**
Academic Unit: **Graduate School of Medicine**
Position: **Associate Professor**

Research Period: FY2019 - FY2021

1. Basic information of research project

Research Area	Developing new genres of humanities and social sciences that address head-on technological innovation such as rapid IT and AI advances and environmental issues
Project Title	Have innovation and environmental chemicals increased infertility?
Institution	The University of Tokyo
Core-Researcher (Name, Academic Unit & Position)	Yoshie Moriki, International Christian University, Senior Associate Professor Manabu Akagawa, The University of Tokyo, Professor Jun Yoshinaga, Toyo University, Professor Hideki Imai, Ishikawa Prefectural Nursing University, Professor Tomoko Saotome, Louis Pasteur Center for Medical Research, Researcher Teruaki Iwamoto, International University of Health and Welfare, Professor Kazumitsu Yamasaki, Tsukuba Gakuen Hospital, Chief Doctor Tatsuji Ihana, International University of Health and Welfare, Lecturer
Project Period	FY2019 - FY2021
Appropriations Plan (¥)	FY2019 5,175,300 JPY
	FY2020 10,367,500 JPY
	FY2021 10,337,600 JPY

2. Purpose of research

Japan has one of the lowest fertility and one of the highest numbers of fertility treatment cycles in the world. Sexless marriage may be one of many factors that cause infertility in this country. Technological innovations such as matching apps and social networking services (SNSs) provide opportunity to meet various people, which could affect marital relationships. One of environmental chemicals, phthalates, are known to reduce sperm counts. We suspected phthalates exposure can reduce both sperm counts and sexual function and increase infertility. This study aimed to analyze how technological innovation and environmental chemicals may affect infertility risks.

3. Outline of research (Including study member)

Online questionnaire survey was conducted targeting 8,000 men aged 20 to 54 years residing across Japan. Associations between sexual behavior and the use of matching apps and SNSs were analyzed. A clinical study was conducted targeting 198 male patients at one hospital in Tokyo and one hospital in Ibaraki. The index to ring finger length ratio (2D:4D) was measured. 2D:4D is believed to reflect androgen exposure in utero. Urine specimens were collected and phthalate metabolites concentrations were measured to quantify the amount of phthalate exposure in the past several weeks. Associations between these two exposure measures and sexual function were analyzed.

Using the data obtained in previous studies targeting Japanese, the time to pregnancy model was established. This model can estimate infertility risks by women's age category and how the risk change when coital frequency changes.

The online questionnaire survey was planned and conducted by Dr. Moriki, Dr. Akagawa, and Dr. Konishi. The clinical study was planned and conducted by Dr. Iwamoto, Dr. Yamasaki, Dr. Uchida, Dr. Ihana, and Dr. Konishi. Recruitment of participants and planning of the study was done with the support of Dr. Yoshinaga, Dr. Imai, and Dr. Saotome. The time to pregnancy model was constructed by Dr. Konishi with the support of Ms. Kariya.

4. Research results and outcomes produced

Technological innovation and environmental exposures quantified in this study did not correlate with sexual behavior or function. The use of matching apps were associated with a higher likelihood of having extra marital sex, but not with sexless marriage. On the other hand, we found that some socioeconomic variables are closely related to sexual behavior. There were no clear associations between 2D:4D or urinary phthalates concentrations and sexual function.

According to the time to pregnancy model, the estimated probability of infertility for a woman discontinuing contraception to conceive her first child at the ages between 30 and 34 years was 35.1%. If her coital frequency increased by 1 per month, the corresponding probability was estimated to reduce to 31.8%.

The use of technological innovation or exposure to environmental chemicals assessed in this study did not correlate with sexual function or behavior. However, there are tens of millions of chemicals in the environment and technological innovations prevail. We need to continuously monitor how all these chemicals and technological innovations may affect reproduction and the future of humans.