Population Projections for Japan with the Effects of Endocrine Disruptors

Takahisa Mizushima, Yasuhiko Kashima, Jin Yoshimura Shizuoka University

Resently, Japanese birthrate keeps on decreasing. Statistics of Population dynamics for Japan in 1995 by the Ministry of Welfare have showed the lowest birthrate (1.34) in history. There is an estimation that Japanese population will decrease from about 125 million persons in 1995 to about 67 million persons in 2100. Endocrine disruptors (EDs), it has been debated whether or not they affect human sperm count, may spur this depopulation tendency. For example, there is a scientific data that have shown reduction in sperm counts worldwide from 113 million sperm/ml to 66 million sperm/ml. However whether it is caused by EDs or not is unknown. World Health Organization had provided that natural pregnancy is difficult to occur if sperm counts is less than 20 million sperm/ml. We have projected a change of Japanese population with reduction of sperm counts assuming the effects of EDs.

This population dynamics model has been constructed along the following process : (1) the exposure of unborn children and babys to EDs through the placenta and breast milk (2) decrease of sperm counts (3) reduction of fertilities (4) decline of birthrates. This model has applyed the leslie matrix to express that effects of the exposure of unborn children and babys to EDC appear when they grow up to be a men, and has shown a change of Japanese women population from the age of 0 to 49. In this model, the correlation between sperm counts and fertilities has been assumed such that if sperm counts become less than 30 million sperm/ml, fertilities will decrease in proportion to sperm counts, and when sperm counts decrease to below 10 million sperm/ml, the reproduction will be impossible. Birthrates is supposed to be proportional to fertilities.

Estimation that used Japanese women's population, fertilities, mortalities in 1995 has been shown in the right figure. In the case whether the effects of EDs exist or not, Japanese population has gone on reducing, and then has extinguish because Japanese birthrate in 1995 is too low to maintain the population. If the effects of EDs exist, the time of the extinction has been brought much forward. We can't say that Japanese future will be hopefull.

We must not believe this result as such, because this model includes many assumptions and parameters that are difficult to test empirically. But, Japanese population is at least threatened with extinction unless birthrate increases in future. We have been forced to take some plompt social measures.



Figure: Women Population Projections for Japan with or without effects of Endocrin Disruptors The vertical axis : Population (× 1000)

The horizontal acis : Year

1 : No damage, 2 : Low damage, 3 : High damage