

Title of Research:

19_R05-01

Establishment of medaka kinetic model for aged microplastic and adsorbed chemical

Principal Investigator:

Yuji Oshima (Kyushu University, Faculty of Agriculture, Laboratory of Marine Environmental Science Professor)

744 Motoooka, Nishi-ku, Fukuoka 8020345, Japan

(tel&fax)+81-092-802-4607

Collaborators:

Yohei Shimasaki (Faculty of Agriculture, Kyushu University, Associated Professor)

Kang Ik Joon (School of Interdisciplinary Science and Innovation, Kyushu University, Associated Professor)

Summary of Research:

Plastic has an extensive use in our daily life due to its low cost, lightweight and hard to decompose. Due to their high production and a quite slow degradation, plastic pollution has been expanded worldwide in aquatic environments. Pollution of plastic from large items to small particle (microscopic plastic MP, < 5mm) were emerged. Effect of MP and its vector effect with toxicants are of concerns. Many researchers have studied these topics. However, most of study were used pristine MPs. Thus, risk analysis of aged MP is required.

In this study, three kinds of aged plastics (sphere polyethylene (PE), grind PE, grind polystyrene (PS)) were prepared by exposure to ultraviolet for 180 and 460 hours. Changes on chemical characters were detected by aging. Decrease in sorption of anthracene on aged MPs were observed, especially aged grind PS showed 1/8 of sorption constant (k_e) compared with that of pristine grind PS. Bioaccumulation studies were performed in medaka mix-exposed with anthracene and MPs, respectively. As results, no effect was observed in maximum concentration of anthracene in medaka body among aging, quality or shape of MPs. However, anthracene was detected in grind-aged PE and PS even at depuration periods. These results suggested that small particle of PE or PS in grind MPs may remained inside of body after depuration period. Further study on another type of aged MP is required.

Timeline:

March 1, 2020 - February 28, 2021

Topics:

Oral presentation at JCIA LRI Annual Workshop 2020 "Establishment of medaka kinetic model for aged microplastic and adsorbed chemical" (On-line, August 21st, 2020)

Publications:

1. Qiu, X., Saovany, S., Takai, Y., Akasaka, A., Inoue, Y., Yakata, N., Liu, Y., Waseda, M., Shimasaki, Y., Oshima, Y., 2020. Quantifying the vector effects of polyethylene microplastics on the accumulation of anthracene to Japanese medaka (*Oryzias latipes*). *Aquatic Toxicology* 228, 105643.
2. Assas, M., Qiu, X., Chen, K., Ogawa, H., Xu, H., Shimasaki, Y., Oshima, Y., 2020. Bioaccumulation and reproductive effects of fluorescent microplastics in medaka fish. *Mar. Pollut. Bull.* 158, 111446.
3. Liu, Y., Qiu, X., Xu, X., Takai, Y., Ogawa, H., Shimasaki, Y., Oshima, Y., 2021. Uptake and depuration kinetics of microplastics with different polymer types and particle sizes in Japanese medaka (*Oryzias latipes*). *Ecotoxicol. Environ. Saf.* 212, 112007.