OPINION :

Plastics and its effect to women reproductive systems

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Since it was found in 1940's, the use of plastic has become a habit, as it is convenient and cheap. It products in a world scale more than 300 million tonnes. What we have to pay for that convenience and cheapness is now obvious. The waste of plastic goods is everywhere. Nowadays, even in rural areas, plastic waste pollutes the environment. Even in the middle of the oceans, islands of plastic refuse are there in the currents.These garbages are deadly to marine life. Globally, we now discard about eight million tonnes of plastics. When it ends up in the seas, fish and turtles take it as a food, swallow it to death or die of starvation because what they have consumed is not real food.[1]

In the year 2018, it was no surprise that after being found in bird, fish and whales, microplastics have now been discovered in humans. To be specific but indelicate, tiny plastic particles and fibers have been found in the stool of eight people who provided samples as a part of a pilot study. The small study examined eight participants from Europe, Japan and Russia. All of their stool samples were found to contain microplastic particles .Up to nine different plastics were found out of 10 varieties tested for, in particles of sizes ranging from 50 to 500 micrometres. Polypropylene and polyethylene terephthalate were the plastics most commonly found. On average, 20 particles of microplastic were found in each 10 g of the excreta. Microplastics are defined as particles of less than 5 mm, with some created for use in products such as cosmetics but also by the breaking down of larger pieces of plastic, often in the sea. Based on this study, the authors estimated that "more than 50% of the world population might have microplastics in their stools".[2] The big question then: what does it mean for our health?

Microplastics (MPs) and mesoplastics are able to sorb harmful substances and often contain additives, e.g., endocrine disrupting chemicals (EDCs), that can cause adverse effects to organisms. Estrogens are the dominant EDCs on plastic particles and either concentrated from the surrounding water or originated from plastic manufacturing.[3] In animal, some evidence show altered physiology in fish as a consequence of endocrine disruption, with some of the most widely reported effects on sexual development and function.[4] Animal and in vitro studies have supported the conclusion that endocrine disrupting chemicals affect the hormone dependent pathways responsible both for male and female gonadal development, either through direct interaction with hormone receptors or via epigenetic and inner cell-cycle regulatory.[5]

Before too far, maybe it's worth for quick review what kinds of EDC's we have to be aware of. Plastic products are defined as in categories. They are the number we can see under each product in triangle. Two categories out of seven will be discussed here, which are the category number 1 and number 7. The type of plastic containing pthalates is the number one, namely polyethylene terephthalate (PET). Almost all bottled beverage are in this category. The type of plastic that contain bisphenol are generally included in the category number seven. This category is made for mixed resin types that cannot be categorized in number one to number six. Examples of this category include food containers, buckets and other containers used for heavier task.

How do endocrine disruptors work?

From animal studies, researchers have learned much about the mechanisms through which endocrine disruptors influence the endocrine system and alter hormonal functions. Endocrine disruptors can:

- Mimic or partly mimic naturally occurring hormones in the body like estrogens (the female sex hormone), androgens (the male sex hormone), and

thyroid hormones, potentially producing over-stimulation.
- Bind to a receptor within a cell and block the endogenous hormone from binding. The normal signal then fails to occur and the body fails to respond properly. Examples of chemicals that block or antagonize hormones are anti-estrogens and anti-androgens.
- Interfere or block the way natural hormones or their receptors are made or controlled, for example, by altering their metabolism in the liver.[6,7]

In recent decades there is also significant increase of polycystic ovary syndrome (PCOS), and its prevalence is estimated to be 4–8% in studies performed in Greece, Spain and the USA.[1,2] This is the most common endocrine abnormality in women of reproductive age. The prevalence of PCOS is increasing all over the world and is parallel with the rising prevalence of type 2 diabetes mellitus (T2DM).[8] The etiology of the disease remains unclear, and the subjective phenotype makes a united diagnosis difficult among physicians. It seems to be a familial genetic syndrome caused by a combination of environmental and genetic factors. PCOS is the cause of up to 30% of infertility in couples seeking treatment.[9]

In animal models, exposure to BPA during prenatal period dramatically disrupts ovarian and reproductive function in females, often at doses similar to typical levels of human exposure. BPA also appears to have obesogenic properties, disrupting normal metabolic activity and making the body prone to overweight.[10] Many epidemiologic researches already found supporting fact that EDC's, especially BPA, are related to PCOS. A United Kingdom study found that BPA levels were significantly higher in total PCOS group compared with the controls.[10] While Rashidi et al in a small case-control study in Iran found a fact that PCOS group had higher level of BPA urine than control group. However, much more studies are need to establish the connection, also role of other EDC's like phthalate, which is very commonly used in Indonesia.

In Indonesia setting, the role of Obstetricians/Gynecologist are very important to reveal the impact of EDCs exposure, because, most women with PCOS/infertility come or be referred to them. Researches about PCOS could include the exposure to EDCs factors. Public awareness could be raised based from these researches, and maybe even some policy could be pushed to make.

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