

The chemical biology of polycyclic aromatic hydrocarbon quinone that affects the activity of transcription factor

ODAigo Sumi and Yoshito Kumagai

(Grad. Sch. Comprehensive Human Sci., Univ. of Tsukuba)

Suspended particulate matter (SPM) is discharged from motor vehicles and fossil fuels are mentioned as an example of air pollutant. Among of SPM, PM_{2.5} has a diameter of smaller than 2.5 μM, which arise question for substances cause circulatory and respiratory disorders. Because PM_{2.5} is considerably small, it is easy to come into the body through nasal cavity.

We are in focus about polycyclic aromatic hydrocarbon (PAH) quinones among over 1,000 chemicals are contained in PM_{2.5}. Examination with 1,2-naphthoquinone (1,2-NQ) belongs to PAH quinones as a model compound let us understand that 1,2-NQ covalently binds with thiol groups, which easily dissociate in physiological pH. Among of bound proteins with 1,2-NQ, we examined the effect of 1,2-NQ on the proteins that regulates the activity of transcription factor. In consequence, 1,2-NQ bound with protein tyrosine phosphatase 1B (PTP1B), which negatively regulates epidermal growth factor receptor (EGFR) and Inhibitor of κB kinase (IKK), which activates transcription factor, NF-κB. The binding of PTP1B and IKK to 1,2-NQ caused the inhibition of their activities, that is to say the stimulation of EGFR phosphorylation and the suppression of lipopolysaccharide-induced NF-κB activation.

In this symposium, from the point of view of “chemical biology”, we introduce that biological responses are caused from the interaction of PAH quinones with protein, especially affects the activity of transcription factor.