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Human-inspired bioelectronic nose for water quality monitoring

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A bioelectronics nose for the real-time assessment of water quality was constructed with human olfactory receptor-carbon nanotube hybrid structure.Geosmin and 2-methylisoborneol (MIB) are representative taste and odor causing compounds mainly produced by bacteria in water supply system. The human nose is extremely sensitive to these compounds and is able to detect at concentrations as low as a few nanograms per liter (ppt). For the screening of human olfactory receptors (hORs) which respond to these compounds, we performed deorphanization assays of two odorants against 193 hORs expressed in human embryonic kidney (HEK)-293 cells. As results, hOR51S1 for geosmin and hOR3A4 for MIB were selected for highly sensitive and selective discrimination of each odorant.Nanovesicles expressing the hORs on surface were produced from HEK-293 cell and functionalized with carbon nanotube field-effect transistor. This bioelectronics nose was able to selectively detect geosmin and MIB at concentrations as low as a 10 ppt. In real samplefrom tap water, bottled water, and river water, we could detect a sufficient level of two odorants without any pre-treatment procedures. These results indicate that the bioelectronic nose could be used fast and easily for water quality monitoring in real environment.

Biography

Manki Son is a PhD student at Seoul National University. He has completed BS and MS from Inha University in 2010 and 2012. His research interests include bioengineering and olfactory biosensors.

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