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Major metabolites characterization from the bacterium *Bacillus pumilus* SA171 isolated from apple plant (*Malus domestica)*

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Bacillus pumilus bacterium was isolated from the apple stem which was collected from Saratov region, Russian Federation. Chemical investigation of the EtOAc crude extract of *B. pumilus*, which was grown on solid rice medium, yielded four known secondary metabolites, including septicine, indole-3-methyl-oxoethyl acetamide, cyclopeptide A and Pyrrole carboxaldehyde. The structures were determined on the basis of HPLC and one-two-dimensional NMR spectroscopy as well as mass spectrometry. The bacterial crude extract was tested *in vitro* for their cytotoxic activity against mouse lymphoma cell line L5178Y, and antimicrobial activity against *Staphylococcus aureus* ATCC 25922, and *Mycobacterium tuberculosis*, the bacterial crude extract showed moderate cytotoxic activity, and weak activity against both selected bacteria.

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High-efficiency separation of single-structure carbon nanotubes with the gel chromatography technique

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Single-wall carbon nanotubes (SWCNTs) are one-dimensional seamless graphene cylinders with structure-tunable optical properties. Depending on the arrangement of carbon atoms, the band gaps of SWCNTs can be varied, inducing the wavelength change of their optical absorption and emission. These amazing features, combined with their high specific surface area, make SWCNTs have great potential application in biomedicine, bio-imaging and photothermal therapy. Current synthesis methods usually produce a heterogeneous mixture of SWCNTs with diverse optical properties. They are difficult to apply in bio-imaging and photothermal therapy. Bulk separation of SWCNT mixture into populations of single-structure species with identical optical properties is an extremely critical step to promote SWCNTs into practical applications in bio-imaging. Recently, we developed multistage gel chromatography technique to separate the structures of SWCNTs. With this technique, high-purity single-chirality SWCNTs and even their optical can be well sorted across different columns by simply pouring SWCNT-dispersion aqueous solution into multistage gel columns. In this technique, the loaded SWCNT mixture can be fully separated and recycled without any loss. Ethanol can be employed to reduce the use of sodium dodecyl sulfate surfactant in the separation, alleviating the negative effect of surfactants on the properties of SWCNTs. Commercially available dextran-based gel employed as the medium of columns can be reused. These features of our technique permit high-efficiency, lost-cost and industrial separation of single-structure SWCNTs and significantly contribute to carbon nanotube industry in future. In this speech, I will introduce our recent progress in carbon nanotube separation and the application of the sorted single-structure SWCNTs.

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