Schröder W. (TUHH)

New volatile molecular markers for the diagnosis of human cancer

(will be presented Tuesday, 10.3.2015, 9:10 on the PittCon 2015)

Abstract

Dogs can reliably distinguish by sniffing between healthy and ill people suffering from cancer. These obviously existing volatile cancer markers have long been searched for, but have not yet been detected.

In cancer tissue, high levels of nitric oxide (NO), nonvolatile thiols and nonvolatile nitrosothiols (SNOs, being a synthesis product of both) have been described as typical. Taking this into consideration, volatile nitrosothiols (vSNOs) generated from volatile thiols that are omnipresent in malign tissue and NO are proposed to be the source of the characteristic smell of cancer.

Derived from the structures of volatile sulfur compounds repeatedly found in the breath emission of humans (e.g. thiols, sulfides and disulfides), with typical carbon structures based on methyl-, ethyl-, 2-propyl- and propenyl- (allyl) groups, the corresponding vSNOs were synthesized and stabilized for weeks as n-decane solutions (see poster for syntheses and analyses of vSNOs).

To prove that the smell of cancer consists of vSNOs, a dog was trained with an artificial odor mixture composed of the four vSNOs structured as mentioned above. In succeeding sniffing tests, this dog was reliably able to find cancer tissue in amongst non-cancer tissues without ever before having sniffed cancer. This is the first time that a dog training procedure using artificial fragrances has enabled a definite and secure detection of cancer. These results are strong hints for vSNOs as cancer markers. But their detection remains difficult due to their fast decomposition rate (e.g. during enrichment) and until now has been unsuccessful in vivo even when handled with consideration by cryo-sampling and low temperature GC.