The Cancer Breathalyzer, Part II: Chemical Strips that Detect Chemicals in Breast, Colorectal, and Prostate Cancer Breathprint

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The purpose of the project is to create strips that can detect chemicals released in the human breath by breast, colorectal, and prostate cancer cells, to be placed in a breathalyzer, creating a cost-effective and noninvasive diagnostic tool. Last year, lung cancer was successfully detected and diagnosed aromatically on yeast cells. The hypothesis for the experiment is that it will be possible to create strips to target specific chemicals released by cancers, as each has a unique signature of chemicals that are released in the human breath. In order to test the hypothesis, mutant E. coli WPZ that could metabolize and rerelease the cancer chemicals into their environment were singled out and cultured. Then, strips were made to target the specific chemicals. After, the chemicals were grown in yeast cultures and attached to a respiratory system-like apparatus to aromatically test the hypothesis. Iron (III) chloride was used to detect acetic acid, released by breast cancer cells. Potassium chloride, calcium chloride, sodium chloride, sodium hydroxide, and hydrochloric acid were used to detect benzoic acid, released by breast cancer cells. Clorox was used to detect cyclohexane, released by colorectal cancer cells. Sulfuric acid was used to detect formaldehyde, released by prostate cancer cells. Out of the eight combinations tested, iron (III) chloride showed consistent color change when exposed to acetic acid. The other strip/cancer chemical combinations did not show any color change, but the pH indicated a potential reaction could still be occurring. A series of tests were run to confirm the final products of the chemical reactions. Finally, a sensor has been developed to measure the exact color of the strips, increasing the effectiveness of the breathalyzer.

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