Ontologies Classes Object Properties Data Properties Annotation Properties Individuals Datatypes Clouds

Class: Breathalyzer_LC

Annotations (2)

- rdfs:comment "Lung cancer causes 160,000 deaths a year in the United States–more than any other cancer. Current diagnostic techniques including CT scans and needle biopsies are invasive and expensive and have a high risk of complications, says Peter Mazzone, a pulmonologist at the Cleveland Clinic. “We need an easy-to-use test for finding early-stage lung cancer,” he says. Some of the products of metabolism, called volatile organic compounds, are carried in the breath and can serve as biomarkers. Cancer cells make different groups of these volatile compounds than normal cells do. Researchers have known since the mid-eighties that these differences can be detected on lung-cancer patients’ breath using a combination of gas chromoAtography and mass spectrometry. But Mazzone says applying these sophisticated analytical techniques to cancer diagnosis is expensive–it requires trained technicians and large machines–and they have not proved accurate enough for clinical use. The Cleveland lung-cancer sensor is a disposable piece of paper called a colorimetric array. The paper has 36 chemically sensitive dye spots that change color when they interact with compounds in the breath. Changes in color are read by a flatbed scanner, which sends the images to a computer for analysis. In a proof-of-principle study, Cleveland Clinic researchers analyzed the breath of 143 patients, some healthy, some known to have lung cancer, and some with other lung diseases. Patients breathed into a machine that kept their exhalations at body temperature and circulated them over the sensing array. The doctors modeled the patterns of color changes in the sensor array characteristic of lung cancer, then used the model to try to detect lung cancer in the remaining patients. The Cleveland device is nonspecific: the researchers did not look for particular compounds in the breath but for patterns of color changes. The best sensors yet for detecting cancer on the breath are also nonspecific: dogs’ noses. A study published last year showed that trained dogs can distinguish between the breath of healthy people and those with lung cancer with 99 percent accuracy. The Cleveland device can detect lung cancer in about three out of four breath samples. “We hope our sensing technology can get close to the nose and can get as accurate results as the dogs do,” says Mazzone. To improve the accuracy of breath-sensing devices, researchers need to know more about what they’re looking for. The metabolic reactions that make the characteristic compounds found in the breath are complex, says Nicholas Broffman, executive director of the Pine Street Foundation, the cancer-research center in San Anselmo, CA, whose scientists demonstrated dogs’ cancer-sensing ability. “We need to see which compounds are unique to cancer and which are not,” he says, in addition to finding out which compounds are unique to which cancers. Lung cancer isn’t the only cancer that causes detectable changes in the breath. “You don’t want to biopsy everywhere,” says Broffman. Mazzone expects that future advances in mass spectrometry will make it possible to identify which compounds are characteristic of cancer patients, and of patients with different kinds of cancer. “When we know truly what the chemicals are, then we can go back to easier-to-use sensors [like the calorimetric array] and fine-tune them,” he says, in the hopes of increasing their accuracy. For example, the researchers might find that a group of alkanes occurs only in the breath of ovarian-cancer patients and tailor the dye spots on a colorimetric sensor to these compounds. The Cleveland Clinic study “validates the idea that cancer could have a smell,” says Broffman. Noting that doctors historically sniffed patients’ breath for yeasty or sweet smells to diagnose tuberculosis and diabetes, Broffman says that “medicine is coming full circle.”"
- rdfs:comment "The chemical composition of breath is largely influenced by environmental chemistry. Inhaled air contains, besides oxygen and nitrogen, all the compounds that characterize the environment. On the contrary, exhaled air is characterized by a small concentration of oxygen, a large content of carbon dioxide, and a number of volatile compounds produced by the body metabolism. The abnormal metabolism of tumor cells is expected to alter not only the quantity, but also the quality of the excreted metabolites. The relationship between the composition of exhaled breath and lung cancer has been investigated for three decades. Gas chromatography has been the gold standard in these studies [28,29,30,31]. However, the results of such measurements depend on a series of factors that include the choice of the absorbent material, the setup of the gas chromatograph, and the characteristics of the detector, among others. In practice, since the measure of breath is not standardized, each investigation captures different aspects of the breath composition, and a clear identification of the involved volatile compounds is still missing [32]. A review of lung cancer-related volatile organic compounds (VOCs) enumerate 19 compounds whose concentration has been found to be statistically altered in the presence of cancer. These compounds belong to a large spectrum of chemical diversity [22]. In spite of the growing collection of evidence, the relationship between cancer and VOCs is still debated. The main hypothesized pathways for the formation of cancer-related VOCs include oxidative stress, gene mutations, and the Warburg effect [33]. Oxidative stress is the result of the increased activity of the cytochrome P450 enzyme [34]. This leads to an excess of concentration of reactive oxygen species and free radicals. These species can react with different molecules in the body, giving rise to a number of compounds that can be emitted in the breath [35]. On the other hand, oxidative stress is common to many inflammatory stages, and so, it cannot be considered a specific source of VOCs for cancer. Gene mutations are typically associated with the growth of cancer. The mutations result in altered proteins that

may induce changes in the metabolic processes and ultimately result in abnormal production of VOCs [36]. Another supposed source of VOCs is the Warburg effect, which corresponds to the glycolysis over oxidative phosphorylation that is activated in hypoxic condition [37]. The reduction of available oxygen is likely a consequence of fast cell replication [38]. This reaction produces an excess of lactic acid that may causes the breakage of the basement membrane, which eventually results in the production of small detectable volatile molecules [39]. On the other hand, all these studies agree in considering that the pattern is altered and that there is not a clear relationship between the molecular structure and the relevance for cancer. For instance, the concentration of 1-methyl-2-(1-methylethyl)-benzene does not depend on cancer, while the abundance of 1-methyl-3-(1-methylethyl)-benzene is five-times larger in the breath of cancer-affected individuals [31]. In spite of the difficulties in finding a relationship between the chemistry of volatile compounds and cancer, the identification of a pattern signaling cancer can be achieved by electronic noses. Several gas sensors technologies have been applied to breath analysis [40]. In the case of lung cancer, the first evidence that an electronic nose can identify cancer from the analysis of breath was obtained in 2003 using an array of porphyrin-coated quartz microbalances [41]. Porphyrins are known for the important role they play in many important biological processes such as the transport of oxygen in blood and catalysis in mitochondria. In all of these mechanisms, porphyrins show a great affinity toward the interaction with molecules, and this property is exploited in these sensors [42]. Porphyrin-functionalized sensors have been successively used to detect cancer with respect to co-morbidities such as chronic obstructive pulmonary disease (COPD) [43] and metabolic dysfunctions [44]. Another prominent sensor technology is based on organically-capped gold nanoparticles [31]. Among the studies with these sensors, it is worth mentioning the discrimination between the first-stages and post-tumor resection cases [45]. More recently, these sensors have been applied to the detection of mutations of the epidermal growth factor receptor (EGFR) [46] and to monitor the response to anticancer treatment [47]. Other interesting devices are those based on resistive blends of polymers and carbon black [48] and colorimetric sensors [49]. Table 1 shows examples of the results achieved by electronic noses in lung cancer detection."

Superclasses (1)

- Sensor_Factors_LC

Disjoints (687)

'\'Abraxane_(Paclitaxel_Albumin-stabilized_Nanoparticle_Formulation)_\'', '\'Afinitor_(Everolimus)\'', '\'Afinitor_Disperz_(Everolimus)_\'', '\'Alecensa_(Alectinib)_\'', '\'Alimta_(Pemetrexed_Disodium)_\'', '\'Alunbrig_(Brigatinib)_\'', '\'Alymsys_(Bevacizumab)_\'', '\'Avastin_(Bevacizumab)_\'', '\'Cyramza_(Ramucirumab)_\'', '\'Enhertu_(Fam-Trastuzumab_Deruxtecan-nxki)_\'', '\'Etopophos_(Etoposide_Phosphate)_\'', '\'Exkivity_(Mobocertinib_Succinate)_\'', '\'Gavreto_(Pralsetinib)_\'', '\'Gemzar_(Gemcitabine_Hydrochloride)_\'', '\'Gilotrif_(Afatinib_Dimaleate)_\'', '\'Hycamtin_(Topotecan_Hydrochloride)_\'', '\'Imfinzi_(Durvalumab)_\'', '\'Imjudo_(Tremelimumab-actl)_\'', '\'Infugem_(Gemcitabine_Hydrochloride)_\'', '\'Iressa_(Gefitinib)_\'', '\'Keytruda_(Pembrolizumab)_\'', '\'Krazati_(Adagrasib)_\'', '\'Libtayo_(Cemiplimab-rwlc)_\'', '\'Lorbrena_(Lorlatinib)_\'', '\'Lumakras_(Sotorasib)_\'', '\'Mekinist_(Trametinib_Dimethyl_Sulfoxide)_\'', '\'Mvasi_(Bevacizumab)_\'', '\'Opdivo_(Nivolumab)_\'', '\'Portrazza_(Necitumumab)_\'', '\'Retevmo_(Selpercatinib)_\'', '\'Rozlytrek_(Entrectinib)_\'', '\'Rybrevant_(Amivantamab-vmjw)_\'', '\'Tabrecta_(Capmatinib_Hydrochloride)_\'', '\'Tafinlar_(Dabrafenib_Mesylate)_\'', '\'Tagrisso_(Osimertinib_Mesylate)_\'', '\'Taxotere_(Docetaxel)_\'', '\'Tecentriq_(Atezolizumab)_\'', '\'Tepmetko_(Tepotinib_Hydrochloride)_\'', '\'Trexall_(Methotrexate_Sodium)_\'', '\'Vizimpro_(Dacomitinib)_\'', '\'Xalkori_(Crizotinib)_\'', '\'Yervoy_(Ipilimumab)_\'', '\'Zirabev_(Bevacizumab)_\'', '\'Zykadia_(Ceritinib)_\'', 4A_NSCLC, 4B_NSCLC, Adagrasib_, Adherence_Based_on_Socioeconomics_LC, Adherence_Factors_LC, Adverse_Reactions_ABRAX, Adverse_Reactions_ADAGR, Adverse_Reactions_AFATI, Adverse_Reactions_AFINI, Adverse_Reactions_AFINIT, Adverse_Reactions_ALECE, Adverse_Reactions_ALIMT, Adverse_Reactions_ALUNB, Adverse_Reactions_ALYMS, Adverse_Reactions_AMIVA, Adverse_Reactions_ATEZO, Adverse_Reactions_AVAST, Adverse_Reactions_BRIGA, Adverse_Reactions_CAPMA, Adverse_Reactions_CEMIP, Adverse_Reactions_CYRAM, Adverse_Reactions_DOXOR, Adverse_Reactions_DURVA, Adverse_Reactions_ENHER, Adverse_Reactions_ENTRE, Adverse_Reactions_ERLOT, Adverse_Reactions_ETOP, Adverse_Reactions_ETOPO, Adverse_Reactions_EXKIV, Adverse_Reactions_GAVRE, Adverse_Reactions_GEFIT, Adverse_Reactions_GEMZA, Adverse_Reactions_GILOT, Adverse_Reactions_HYCAM, Adverse_Reactions_IMFIN, Adverse_Reactions_IMJUD, Adverse_Reactions_INFUG, Adverse_Reactions_IRESS, Adverse_Reactions_KEYTR, Adverse_Reactions_KRAZA, Adverse_Reactions_LIBTA, Adverse_Reactions_LORBR, Adverse_Reactions_LUMAK, Adverse_Reactions_LURB, Adverse_Reactions_MEKIN, Adverse_Reactions_METH, Adverse_Reactions_MVASI, Adverse_Reactions_OPDIV, Adverse_Reactions_PORTR, Adverse_Reactions_RAMUC, Adverse_Reactions_RETEV, Adverse_Reactions_ROZLY, Adverse_Reactions_RYBRE, Adverse_Reactions_SELPE, Adverse_Reactions_SOTOR, Adverse_Reactions_TABRE, Adverse_Reactions_TAFIN, Adverse_Reactions_TAGRIS, Adverse_Reactions_TAXOT, Adverse_Reactions_TECEN, Adverse_Reactions_TEPME, Adverse_Reactions_TOPO, Adverse_Reactions_TRAME, Adverse_Reactions_TREME, Adverse_Reactions_TREXA, Adverse_Reactions_VINOR, Adverse_Reactions_VIZIM, Adverse_Reactions_XALKO, Adverse_Reactions_YERVO, Adverse_Reactions_ZIRAB, Adverse_Reactions_ZYKAD, Afatinib_Dimaleate_, Age, Air_Pollution, Amivantamab-vmjw_, Atezolizumab_, Behavioral_Factors_LC, Beta_Carotene_Supplements_LC, Biological_Effects_LC, **Breathalyzer_LC**, Breathing_LC, Brigatinib_, Capmatinib_Hydrochloride_, Causes_and_Risks_LC, Cemiplimab-rwlc_, Choosing_Quality_of_Life_-_Reasons_People_Forego_Treatment, Choosing_Survival_-_Deciding_to_Undergo_Treatment, Clinical_Factors_LC, Complications_LC, Contraindications_ABRAX, Contraindications_ADAGR, Contraindications_AFATI, Contraindications_AFINI, Contraindications_AFINIT, Contraindications_ALECE, Contraindications_ALIMT, Contraindications_ALUNB, Contraindications_ALYMS, Contraindications_AMIVA, 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Doxorubicin_Hydrochloride_, Drug_Interactions_ABRAX, Drug_Interactions_ADAGR, Drug_Interactions_AFATI, Drug_Interactions_AFINI, Drug_Interactions_AFINIT, Drug_Interactions_ALECE, Drug_Interactions_ALIMT, Drug_Interactions_ALUNB, Drug_Interactions_ALYMS, Drug_Interactions_AMIVA, Drug_Interactions_ATEZO, Drug_Interactions_AVAST, Drug_Interactions_BRIGA, Drug_Interactions_CAPMA, Drug_Interactions_CEMIP, Drug_Interactions_CYRAM, Drug_Interactions_DOXOR, Drug_Interactions_DURVA, Drug_Interactions_ENHER, Drug_Interactions_ENTRE, Drug_Interactions_ERLOT, Drug_Interactions_ETOP, Drug_Interactions_ETOPO, Drug_Interactions_EXKIV, Drug_Interactions_GAVRE, Drug_Interactions_GEFIT, Drug_Interactions_GEMZA, Drug_Interactions_GILOT, Drug_Interactions_HYCAM, Drug_Interactions_IMFIN, Drug_Interactions_IMJUD, Drug_Interactions_INFUG, Drug_Interactions_IRESS, Drug_Interactions_KEYTR, Drug_Interactions_KRAZA, Drug_Interactions_LIBTA, Drug_Interactions_LORBR, Drug_Interactions_LUMAK, 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Increased_Susceptibility_LC, Indications_and_Usage_ABRAX, Indications_and_Usage_ADAGR, Indications_and_Usage_AFATI, Indications_and_Usage_AFINI, Indications_and_Usage_AFINIT, Indications_and_Usage_ALECE, Indications_and_Usage_ALIMT, Indications_and_Usage_ALUNB, Indications_and_Usage_ALYMS, Indications_and_Usage_AMIVA, Indications_and_Usage_ATEZO, Indications_and_Usage_AVAST, Indications_and_Usage_BRIGA, Indications_and_Usage_CAPMA, Indications_and_Usage_CEMIP, Indications_and_Usage_CYRAM, Indications_and_Usage_DOXOR, Indications_and_Usage_DURVA, Indications_and_Usage_ENHER, Indications_and_Usage_ENTRE, Indications_and_Usage_ERLOT, Indications_and_Usage_ETOP, Indications_and_Usage_ETOPO, Indications_and_Usage_EXKIV, Indications_and_Usage_GAVRE, Indications_and_Usage_GEFIT, Indications_and_Usage_GEMZA, Indications_and_Usage_GILOT, Indications_and_Usage_HYCAM, Indications_and_Usage_IMFIN, Indications_and_Usage_IMJUD, Indications_and_Usage_INFUG, Indications_and_Usage_IRESS, 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Location_LC, Lurbinectedin_, Marijuna_Smoking_LC, Medications_LC, Methotrexate_Sodium_, Never-Smokers_LC, Non-Small_Cell_LC, Non-Small_Cell_LC_NSCLC, Non-Small_Cell_Lung_Cancer, Non-Small_Cell_Medication_LC_, Non-Smokers_LC, Non-Smokers_NSCLC, Non-Smokers_SCLC, Nutrition_LC, Occupational_Exposure, Physical_Activity_For_Mitigation_of__LC, Physical_Activity_For_Prevention_Of_LC, Preventative_habits_LC, Quitting/Not_Smoking_LC, Racial/Ethnic, Radiation_Exposure_LC, Ramucirumab_, Recurring_LC_NSCLC, Recurring_LC_SCLC, Rural_LC, Second-hand_Smoke_LC, Secondhand_Smoke_LC, Selpercatinib_, Size_of_the_community_LC, Sleep_LC, Small_Cell_LC, Small_Cell_LC_SCLC, Small_Cell_Lung_Cancer, Small_Cell_Medication_LC_, Smoke_LC, Smokers_LC, Smokers_NSCLC, Smokers_SCLC, Smoking_LC, Smoking_Marijuana_LC, Smoking_Other_Drugs_LC, Smoking_Tobacco_LC, Socioeconomics_LC, Sotorasib_, Stage_0_NSCLC, Stage_1_NSCLC, Stage_1_SCLC, Stage_2_NSCLC, Stage_3A_NSCLC, Stage_3B_NSCLC, Stage_4_NSCLC, Support_Groups_LC, Symptoms_and_Tests_LC, Symptoms_NSC, Symptoms_SC, Tests_NSC, Tests_SC, Tobacco_Smoking, Tobacco_Smoking_LC, Topotecan_Hydrochloride_, Tramentinib_Dimethyl_Sulfoxide, Treatment_Regimens_LC, Treatments_LC, Tremelimumab-actl_, Urban_LC, Use_in_Specific_Populations_ABRAX, Use_in_Specific_Populations_ADAGR, Use_in_Specific_Populations_AFATI, Use_in_Specific_Populations_AFINI, Use_in_Specific_Populations_AFINIT, Use_in_Specific_Populations_ALECE, Use_in_Specific_Populations_ALIMT, Use_in_Specific_Populations_ALUNB, Use_in_Specific_Populations_ALYMS, Use_in_Specific_Populations_AMIVA, Use_in_Specific_Populations_ATEZO, Use_in_Specific_Populations_AVAST, Use_in_Specific_Populations_BRIGA, Use_in_Specific_Populations_CAPMA, Use_in_Specific_Populations_CEMIP, Use_in_Specific_Populations_CYRAM, Use_in_Specific_Populations_DOXOR, Use_in_Specific_Populations_DURVA, Use_in_Specific_Populations_ENHER, Use_in_Specific_Populations_ENTRE, Use_in_Specific_Populations_ERLOT, Use_in_Specific_Populations_ETOP, Use_in_Specific_Populations_ETOPO, Use_in_Specific_Populations_EXKIV, Use_in_Specific_Populations_GAVRE, Use_in_Specific_Populations_GEFIT, Use_in_Specific_Populations_GEMZA, Use_in_Specific_Populations_GILOT, Use_in_Specific_Populations_HYCAM, Use_in_Specific_Populations_IMFIN, Use_in_Specific_Populations_IMJUD, Use_in_Specific_Populations_INFUG, Use_in_Specific_Populations_IRESS, Use_in_Specific_Populations_KEYTR, Use_in_Specific_Populations_KRAZA, Use_in_Specific_Populations_LIBTA, Use_in_Specific_Populations_LORBR, Use_in_Specific_Populations_LUMAK, Use_in_Specific_Populations_LURB, Use_in_Specific_Populations_MEKIN, Use_in_Specific_Populations_METH, Use_in_Specific_Populations_MVASI, Use_in_Specific_Populations_OPDIV, Use_in_Specific_Populations_PORTR, Use_in_Specific_Populations_RAMUC, Use_in_Specific_Populations_RETEV, Use_in_Specific_Populations_ROZLY, Use_in_Specific_Populations_RYBRE, Use_in_Specific_Populations_SELPE, Use_in_Specific_Populations_SOTOR, Use_in_Specific_Populations_TABRE, Use_in_Specific_Populations_TAFIN, Use_in_Specific_Populations_TAGRIS, Use_in_Specific_Populations_TAXOT, Use_in_Specific_Populations_TECEN, Use_in_Specific_Populations_TEPME, Use_in_Specific_Populations_TOPO, Use_in_Specific_Populations_TRAME, Use_in_Specific_Populations_TREME, Use_in_Specific_Populations_TREXA, Use_in_Specific_Populations_VINOR, Use_in_Specific_Populations_VIZIM, Use_in_Specific_Populations_XALKO, Use_in_Specific_Populations_YERVO, Use_in_Specific_Populations_ZIRAB, Use_in_Specific_Populations_ZYKAD, Vinorelbine_Tartrate_, Warnings_and_Precautions_ABRAX, Warnings_and_Precautions_ADAGR, Warnings_and_Precautions_AFATI, Warnings_and_Precautions_AFINI, Warnings_and_Precautions_AFINIT, Warnings_and_Precautions_ALECE, Warnings_and_Precautions_ALIMT, Warnings_and_Precautions_ALUNB, Warnings_and_Precautions_ALYMS, Warnings_and_Precautions_AMIVA, Warnings_and_Precautions_ATEZO, Warnings_and_Precautions_AVAST, Warnings_and_Precautions_BRIGA, Warnings_and_Precautions_CAPMA, Warnings_and_Precautions_CEMIP, Warnings_and_Precautions_CYRAM, Warnings_and_Precautions_DOXOR, Warnings_and_Precautions_DURVA, Warnings_and_Precautions_ENHER, Warnings_and_Precautions_ENTRE, Warnings_and_Precautions_ERLOT, Warnings_and_Precautions_ETOP, Warnings_and_Precautions_ETOPO, Warnings_and_Precautions_EXKIV, Warnings_and_Precautions_GAVRE, Warnings_and_Precautions_GEFIT, Warnings_and_Precautions_GEMZA, Warnings_and_Precautions_GILOT, Warnings_and_Precautions_HYCAM, Warnings_and_Precautions_IMFIN, Warnings_and_Precautions_IMJUD, Warnings_and_Precautions_INFUG, Warnings_and_Precautions_IRESS, Warnings_and_Precautions_KEYTR, Warnings_and_Precautions_KRAZA, Warnings_and_Precautions_LIBTA, Warnings_and_Precautions_LORBR, Warnings_and_Precautions_LUMAK, Warnings_and_Precautions_LURB, Warnings_and_Precautions_MEKIN, Warnings_and_Precautions_METH, Warnings_and_Precautions_MVASI, Warnings_and_Precautions_OPDIV, Warnings_and_Precautions_PORTR, Warnings_and_Precautions_RAMUC, Warnings_and_Precautions_RETEV, Warnings_and_Precautions_ROZLY, Warnings_and_Precautions_RYBRE, Warnings_and_Precautions_SELPE, Warnings_and_Precautions_SOTOR, Warnings_and_Precautions_TABRE, Warnings_and_Precautions_TAFIN, Warnings_and_Precautions_TAGRIS, Warnings_and_Precautions_TAXOT, Warnings_and_Precautions_TECEN, Warnings_and_Precautions_TEPME, Warnings_and_Precautions_TOPO, Warnings_and_Precautions_TRAME, Warnings_and_Precautions_TREME, Warnings_and_Precautions_TREXA, Warnings_and_Precautions_VINOR, Warnings_and_Precautions_VIZIM, Warnings_and_Precautions_XALKO, Warnings_and_Precautions_YERVO, Warnings_and_Precautions_ZIRAB, Warnings_and_Precautions_ZYKAD