



# DESERT BREEZE

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## Emerging Cancer Treatment Technologies

Last quarter we talked about “Carcinogenic Emissions and How They Are Being Reduced.” A health risk probability number can be misleading. Meaning what may not affect the average person, can affect someone else. To demonstrate, the probability of being struck by lightning is 1 in 1,107,143 (approximately 1 in a million). However, someone is struck by lightning every year. The same can happen with cancer. Someone may contract cancer even with technologies and equipment used to minimize carcinogenic emissions and risk.

However, contracting cancer is not the automatic death sentence it was 50-years ago. There have been many strides made with chemotherapy and radiation therapy developed years ago. Networks of doctors have used information gathered through the years to develop targeted treatments that are more effective than before.

### Diagnosis

One key to successful cancer treatment is early diagnosis. Fluid biopsy is a new emerging technology which extracts cancer cells from a simple blood sample. Illumina DNA sequencing is utilized to determine the cancer’s DNA. The procedure is less invasive than current biopsy techniques of cancer cells directly from the patient.

Another diagnosis technology is the intelligent surgical knife (the iKnife) that was developed by Zoltan Takats of Imperial College London. The iKnife works by using an old technology where an electrical current heats tissue to make incisions with minimal blood loss, but with iKnife the vaporized smoke is analyzed by a mass spectrometer to detect the chemicals in the biological sample. This allows real-time identification of malignant tissue. Surgeons will love this surgical Jedi knife which can significantly reduce the length of operations in oncology.

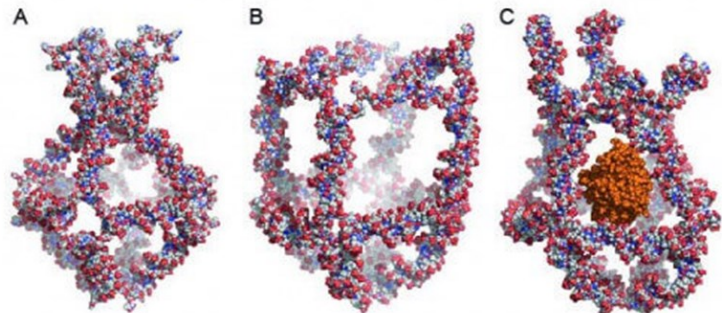
### Treatment

New cancer treatments are also emerging. Next-generation targeted therapies are being developed. New approaches in the field of systems biology use computer models to predict therapy effects are promising to cut through the complexity of possible cancer therapies, and deliver effective combinational therapies in the coming years. Additionally, new approaches like immunotherapies put emphasis on making the patient’s immune system sensitive to cancer cells again, this way letting the immune system fight back.

Molecular cancer diagnostics is a promising technology. Companies like Foundation Medicine are creating customized treatment plans based on the genetic makeup of the patient’s tumor. They sequence DNA from the patient’s tumor, subsequently try to match the key mutations to drugs on the market or clinical trials already on the way. Over time, this will become the standard for assigning cancer treatment regimes.

Multi-functional radiology is a field of interdisciplinary innovations. Neurosurgeons at the University of California, San Diego School of Medicine and UC San Diego Moores Cancer Center used magnetic resonance imaging (MRI) guidance for delivering gene therapy as a potential treatment for brain tumors. Similar innovations in treatment delivery would decrease side effects significantly while boosting treatment effectiveness.

Most cancer treatments today destroy not only cancerous cells, but also healthy ones. The ultimate goal is delivering drugs only to cells that need to be treated. Using DNA cages holding a payload of drugs might be the answer. This method could be used in clinical trials soon. Cancer cells can trigger the DNA cage to open and thus the drug could only make an impact on those cells, but not the healthy ones.



I have just touched on a few emerging technologies. New technologies are being used to improve air quality and lengthen life.

*By: Glen Stephens*

## Pollutant of the quarter : Lead

**Lead (Pb) Air Pollution** - Lead is a heavy metal with the chemical element symbol Pb. It is denser than most common materials, soft and malleable, and has a relatively low melting point. Due to its corrosion-resistant properties and easy workability, lead has been used in many applications such as pewter, paint, pottery glazes, and pipes since the Roman era; and most recently used in insecticides, hair dyes, and as an anti-knocking additive in gasoline. In the late 19<sup>th</sup> century, lead's toxicity was recognized and most uses have been replaced, discouraged, or banned.

**Health Effects** - Lead is a neurotoxin that distributes throughout the body and accumulates in soft tissues and bones. While the suggested threshold is no more than 0.4 parts-per-million (ppm) for adults and 0.3 ppm for children, people can exhibit lead poisoning symptoms at 0.2 ppm. Depending on the level of exposure, lead can adversely affect the nervous system, cause blood disorders, and increase the rate of infections and cancer. It is particularly problematic in children, in that permanent brain damage may result, even if blood levels are promptly normalized with treatment. Elevated lead in the environment can decrease reproductive and growth rates of plants and animals, and cause neurological effects in vertebrates.

**How Lead Becomes Airborne** - Lead is persistent in the environment and can accumulate in soils and sediments through deposition from varying sources of lead emissions. In the past, automobiles were the main source of atmospheric lead. However, due to the EPA's regulatory measures to remove lead from gasoline, levels of atmospheric lead have decreased by 98 percent since 1980.



**How to Reduce Lead Exposure** - You can reduce your family's chance of lead exposure by taking the following steps:

- Inspect and maintain all painted surfaces to prevent paint deterioration.
- Address water damage quickly and completely.
- Keep your home clean and dust-free.
- Clean around painted areas where friction can generate dust, such as doors, windows, and drawers; wipe these areas with a wet sponge or rag to remove paint chips or dust.
- Use only cold water to prepare food and drinks.
- Flush water outlets used for drinking or food preparation.
- Clean debris out of outlet screens or faucet aerators on a regular basis.
- Wash children's hands, bottles, pacifiers and toys often.
- Teach children to wipe and remove their shoes and wash hands after playing outdoors.
- Ensure that your family members eat well-balanced meals. Children with healthy diets absorb less lead.
- If you are having home renovation, repairs, or painting done, make sure your contractor is Lead-Safe Certified, and make sure they follow lead safe work practices.

Although lead has been banned from gasoline, it is still widely used by the automotive industry. More than half of the lead produced in the US each year is used for the production of car batteries. Ore and metal processing is the biggest source of atmospheric lead with the highest air concentrations found near ferrous and nonferrous smelters and battery manufacturers. Use the procedures to reduce your lead exposure, and health effects from lead exposure will not be a part of your worries.

*By: Jeremiah Cravens*

## DMV Grant Program

**DMV Voucher Program** - Beginning October 1, 2018, financial incentives will be available to Eastern Kern County residents for the purchase of new lower emission vehicles. Eligible applicants can receive a District DMV Voucher Program voucher, for the purchase of the following new lower-emission vehicles:

\$2,000 for purchase of a Partial Zero Emission Vehicle (PZEV).

\$3,000 for purchase of a Zero Emission Vehicle (ZEV).

The District's DMV Voucher Program is ongoing with no deadline to apply. Applications are processed first-come first-served and vouchers are issued accordingly until all funds are exhausted.

**DMV Grant Program** - Additional Grants available. The District's 2019 DMV Grant Program will begin accepting applications for Tier I and Tier II projects October 1, 2018. Grantees can receive up to \$50,000 for an eligible project that reduces oxides of nitrogen (NOx), reactive organic gas (ROG), or particulate matter (PM10) emissions from on-road motor vehicle related activities.

Guidelines and applications for both grant programs are available on the District's website: [www.kernair.org](http://www.kernair.org). Please contact the District at: (661) 862-5250 or [ekapcd@kerncounty.com](mailto:ekapcd@kerncounty.com) with any questions or comments.

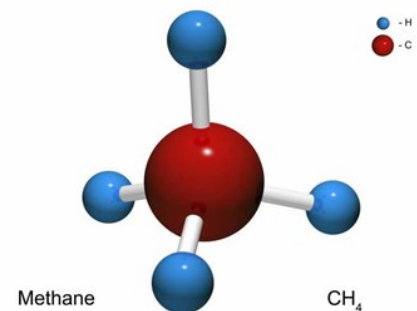
## Natural Gas as an Alternative Fuel

As technology progresses, in the vehicle realm, more sources of fuel are being tested and becoming available for common consumption. One of those fuels is natural gas. Natural gas, in reality, is methane (CH<sub>4</sub>). Natural gas has to be processed before it is sent to the proper dispensing/storage tanks. Certain contaminants have to be filtered out like water and hydrogen sulfide. Natural gas comes in two phases for vehicle use: Compressed Natural Gas (CNG) or Liquefied Natural Gas (LNG). Most vehicles use CNG because CNG can be stored at ambient temperature under high pressures (3,000 to 3,600 psi), in a storage tank. On the other hand, LNG is stored at nearly ambient pressure but has to be placed under low temperatures (-184 and -274°F) in a storage tank which requires special cooling systems.

What are the pros to using natural gas as a vehicle fuel source? It burns cleaner, meaning it does not typically release many pollutants (especially toxic) when combusting. Natural gas is composed of typically 70-98% methane with 2-30% being made up of hydrocarbons such as Ethane, Propane and other gases like Nitrogen. It is odorized with mercaptans to identify leaks. Due to the molecular structure of methane (CH<sub>4</sub>), in the presence of oxygen and activation energy in the form of a spark, methane breaks down pretty simply to Carbon Dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O). While all hydrocarbons in a perfect combustion cycle are supposed to break down to CO<sub>2</sub> and H<sub>2</sub>O, methane requires a lower activation energy due to not having to break as many molecular bonds in its structure. It is also a less expensive fuel than gasoline and at least 96% of the United States' natural gas supply is produced domestically which is a positive for our economy.

Along with the positives, comes a few negatives. Natural gas fuel and natural gas vehicles are not readily available on the market in the US. There are a handful of car makers who make light duty passenger Natural Gas Vehicles (NGVs) in the US and they include Honda, Ford, Fiat Chrysler and General Motors. Some of the same car makers manufacture trucks and heavy-duty vehicles for fleet usage and buses for public transportation. However, while there are places that dispense CNG, there are not many. This is why they have made some vehicles that can use natural gas and another fuel, just in case there is no natural gas supply around. Vehicles that can use either natural gas or gasoline are called bi-fuel vehicles. Vehicles that can use natural gas but use diesel fuel combustion to ignite the natural gas are called dual-fuel vehicles. Lastly, gas mileage from natural gas is not as desirable as it is with gasoline and diesel vehicles. The fuel tanks on NGVs have to be larger to hold enough NGV to be viable in today's market.

Natural gas vehicles are a step toward our future goals of cleaner air, but making these vehicles more efficient will make them more appealing to the consumer and that is when we will start seeing them on our roadways.



*By: Nicole Dickerson*

**Board of Directors**

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Board of Directors usually meet once every two months starting in January at the Tehachapi Police Department Community Room.

**Air Pollution Control Officer**

Glen E. Stephens, P.E.

**Hearing Board Members**

William Deaver  
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For news updates and other information, please visit the Eastern Kern APCD website at [www.kernair.org](http://www.kernair.org)

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