Let's Cure Cancer!

Let's Cure Cancer!

PURDUE
UNIVERSITY

"Let's Cure Cancer!"

Written by:
Wallace Morrison, DVM, MS, DACVIM
Sandy Amass, DVM, PhD, DABVP
Jessica Schneider, BS, RVT
of the Purdue University College of Veterinary Medicine

Illustrated by:
Carol Bain, DVM

Designed by:
Thad Blossom, BS

This book is based on the manuscript:
Morrison, W.B. Cancer Chemotherapy: An Annotated History.
J Vet Intern Med 2010 (24):1249-1262.

Summary:
This book describes advances in cancer treatment from ancient Egypt to modern times and select scientists who have furthered our knowledge towards finding a cure for cancer.

Special thanks to our Purdue Veterinary Medicine scientists:
Patty Bonney, BS, RVT
Michael Childress, DVM, MS, DACVIM (Oncology)
Amalia de Gortari, MVZ
Yava Jones, DVM, PhD, DACVP
Debbie Knapp, DVM, MS, DACVIM (Oncology)
Sophie A. Lelièvre, DVM, PhD, LLM Public Health
Wallace Morrison, DVM, MS, DACVIM (Small Animal Internal Medicine)
Rebecca Packer, DVM, PhD, DACVIM (Neurology)
Tim Ratliff, PhD
Cleveland Shields, PhD

This book is part of the "Fat Dogs and Coughing Horses: Animal Contributions towards a Healthier Citizenry" program at Purdue University. Fat Dogs and Coughing Horses is made possible by Science Education Partnership Award (SEPA) funding from the National Institutes of Health (NIH).

Table of Contents

Have you ever dreamed of being the scientist who cures cancer? The earliest recorded mention of cancer and treatment were found in two ancient documents written by Egyptian physicians in 3000-1600 BC. Physicians and veterinarians today are still studying ways to help people and pets with cancer. Doctors who specialize in cancer medicine are called "oncologists". "Onco" is derived from the Greek word for swelling or tumor and "ology" means "study of." Another word for a tumor that behaves in an aggressive manner is called cancer. Oncology is the study of cancer medicine. In 2011, the National Cancer Institute estimated that the number of new human cancer cases in the United States was at least 1,596,670 and the number of human deaths due to cancer was 571,950. Cancer is also a leading cause of death in older dogs and cats.

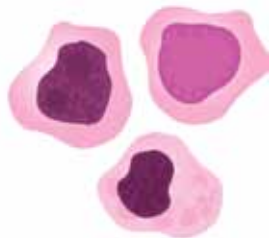
This book highlights innovations in cancer treatment and prevention and provides information about what Purdue University scientists are doing to advance cancer research. How will you contribute to the fight against cancer?

What is cancer?

The word "cancer" is used to describe a wide variety of diseases that result from abnormal cells dividing and invading other parts of the body. Normal cells grow and divide using a very controlled system. The body is kept healthy because old or damaged cells are replaced by new cells. Sometimes the system has problems. When this happens, abnormal cells can divide without the normal control mechanisms and form tumors.

Not all tumors are considered to be cancer. Tumors where the abnormal cells divide but stay in the same location in the body are called benign. Benign tumors can often be surgically removed and do not recur. However, if the abnormal cells invade nearby tissues and travel to other parts of the body, we call them "malignant" cells. Malignant tumors are cancerous. The spread of malignant cells to other parts of the body is called "metastasis."

Normal Cell



Cancer Cell

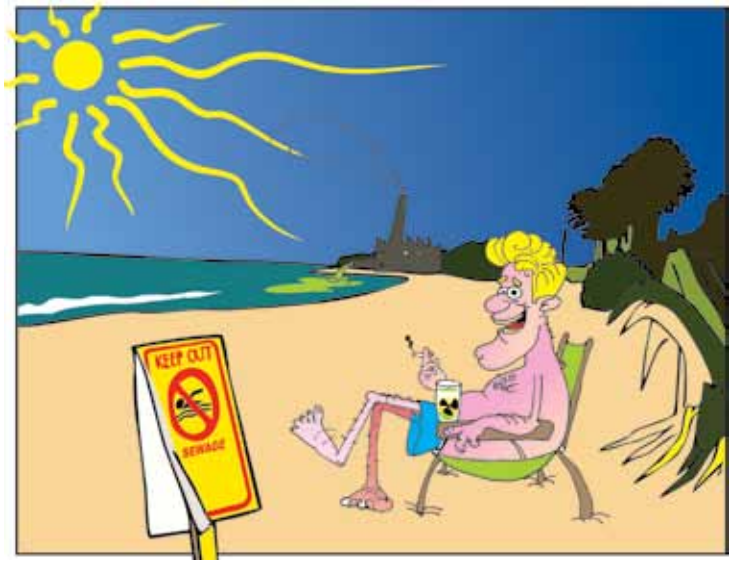
What causes cancer?

Before Hippocrates (ca 460-370 BC), cancer was believed to be caused by vengeance of the gods on people who had sinned. Hippocrates, known as the "Father of Medicine," established the alternative belief that excess black bile caused cancer.

Today, scientists have identified many factors that can increase the risk of cancer:

- genetics
- radiation exposure
- tobacco use
- sunlight exposure
- infectious agents
- chronic (long term) inflammation
- environmental exposure to chemicals

Often multiple factors act together to change a cell from normal to malignant.



Identify potential risk factors for cancer in the picture.

How do cancers form?

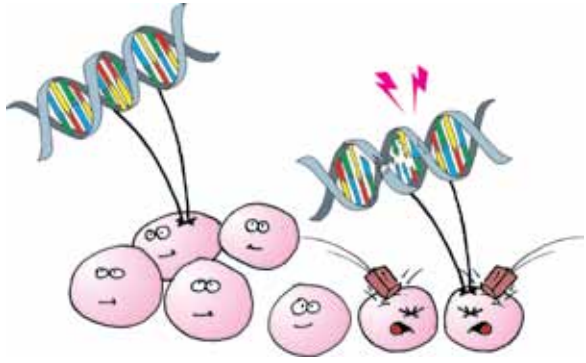
The process of cancer development is called carcinogenesis. "Carcin" means "cancer" and "gen" means "producing". Carcinogenesis literally means "producing cancer."

The process of carcinogenesis is the same in dogs as it is in people.

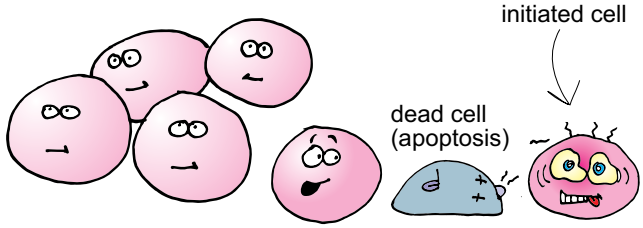
Scientists have identified three stages in cancer formation:

Stage I: Initiation

Initiation happens when a cell's genetic material or DNA is damaged. DNA can be damaged in many ways. Mutations can occur at a single point in a gene, parts of a gene can be removed, or genetic material can be rearranged. Other types of genetic damage may also occur.

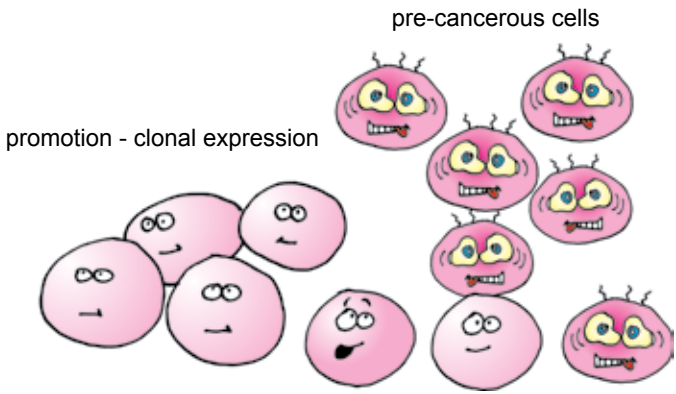


Usually the body repairs minor damage to the gene, or the cells dies and is replaced by a new, normal cell. Cancer develops when the genes aren't repaired by normal processes or the damaged cell refuses to die resulting in permanent genetic changes to the cell.



Stage II: Promotion

Promotion happens when initiated cells in Stage I are stimulated to change into cancer cells and divide. There are many factors that can promote the survival and multiplication of cancer cells. One example is the oncogene. Oncogenes normally direct cellular growth. Under certain conditions, oncogenes promote uncontrolled growth of cancer cells. Another example is the tumor suppressor gene. Tumor suppressor genes produce proteins that keep cell division in check. If damaged or mutated, the tumor suppressor genes cannot regulate cell division and uncontrolled cell growth occurs.

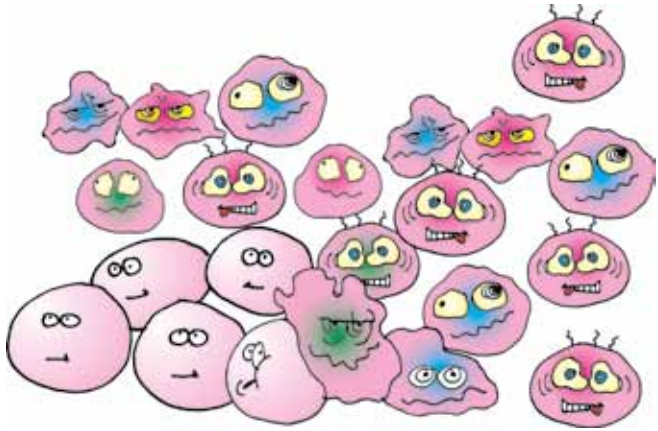


Did you know?

In 1740, the first hospital dedicated to caring for cancer patients was established in Rheims, France. However, at that time, cancer was believed to be contagious. By 1779, residents of Rheims were so fearful of infection that they had the cancer patients moved to a new hospital outside of the city lines.

Stage III: Progression

Progression of cancer involves substantial growth or spread (metastasis) of the cancer. It is the progression of a cancer that usually leads to its detection, diagnosis, and treatment.



Did you know?

In 1798, John Adams, the second president of the United States of America, established The Marine Hospital Service which later became the National Institutes of Health (NIH), the United States' agency for medical research, consisting of 27 institutes and centers.

Dr. Cleveland Shields

Dr. Cleveland Shields studies how doctors talk to patients who have cancer. He tries to figure out how doctors can let patients know that they care about them. He is also trying to figure out the best ways for doctors to help patients make good decisions about their treatment.

Hometown:
Elred, Pennsylvania

Favorite subjects in school:
Chemistry, Science, Physics and Math

Goals for the future: "I enjoy working with people and like to think about human problems from a scientific perspective. I like to test methods/interventions that will improve families and couple relationships- I want to make my field more scientific."

Did you know?

Paul Ehrlich (1854-1915), a physician, coined the term "chemotherapy." Ehrlich encouraged scientists to search for "magic bullets," drugs that would attack only intended targets. He is known as the "Father of Chemotherapy."

Dr. Tim Ratliff

Dr. Tim Ratliff works in the area of immunotherapy of cancer. The immune response kills viruses and bacteria when they infect our bodies because these invaders are recognized as being foreign to the body. There is a continuous surveillance process where the body's immune system looks for the presence of foreign invaders and then attacks. Following such attacks, the body has very powerful control mechanisms that calm the immune system.

Hometown:
Columbus, Georgia

Favorite subjects in school:
Biology, Chemistry and Physics

Favorite animal:
Bald Eagle

Goals for the future: "Simply stated; To find a cure."

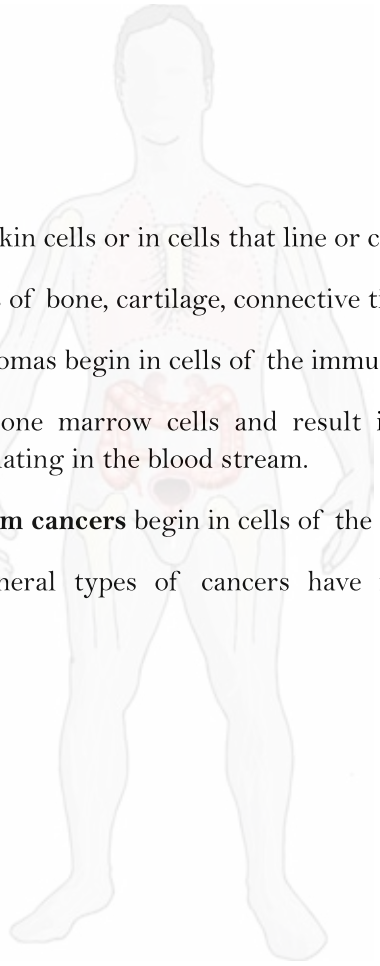
Even though the mutated genes in cancer cells produce proteins which are foreign to the body, the immune system recognizes a cancer cell as a normal cell of the body. Unfortunately, the same control mechanisms that calm the immune system after it attacks viruses and bacteria, stop the immune response to mutated cancer proteins.

Dr. Ratliff's research investigates ways to activate the body's immune system to mutated cancer proteins and to understand the control processes that inhibit activated cells from attacking the cancer cells. He wants to train the body to attack cancer cells just like it attacks viruses and bacteria. He wants to be sure the body's response is strong enough to kill all the cancer cells. He is working to stop the body's immune control mechanisms to cancer cells. By blocking the control mechanisms, the body's immune cells can continue to attack the cancer and eliminate it just like viruses and bacteria. There are FDA approved immunotherapy treatments for prostate cancer and melanoma. These treatments increase survival by a mean of about 4-6 months. By blocking control mechanisms, Dr. Ratliff thinks that we can cure some cancers.

What are the different types of cancers?

In people, there are at least 100 different kinds of cancers. Domestic animals are affected by most of the cancer types that occur in people. Many cancers that occur in animals also behave like cancers in people.

Cancers are grouped according the tissue of the body where they originate.



Carcinomas begin in skin cells or in cells that line or cover internal organs.

Sarcomas start in cells of bone, cartilage, connective tissues, fat, or muscle.

Lymphomas and myelomas begin in cells of the immune system.

Leukemias start in bone marrow cells and result in large numbers of cancerous blood cells circulating in the blood stream.

Central nervous system cancers begin in cells of the brain and spinal cord.

All of the above general types of cancers have many sub-types and classifications.

The Renaissance - The Start of Modern Medicine

The Renaissance Era is famous for legendary art and literature. However, one of the most important achievements of all during the Renaissance was the establishment of the scientific method. Hypothesis-driven research changed the way that scientists approached problem-solving.

Dr. Morrison is a veterinary oncologist who works with pets who have cancer. He has documented advances in cancer medicine. Follow Dr. Morrison as he meets with influential people from the Renaissance, when the foundation for modern medicine was formed. You'll learn more about Dr. Morrison later in this book.

Leonardo da Vinci (1452-1519) is famous for painting the "Mona Lisa" among other great works of art. Did you know that he also made over 700 detailed sketches based on the dissection of human bodies? His work greatly increased our understanding of human anatomy.

Dr. Morrison as da Vinci

Gaspar Aselli (1581-1626), a surgeon and professor, discovered the lymphatic system by examining a dog. Later, we learned that the lymphatic system plays a role in the spread of cancer.

William Harvey (1578-1657), a physician, was captivated by how blood is pumped through the body by the heart. He described this process in detail, providing us the fundamentals of the circulatory system in people and other animals.

Dr. Morrison and William Harvey

Anton Van Leeuwenhoek (1632-1723) was a shopkeeper who liked to build lenses and explore the world around him. He built a light microscope and was the first person to view bacteria, blood, and other living cells invisible to the unaided human eye.

Anton Van Leeuwenhoek and Dr. Morrison

Can cancer be prevented?

Many scientists are investigating ways to prevent or reduce the risk of cancer. Most prevention strategies involve lifestyle changes that avoid the risk factors already mentioned. For example, avoiding or quitting smoking, or using sun block to reduce the chance of sunburn, may reduce the risk of getting certain cancers. Results of studies investigating the impact of diet on the risk of cancer are not as straight forward. In some studies, fruits and nonstarchy vegetables appeared to reduce risk of certain cancer types, but in other studies, no reduction in risk could be found. However, alcohol consumption was linked to an increased risk of certain cancers. Obesity has also been recognized as a risk factor for some cancers. Evidence shows that increasing physical activity and reducing or avoiding alcohol consumption could reduce the risk of certain cancers. Finally, detecting precancerous conditions or early detection of cancer itself through regular visits to your doctor, can offer the best chance of survival should you find yourself at risk.

Dr. Yava Jones

Dr. Yava Jones studies inflammatory bowel disease and colon cancer. Inflammatory bowel disease (IBD) causes lifelong intermittent bouts of severe inflammation in the intestines, mainly the colon. These repeated episodes of inflammation and healing greatly increase the risk of developing colon cancer. The cause of IBD is not completely understood. Some identified risk factors are the environment (diet, weight, smoking, pollution, etc.), genetics, and the make-up of a person's bacterial population in their gastrointestinal tract. Dr. Jones uses mice to study IBD. She looks at how the bacterial population in healthy mice changes as they go from having sudden inflammation, to long-term inflammation, to colon cancer. She uses mice because she can control their genetics (they are genetically identical) and their environment (they are all housed the same and fed the same food). She can also control when they develop inflammation and cancer which allows her to sample their colon bacteria at specific times and see if there are changes. Dr. Jones has found that some changes in their bacteria are associated with more inflammation and cancer and some are associated with less inflammation and cancer. The end goal is to hopefully find bacterial changes in her mice that also change in people. This finding could lead to new ways to treat people that will decrease the severity of their disease and ultimately cure their disease.

Hometown:
Childersburg, Alabama

Favorite animal:
Cats

Favorite subjects in school:
Math and Science

Goals for the future:
"I plan to continue to teach pathology to veterinary students and continue to do research that will hopefully find cures or better treatments for IBD as well as others that affect people."

How do we treat cancer?

Cancer treatment from 3000-1600 BC involved surgery and cautery (burning the affected tissue). For the next 2000 years, cancer treatment consisted of surgery, cautery, use of caustic pastes, blood-letting, and medicines derived from plants and minerals. Today, the main types of cancer treatments include chemotherapy, surgery, radiation therapy, immunotherapy, and modern targeted therapies. Often treatments are combined to optimize success. How did we get to where we are today?

Surgery

Surgery as a treatment for cancer can be traced back to ancient Egyptian times. In the millennia since the writing of the Ebers and Edwin Smith papyri, advances in surgery and medical care in general have occurred that would astonish the ancients.

Medical advances, such as the development of anesthesia and discovery of antibiotics, improved the survival of surgical patients. Today, imaging technologies that allow us to visualize the location of the tumor prior to surgery, coupled with surgical advances such as endoscopy and laparoscopy, allow surgeons to remove tumors while preserving unaffected tissue and minimizing scarring.

Cryptogram

A cryptogram is a puzzle with a quote or phrase that has been encrypted. Your job is to decrypt the the puzzle by substituting letters throughout the cryptogram. The clue below says that the letter "O" should be replaced with the letter "I" in the puzzle. Single letter words are usually "A" or "I". Use trial and error to figure out the remaining letters.

" TKHOIS RVK KV AS J TPDDSTT, APK HJKUSH KV AS VM IJYPS."

~ JYASHK SORTKSOR

Clue: O=I

Answer is on page 32

Dr. Rebecca Packer

Dr. Rebecca Packer, a veterinary neurologist and neurosurgeon, studies brain tumors in dogs. Brain tumors in dogs and people are very similar, and understanding how to treat dogs with these diseases may someday help human patients too. Originally, surgery to remove brain tumors required that a large window be made in the skull. Dr. Packer and her collaborators have developed a technique for performing brain tumor surgery through a small 5 mm hole instead! They are also developing nanoparticles that deliver cancer treatments deep inside the brain. These nanoparticles are so tiny that it would take approximately 10,000 of them lined up end to end to match the diameter of a speck of dust. These tiny nanoparticles can diffuse through brain tissue to deliver chemotherapy deep to tumor tissues.

Hometown:
Canton, Ohio

Favorite animal:
My favorite animals to treat in veterinary medicine are dogs. The most unusual animals I have treated were a pair of reindeer. The animals I appreciate the most are exotic wildlife, such as in the animal conservation parks in Africa. They are just amazing to watch.

Favorite subjects in school:
Math and Science

Goals for the future: "My goal is to continue to help patients with neurological diseases, and work toward improving medical and surgical treatments for brain tumors."

Chemotherapy

Chemotherapy comes from the words "chemo" meaning "chemical" and "therapy" meaning "healing." Chemotherapy is the use of "healing chemicals" or drugs to combat cancer. In ancient times, drugs were made from minerals, animals, or plants. Some drugs used by ancient physicians came from the same materials that we use to develop modern drugs.

Crocus plant

For example, in the 1st century AD, a Greek physician named Dioscorides used the autumn crocus plant soaked in wine to treat cancer. In 1938, Albert Pierre Dustin, a Belgian physician, investigated the same plant as a cancer treatment. Later it was discovered that the drugs derived from this plant inhibit cell division.

Dioscorides also thought that plants from the genus Vinca (now Catharanthus) would have antitumor activity. He was correct. The modern anti-cancer drugs, vincristine and vinblastine, are derived from this genus of plant.

Another example of ancient chemotherapy finding a modern acceptance is the use of arsenic. Arsenic has been used to treat cancer for thousands of years. An English physician named Thomas Fowler began to use a mixture of arsenic trioxide and potassium bicarbonate to treat his patients. This solution, named "Fowlers Solution," was later used by a German neurologist named Heinrich Lissauer to treat human leukemia and human lymphoma. Fowler's Solution remained the standard treatment for human leukemias until the 1930s when it fell out of favor. Today, a drug containing arsenic trioxide is considered one of the best drugs for people who have a type of cancer called promyelocytic leukemia that has not responded to other treatments, or has recurred after trying another treatment.

Vinca plant

Towards the end of the 1960s, combination chemotherapy began where multiple drugs were used together in a treatment protocol. Combination chemotherapy along with supportive medical care increased remission and survival for many human and veterinary patients. Chemotherapy began to be used routinely along with surgery and radiation therapy. Today, there are approximately 14 categories of cancer chemotherapy drugs in use and there are over 50 different agents that can be used to treat cancer.

Development and use of animal models in cancer research began in the 20th century. This was important because it made it possible to test new therapies in a standardized manner. In the early 1940s, Drs. Alfred Gilman and Louis Goodman reported that nitrogen mustard was effective in treating lymphoma in mice. In 1943, the first treatment of human cancer with nitrogen mustard was recorded in a person with non-Hodgkin's lymphoma and severe airway obstruction. The cancer regressed temporarily. By 1946, nitrogen mustard was considered to be the first modern chemotherapy agent. This translation of animal research to benefit human health remains an important means of advancing human medicine.

Did you know?

In 1937, the Office of Cancer Investigations of the United States Public Health Service combined with the NIH Laboratory of Pharmacology to become The National Cancer Institute.

Dr. Michael Childress

Dr. Michael Childress, a veterinarian, helps dogs with lymphoma. Lymphomas are among the most common cancers seen in dogs, and one of the most common cancers treated by veterinary medical oncologists like Dr. Childress. They can occur in any organ within the body, although they most commonly affect lymph nodes.

Most lymphomas in dogs are treated with chemotherapy, which can effectively put the cancer into remission. Unfortunately, most lymphomas in dogs relapse and when they return, they are increasingly resistant to chemotherapy. Most dogs with lymphoma die of their cancer because it eventually becomes resistant to all chemotherapies.

Dr. Childress' research team is exploring the development of drug resistance in canine lymphomas in hopes of someday preventing resistance to chemotherapy. Dr. Childress is also looking at factors that put dogs at risk for developing lymphomas. For example, certain dog breeds, such as Golden Retrievers and Boxers, have a high risk for developing lymphomas.

In people, a history of immune-mediated diseases (i.e. diseases in which the immune system goes haywire and starts attacking the body) is a risk factor for the development of lymphomas. Dr. Childress would like to explore whether there is a link between immune-mediated disease and lymphoma in dogs.

Hometown:
McLean, Virginia

Favorite animal:
Owls-they are so majestic and mysterious

Favorite subjects in school:
Everything but math!

Goals for the future:
"I really want to build and expand the Purdue Comparative Oncology Program. I want to make it a world-class clinical, educational, and research center for veterinary cancer. I also would like to inspire others to become veterinary oncologists."

Radiation Therapy

The element radium was discovered in 1898 by Marie and Pierre Curie and it was observed to cause skin irritation and hair loss if these tissues were exposed to it for long enough. Use of radiation to treat cancer began in the 19th century. Radiation therapy for cancer began with using radium filled tubes that were inserted directly into cancers or into body cavities that were affected by cancer. Later, special X-ray tubes were developed that emitted relatively high energy X-rays that were used to treat some solid tumors.

Radar research during the Second World War made possible the development of instruments called linear accelerators that produced X-rays of much higher energy. Use of linear accelerators put more cancers on the list of curable types. In the 1970s, computers were introduced into the radiation therapy treatment planning process. Today, the ability to deliver a precise dose of radiation to a precise volume of tissue is truly remarkable.

Radiation therapy can be delivered to cancer patients by using many different devices in many different ways. The most common types of radiation therapy used today are high energy X-rays derived from a linear accelerator or other X-ray producing machine, proton therapy, and brachytherapy (radioactive materials placed in or near the cancer). The choice of which type of radiation therapy is best depends on many factors such as the type of cancer involved, the size and location of the cancer, the general health of the patient, how close the cancer is to other normal tissues that are sensitive to radiation, and whether the patient will receive other types of cancer treatment.

Did you know?

The National Cancer Institute (NCI) is the institute within NIH that focuses on cancer research, spending approximately $4.9 billion each year to advance prevention, diagnosis, and treatment of cancer.

Dr. Wallace Morrison

Dr. Wallace Morrison is a veterinary oncologist who uses radiation therapy delivered by a linear accelerator to treat different kinds of cancers in dogs and cats. Before coming to see Dr. Morrison, many of his patients had tried other types of cancer treatment which failed. Dr. Morrison can provide these patients with another opportunity for treatment using radiation therapy. Other patients have tumors that are best treated with external beam radiation therapy. Unlike people treated with radiation therapy, dogs and cats require general anesthesia to be treated because they must be absolutely still during treatment to ensure that the correct dose of radiation is delivered precisely to the intended target. A state-of-the-art computerized planning system is used to prepare a treatment plan for each individual patient prior to starting treatment. Dogs and cats with cancer are given either definitive treatment or palliative treatment. Definitive treatment is treatment with the intent to cure or provide a very long remission. Palliative treatment is intended to provide relief of cancer-associated pain or to control clinical signs when cure is not possible. It is remarkable how effective external beam radiation therapy can be when used to treat dogs and cats with cancer.

Hometown:
Farmingdale, New York

Favorite animal:
Dog

Favorite subjects in school:
Biology and History

Goals for the future:
"To continue to meet new challenges as they come."

P I E K V K P B R B C P D K U X B R B W W J F S
D F B A L R C G V J I A E I M C F J R C N D H V
Y P J K J N S L A V F C B H S I V U K K F N U C
M U G B A F V J R Q Z P B C A U N T D X H J T E
I A J U I E T P V K C K N P L A N J L P O S H R
N Y R E T U A C Z R N N R O C O A O R H N K R Z
I C L I R S M H D E K E I S S K O B D A U E E I
O A L E E H R E T G V T T I S Y B S N O T Y E E
X K P L E J S M U E U C F T I B A O A B R A D T
Y O L T Y K D O N D N L H K R U T R G E I I C O
G E H H B H U T F C E I T N C C M O G V T N E I
E Y Q M A S I H A Z M N C R C P O R U E I B L L
N L U E U O V E O M C I C H A D U W P L O W L A
A O L R N I O R L E O C Y G J S N F C Y N I C Q
T G T N N C M A Q T Q A Q N V I O G K N A W U N
O C R C H E P P K P A L L O D S M U N Y B H L O
R N A S O I I Y Q F W T C I V Y N J N K I D T B
O I X H M R I B P I M R W T K U N E S D L N U Q
L T S H R D H U P R F I H A V P I E H T E G R L
O I E I A T R A V E Z A X I T A U L N A L E E H
I W A M U D O E T D M L I D S O X L P U P Q J O
B S D X U Y O G M R A N W A K V D A G O Z S Z Y
Y H O E Z L Q P K I R S I R D K L I C Y O Q W E
N I V U Q N U J D L T P M J N O I S C V S Y C L
A H O R E W H V O L Y G F U L D O G Z J U Z C I
N A N O T E C H N O L O G Y L R V F G T G C N F
U D E G H I Q H W U X O H S C I O B F X V D X L
R O A G A R S O L X Y F Z I P K V F N H U I S U
Y F Z D N P A C F Z L T M R Z W H F S N G A D X

firedrill	microscope	clinical trial	MRI
surgery	chemotherapy	nutrition	nanotechnology
cautery	ultrasound	prevention	mini oxygenator
vinca	radiation	CT scan	Three D cell culture

Other types of cancer treatment

There are many other approaches to cancer treatment. Some are still evolving and some are well accepted. In the 1990s, advances in genomics and molecular biology led to a better understanding of abnormalities in cancerous cells. This led to developments of treatments that targeted specific cell receptors. These treatment types include use of protein kinase inhibitors and monoclonal antibodies. Tyrosine kinase is a protein kinase and scientists have found that targeting tyrosine kinase with specific drugs can inhibit cancer cell growth and survival. Monoclonal antibodies are antibodies to a very specific site on a cells surface. Scientists can use monoclonal antibodies in combination with chemotherapy to attack specific cancer cell receptors. Other new drugs block the development of blood vessels that carry nourishment to cancer cells and thus deprive them of the ability to survive and spread.

Cryptogram

"BZARPBM PB ARPG EZDYJ HVB AVSU ARU IYVHU ZQ

IUDGPGAUBHU."

~HVYTPB HZZYPJMU

Clue: A = T

Answer is on page 32

Dr. Sophie Lelièvre

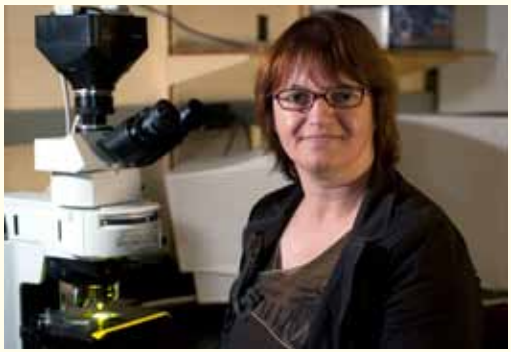
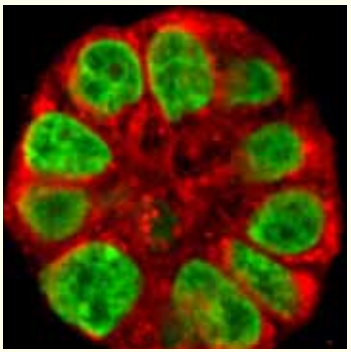


Photo: Mark Simons / Purdue News Service



3D Breast Cell Culture
Photo: Shuhua Yue / Ji-Xin Cheng Laboratory

Dr. Sophie Lelièvre is a veterinarian who researches how cancer cells become resistant to chemotherapeutic drugs. She discovered that the behavior of cancer cells cultured in the laboratory was closer to what is observed in the body if the cells were cultured in an environment that enticed them to grow in three-dimensions instead of flat on a plate. For this work Dr. Lelièvre was awarded the National Prize for Fundamental Cancer Research/young investigator from the French Society of Cancer and National Federation of Cancer Institutes and the National Alexandre Joel Prize for young investigator from the Association for Cancer Research.

Hometown:
Normandy, France

Favorite animal:
Cow

Favorite subjects in school:
Biology, History and Physics

Goals for the future:
"[To] work in uncharted territories of cancer research and make meaningful contributions to public health; motivate students so that they wish to thrive; work on projects that require international collaborations to solve a scientific/health issue."

Dr. Lelièvre's research program focuses on the role of the organization of the cell nucleus in the control of the expression of genes involved in tumor initiation in order to develop new treatments to prevent breast cancer. She has developed new three-dimensional culture systems that mimic the branched breast ducts and serve as models to design detection and treatment approaches with tiny little devices (nanoparticles) that, in the future, could be travelling inside the mammary ducts to detect and treat abnormal cells before a tumor can even be detected with usual methods like mammography.

How do advances in veterinary medicine help people and pets with cancer?

Many of the same types of cancers found in people are also found in our pets, particularly dogs. Dogs share the same environment, drink the same water, and in some cases eat the same food as their owners. This means that studying dogs with cancer can help us understand how to better treat people with cancer. Comparing cancers and other medical problems in people and their pets is often referred to as "One Medicine." Using information learned from our pets to help people is called "translational medicine."

The first reported use of chemotherapy in a dog was in 1946. The dog was treated for lymphoma and lymphocytic leukemia and survived 82 days after treatment began. In 1950, a veterinarian named Dr. John McCoy partnered with human cancer researchers to establish the Canine Cancer Clinic for Dogs at Rutgers University. This was the first clinic that exclusively treated dogs with cancer. Dr. McCoy and his associates began to study chemotherapy as a treatment for cancer in dogs to help people with cancer.

The most recent advance in the concept of One Medicine has been the establishment of the Comparative Oncology Clinical Trials Consortium which is a NIH/NCI managed program that investigates new therapies in client-owned pet animals with naturally occurring cancer. The program was conceived by Dr. Chand Khanna and involves partnerships with 19 veterinary cancer centers located at universities.

Dr. Debbie Knapp

Dr. Debbie Knapp, a veterinary oncologist, studies a kind of bladder cancer in dogs called transitional cell carcinoma. Transitional epithelial cells are a type of cell that lines the urinary bladder. Scottish Terriers have 18-20 times the risk of developing bladder cancer compared to other breeds of dogs. Dr. Knapp and her team at Purdue Veterinary Medicine discovered that a type of medicines, called Cox-inhibitors, can extend the life of dogs diagnosed with bladder cancer for an average of 6 months with some dogs living well beyond a year. Before this discovery, the prognosis was poor and most dogs with bladder cancer were euthanized. Dr. Knapp has also helped identify other new medicines for bladder cancer. Today, dogs with bladder cancer can live a good quality life for a year or more following their diagnosis of cancer. Cox-inhibitors are now being tested to see if they can help people with transitional cell carcinomas.

Hometown:
Wilmington, North Carolina

Favorite animal:
Dog

Favorite subject in school:
Science

Goals for the future:
"To work with a team to make a difference in the lives of pet animals and people with cancer. I also want to train the veterinary scientists who will lead the field, people who will take science further than I have, and people to replace people like me when we retire."

Patty Bonney and Amalia de Gortari are veterinary technicians. They are part of Dr. Knapp's team studying bladder cancer in dogs so people with bladder cancer can also be helped.

Amalia de Gortari, MVZ

Amalia enjoys her career choice and the relationship she has with clients and their pets. She enjoys talking with clients, helping them with their questions, and giving them the support they need. She loves her patients too! Amalia finds it very satisfying to work with dogs and cats that may not be feeling well and are in need of medical attention because she can help them feel better. Amalia also enjoys working with her team, "Dr. Knapp is the best boss, person, researcher, scientist I have ever known. It is a pleasure and an honor to work with her!"

Hometown:
Mexico City, Mexico

Favorite animal:
Dogs and Cats

Favorite subjects in school:
English and Biology

Goals for the future:
"To keep working for Dr. Knapp's research, which I believe will make a difference in the future."

Patty Bonney, BS, RVT

Patty finds that people who have pets with cancer are some of the most dedicated group of pet owners she has ever seen. One elderly gentleman slept on the kitchen floor so that he could let his dog outside throughout the night. His dog was on a cancer medicine that made her urinate frequently and he knew that she would be embarrassed if she had an accident in the house. The commitment that owners have for their pets with cancer is an inspiration for Patty. She truly enjoys her career because it balances love of people, love of pets, and love of research.

Hometown:
Dallas, Texas

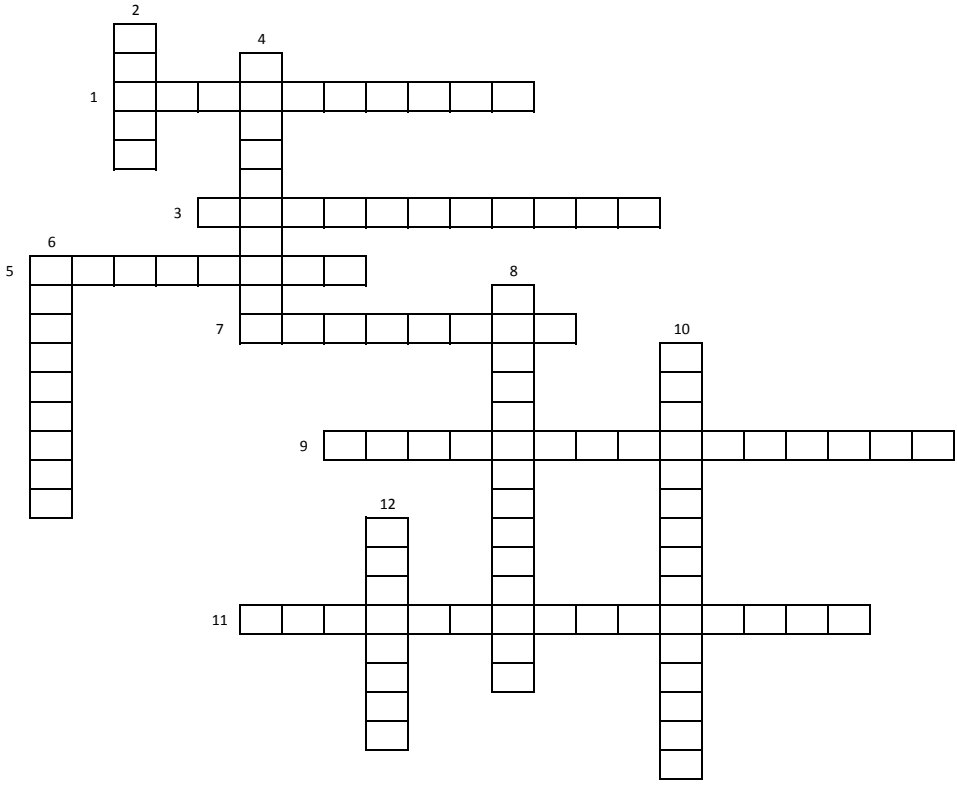
Favorite animal:
Dog

Favorite subjects in school:
English and Biology

Goals for the future:
"Contribute to the health care team by caring for pets with cancer."

Partnerships are important to advance cancer treatment in people and animals. Veterinarians, physicians, scientists, the pharmaceutical industry, biomedical engineers and others, all must work together with a common goal of curing cancer. What part will you play?

What have you learned?



Crossword Puzzle Hints

Across

1. The process of cancer spreading to distant sites in the body through blood or lymphatic vessels.

3. A term coined to compare medical problems in people and their pets.

5. Type of cancer that arises from cells normally found in bone marrow; characterized by the presence of large numbers of cancer cells circulating in the blood stream.

7. Cancers that arise from cells of bone, cartilage, connective tissues, fat or muscle.

9. Considered one of the first line treatments for promyelocytic leukemia.

11. Composed of arsenic trioxide & potassium bicarbonate; Used by a German neurologist named Heinrich Lissauer to treat human leukemia up until the 1930s.

Down

2. An abnormal growth or swelling.

4. Cancers that develop from skin cells or in cells that line or cover internal organs.

6. Cancers that arise from cells normally associated with the lymphatic system such as lymph nodes.

8. Classically divided into three stages known as initiation, promotion, and progression.

10. Considered to be the first modern chemotherapy agent.

12. One risk factor for skin cancer.

References

This book is based on the manuscript:

Morrison, W.B. Cancer Chemotherapy: An Annotated History. J Vet Intern Med 2010 (24):1249-1262.

Other References:

Gaspare Aselli (1581-1626) The Lacteals. JAMA. 1969;209(5):767-767.

Genetics Home Reference. http://ghr.nlm.nih.gov/ (accessed May 30, 2012).

Karwatka, D. (2002). Technology's PAST. Tech Directions, 62(5).

Knapp, D.W. Canine Bladder Cancer. http://www.vet.purdue.edu/pcop/CanineUrinaryBladderCancer.pdf (accessed May 30, 2012).

National Cancer Institute at the National Institutes of Health. Acute Lymphocytic Leukemia. http://www.nlm.nih.gov/medlineplus/acutelymphocyticleukemia.html (accessed May 30, 2012).

National Cancer Institute at the National Institutes of Health. Cancer Prevention Overview. http://www.cancer.gov/cancertopics/pdq/prevention/overview/HealthProfessional (accessed May 30, 2012).

National Cancer Institute at the National Institutes of Health. Lymph System. http://www.nlm.nih.gov/medlineplus/ency/article/002247.htm (accessed May 30, 2012).

National Cancer Institute at the National Institutes of Health. What is Cancer? http://www.cancer.gov/cancertopics/cancerlibrary/what-is-cancer (accessed May 30, 2012).

Answers to cryptograms:

"Strive not to be a success, but rather to be of value."
~ Albert Einstein

"Nothing in this world can take the place of persistance"
~ Calvin Coolidge (30th President of the United States of America)

Let's Cure Cancer!

From ancient Egypt to modern times, scientists have been learning new ways to prevent, diagnose, and treat cancer. In this book, you'll learn about cancer and how veterinarians, veterinary technicians, physicians, and other scientists are working together to find a cure for cancer in people and their pets.

9 781932 739244

PURDUE UNIVERSITY

SEPA SCIENCE EDUCATION PARTNERSHIP AWARD

Supported by the National Institutes of Health