Hyper-proliferative lesion - malignant

- Skin cancer
- Rough edge
- Random edge
- Malignant: have randomness in them

Causes of death – Canada (2011)

- Cancer accounts for nearly one-quarter of deaths in the United States, exceeded only by heart disease. In 2001, there were 553,768 cancer deaths in the US.
- They most common death in Canada: cancer
- Second most common: heart disease

Cancer is a disease of the Aged

- Cancers commonly happens after age of 55
- Cancer death rate is higher for men than women, difference in the behaviour between the 2 not biological

Cancer in children is extremely rare

- When cancer happens to children its rare, takes time from start to finish

Cancer treatments are unpleasant

- Ppl would die due to the treatment
- Side effect is death

Change in the US death rates* by cause, 1950 & 2001

- Compared to the rate in 1950, the cancer death rate was 0.2% higher in 2001, while rates for other major chronic diseases decreased during this period.
- Dramatic drop in the death rate
- Cancer rate is exactly the same
- Biggest reason is the behaviour (change in the behaviour): ex. Less ppl smoke nowadays

Cancer death rates*, US

- The age-adjusted death rate from all cancers combined stabilized from 1998 to 2000, after decreasing from 1990 to 1998. The stabilization of death rates, during the most recent time period may be due, in part, to changes in the classification and coding of causes of death.
- Compared to the rates in 1990, the cancer death rate in 2000 was 10.7% lower in men and 4.2% lower in women.
- Curve for women is relatively flat, gradual

- Death rate for women is above due to difference in behaviour between men and women

US Cancer death rates*, men

- Most of the increase in cancer death rates for men prior to 1990 was attributable to lung cancer. However, since 1990, the age-adjusted lung cancer death rate in men has been decreasing. Stomach cancer mortality has decreased considerably since 1930. Death rates from prostate and colorectal cancers have also been declining.
- Increase in lung cancer, used to be rare, due to rise in cigarette consumption

US Cancer death rates*, women

- Currently, the lung cancer death rate in women is about two-and-a-half times what it was 25 years ago, and lung cancer is the most common cause of cancer death. In comparison, breast cancer death rates were virtually unchanged between 1930 and 1990, and have since decreased. The death rates for stomach and uterine cancers have decreased steadily since 1930; colorectal cancer death rates have been decreasing for over 50 years.
- Women smoke less
- Decrease in stomach and uterus cancer

Normal cells become cancerous

- One of the cells in the body goes wrong

Cell division is closely regulated

- Normal cell growth is closely controlled
- Cells touch other cells in the body to stay alive, safety system

Cancer cell division is uncontrolled

- Cancer cells divide without any regulation, uncontrolled
- Cells will have infinite life spam, divides and divides

Many cancer cells are immortal

- Hela cells, they're used in the lab, specialized form of cancer cells, immortality property

HeLa cells from Henrietta Lacks 1951

- She had cervical cancer, these cells were hers from her cancer

Cancer requires 20 years to develop

- 20 yrs to get the mutation and develop a tumour
- 20 yrs is the avg

Every cancer tumor is different

- different cancers: Different behaviours and biochemical properties

Cancer mutations involve **loss of function**

- Can't kill cancer before killing the health cells , a challenge

Biological regulation is complex

- If one doesn't work another one will cover for it
- Its complex but it can make weaknesses too
- Pattern in biological system
- Body balance the both passways, with cancer you lose that balance
- The passways are complicated

Cell division is regulated in 2 ways

- One system switches on the cell division
- One switches off
- Nature drives with both feet, push on the brake and acceletor at the same time but one of them more or less sometimes
- Cancer breaks the both systems

"Off" switch for cell division is broken

- Lose the ability to switch off

Ras is a common ON/OFF switch

- Family of proteins: Ras proteins

p53 is an important braking protein

- In 50% of the tutors there is sth wrong with the p53

Apoptosis – programmed cell death

- Body has the ability to detect the cell tats acting weird and get rid of the defective cell

Programmed cell death in embryo development

- Apoptosis get rid of human tail and webbing between the fingers

Programmed cell death protects the body from viruses and cancer

- Viruses live inside the cells
- Kill the cells that virus live in it

p53 is an important suicide protein

- Cancer cells protect themselves by reducing this process
- Lose the protection detecting system

Normal cells count cell divisions

- Cells has built in lifespan
- Devices at the end of the chromosomes counts every time that the cells divide

Chromosomes tips are like shoe laces

- Every time it divides a piece of the shoelace chops off

Cancer cells are immortal

- The enzyme gives immortality to the cancer cells
- Cancer cells activate the enzyme, figure out the way to unlock the box that contains the enzyme inside
- Cells become immortal bc tej enzyme can rebuild the chromosome parts that re chopped off

Tumor formation requires 8 to 10 mutations

- 8-10 gene changes
- 20 yrs

Gene is a set of instructions to make protein

- Gene is a set of instruction on how to make proteins
- In genetic alphabet: 4 letters

Gene uses 3 letter words called codons

- Rearrange the letters to make different instruction
- Grouped one after another

Each codon specifies an amino acid in a protein

- When we link them together we make proteins

Sequence of amino acids determines protein structure

- Genetic code is an indirect code
- We need these proteins to make the right shape

Genetic susceptibility – form and function

- White skin: can cause skin cancer
- Doesn't have a gene sequence that its modifies, lighter pigments can get skin cancer easier, increase the risk of cancer

Genetic susceptibility – biochemical differences

- Some ppl have less amnt of this enzyme would have more serious hangover
- The person that lacks the second enzyme, they can break down the acetaldehyde so in increases the risk of cancer for them

Most cancer death is caused by controllable factors

- In blue: we have control over them
- In black: uncontrolled

Nicotine is the addictive substance

- Nicotine doesn't cause cancer
- Its the reason why ppl smoke tobacco

α emitters are normally safe

- Polonium 210 is part a emitters
- Radioactive class of metals
- As long as its outside of the body its safe

Polonium spinthariscope in KIX cerial

- Toy that ppl could get in cereal packages
- It would give light

Heat from burning vaporizes polonium

- Polonium evaporate very easily
- Heat of cigarets can make polonium vapour
- Enters your lung
- Permeant radioactive source on the tissue of your body

Benzopyrene carcinogenicity

- DNA damage and mutation
- Introduce a brand new letter, not gonna be able to read it, causes mutation

Tobacco use in the US

- The last set of slides describes at the prevalence of cancer risk factors, such as tobacco use and physical inactivity, and the prevalence of cancer screening, such as use of mammography.
- Tobacco use is a major preventable cause of death, particularly from lung cancer. The year 2004 marks the anniversary of the release of the first Surgeon General's report on Tobacco and Health, which initiated a decline of per capita cigarette smoking in the United States. As a result of the cigarette smoking epidemic, lung cancer death rates showed a steady increase through 1990, then began to decline. The lung cancer death rate among US women, who began regular cigarette smoking later than men, has continued to increase, but at a slower rate since the early 1990s.
- As cigarette consumption goes up, cancer goes up
- Curve is lower in the women, and comes after men, delay, bc cigarette was advertised to men at first

<u>US Cigarette smoking prevalence*</u>

- The reduction in cigarette consumption has been associated with a decrease in adult smoking prevalence in both men and women since 1965. The difference in cigarette smoking across gender narrowed from 1965 to 1985, a result of smoking becoming more popular among women and higher rates of quitting among male smokers following the Surgeon General's Report.
- Steady decrease since then

<u>Cooking generates flavor and some nasty materials</u>

- Produce carcinogenic material , burning process just slower
- The darkest part of the food: most flavourful, most harmful
- Cooking food less is safer than well done
- charcoal : the dark parts

<u>Fiber promotes the passage of waste</u>

- Speeds up the rate of passage
- Reduces the exposure to any harmful materials in the food
- Causes nasty materials to stick to the fibers, attract nasty materials and promotes their removing
- We also cool vegetable less so its safer

<u>Consumption of five or more vegetable and fruit servings for cancer prevention</u>

- The American Cancer Society recommends that individuals eat five or more servings of vegetables and fruits a day for cancer prevention. Fruit and vegetable consumption may protect against cancers of the mouth and pharynx, esophagus, lung, stomach, and colon and rectum. However, there has been little improvement in consumption since the mid-1990s. Less than one in four adults was eating the recommended servings in 2002.
- Reduce the quantity of meat

Obesity* (%), by gender, adults aged 20 to 74

- Obesity has reached epidemic proportions in the United States. The percentage of adults age 20 to 74 who are obese increased from 1960 to 2000 with the largest increases occurring in the 1990s. Similar trends were observed among men and women.
- It's not just what we eat but its about how much we eat