The Biology of Aging

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Presented to Science Central
Lunch with a Scientist Program
What Do I do at IPFW?

- Immunologist - What is this??
- Teaching
- Advising
- Research
- Sports
- Committee member
Involvement with Students

• Advising
• Teaching
• Research
• Clubs
  – Pre-Med Club
• Sports
  – FAR (NCAA)
  – Involvement in intramurals
• Community
  – Swimming
Teaching

• Variety of classes
  - Immunology
  - Cancer Biology
  - Virology
  - Microbiology (Nursing)
  - Biology of Aging (Gen Ed & Research interests)
  - Freshman Success classes

• Service Committees
  - Steering Committee for Aging and the Aged
    • Issues- the senior population on campus
Research Interests

- **Immunosenescence**
  - Understanding how immune system “ages”
  - Understanding how to “delay” these aging changes
  - Understanding how to promote an increase in the quality of life as one ages (not necessarily how to extend life)

- **Regulation of tumor growth**
  - Associated with immune response
What is Biological Aging??

• What physical changes occur?
• How old is OLD?
  – Chronological age versus physical age
• What mental changes occur?
What is Biological Aging?

Morphological vs chronological

- **How we look?**
  - Hair
    - Loss
    - Gray
  - Skin
    - Wrinkles
    - Skin spots
  - Stature
    - Stooping
    - Getting shorter
    - osteoporosis

- **Changes**
  - Eyes
  - Hearing
  - Reflexes
  - Memory
  - Aches and Pains

- **Diseases**
  - Susceptibility
  - Alzheimers (1° genetic but life style important too)
When does Aging Begin?

- **Kids vs Adults**
  - Depends upon who you ask and when you ask
  - Depends upon how you feel at the time you are asked
  - When did I get OLD??

- **Reality**
  - Slow, progressive changes that you are never really aware of
  - Sexual maturity
  - Reproductive life span

- **Who is that in the mirror?**
• 122 years old
• 37 years old
• 49 years old
• 115 years old
128 years old
59 years old
How is Aging Studied?

- Can we use humans to study aging?
- Need model systems to allow researcher to study process
  - Short life span
    - Fruit Flies
    - Worms
    - Rodents
  - Easily manipulated and controlled
    - Diet
    - Environment
  - Genetically Identical
    - Inbred animals
Definitions

- **life span**---Longest time that species is capable of living (110 years for humans)
  - Even if all disease eradicated
    - Coronary
    - Cancer

- **life expectancy**---Average time that species lives (72-76 years for humans)
Theories of Aging

1. Programmed Theory of Aging
   - Cell death is programmed (telomerase)

2. Mutation Theory of Aging
   - Mutations change function of proteins

3. Autoimmune Theory of Aging
   - Immune system loses effectiveness

4. Free-Radical Theory
   - Take anti-oxidants

5. DNA Repair Mechanisms
   - Repair processes decrease with age
Genes

- Aging genes found
- Women live longer than men (genes, hormones)
- If you want to live a long and healthy life choose your parents wisely
Progeria
Werner syndrome

WS patient age 15 yrs
My Research

- Using rodent model (2 month → 24 month old animals)
- Examination of T and B lymphocytes isolated from spleen
- Look for alterations in signal pathways that may explain the decrease in immune response in aged animals
  - Decrease IL-2 levels and enzyme activity levels
My Research

• Use of strategies to “delay” age-dependent alterations of immune response
  - Dietary restriction (caloric restriction)- up to 70% restricted [works in lab animals fed ad lib]
  - Berry extracts
    • Elderberry/ Chokeberry/ Bilberry products
    • Put into culture with spleen cells from young and old animals and looked for T and B lymphocyte growth (proliferation) and for cytokine production (IL-2 and interferon)
My Research- Findings

- Found that these extracts stimulated cells from older animals more than cells from younger animals.
- Found that the extracts stimulate cytokine production more in older animals.
- Found that while stimulating immune cell function, these extracts INHIBIT tumor cell growth! (double edged sword)
My Research - Future

• Feed / Inject extracts into animals and examine resistance to viral infection and tumor cell growth in vivo

• Understand the pathways involved in these responses
  - Signal transduction and enzyme activities and gene responses
  - Tumor cell killing
What can we do about aging?
Strategies for Successful Aging

• Eat well
  - Low cholesterol
  - Avoid red meat
  - High fiber diets
  - Vitamins (A and C and E) - antioxidants
  - Calcium

- EAT LOTS OF FRUITS AND BERRY PRODUCTS
Strategies for Successful Aging

• Exercise
  - Low impact exercise
    • Swimming
    • Walking
  • Never too late to start
Strategies for Successful Aging

• **Keep Mentally Active****
  - Stay active in family activities
  - Stay active in community activities
  - Educate yourselves – educated people live longer
  - Read
  - Crossword puzzles
Strategies for Successful Aging

• Living Environment
  - Keep out of sun
  - Non-polluted environment
    • Air and water (is this possible??)
  - Live in a stress-free environment
    • Stress hormones decrease immune function and shorten life expectancy
• I want to thank my wife and daughter for helping me to continue working at something that I really enjoy (teaching and research)

• I want to thank my dog (Shannon) a Sheltie, who is 16 years + 8 months old!
Questions????
Cartoons
I CAN'T GET THE VCR TO WORK! THAT'S BECAUSE YOU'RE USING THE WRONG REMOTE, DAD.

AND YOU DIDN'T SET THE TV TO "VCR 1."

AND YOU DON'T HAVE IT TUNED TO CHANNEL 3.

AND YOU DIDN'T HIT "INPUT 1."

AND YOU HAD THE VCR ON "PAUSE," INSTEAD OF "PLAY."

AT LEAST YOU WERE IN THE RIGHT ROOM.
Because that's all you can remember anyway.
HAPPY BIRTHDAY!
As we get older, we still eagerly anticipate Happy Hour.

Only now it’s called “Nap Time”
HAPPY BIRTHDAY! You know you’re getting older when you close your eyes to make a wish...

- ... and when you open them, the party’s been over for hours
• Hope you all age well!!

Thank you!!
GOOD LORD, ETHEL... YOU CAN'T APPEAR IN PUBLIC LIKE THAT!