The Biology of Aging

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Presented to IPFW-Friends of the University

Thanks!!

- Could not have received this award without students
  - Undergraduate
  - Graduate
- Joy of both performing teaching and research and student activities

Involvement with Students

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

Teaching

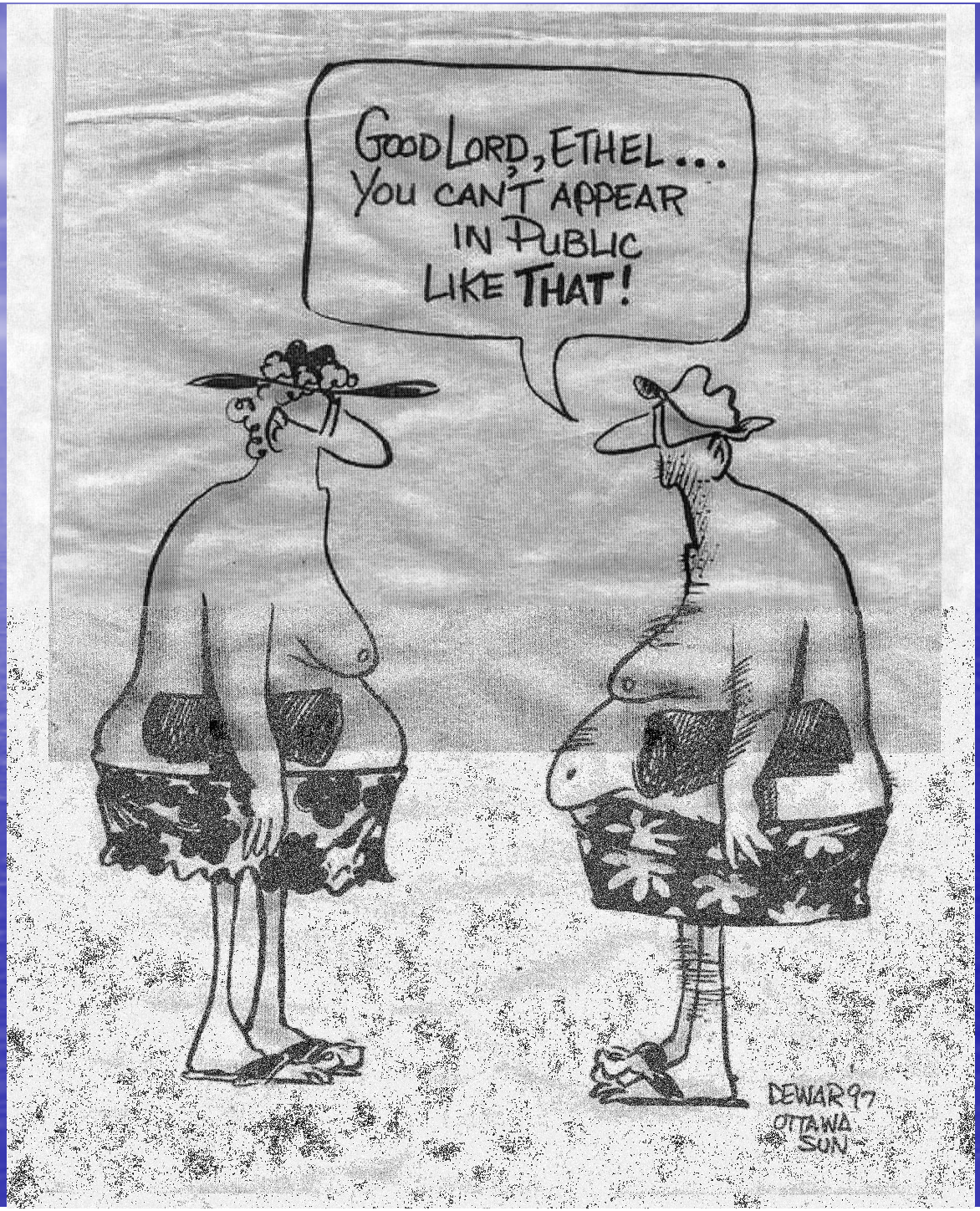
- Variety of classes
  - Immunology
  - Cancer Biology
  - Virology
  - Microbiology (Nursing)
  - Biology of Aging (Gen Ed & Research interests)
  - Freshman Success classes

- 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??


GOOD LORD, ETHEL...
YOU CAN'T APPEAR
IN PUBLIC
LIKE THAT!
DEWAR 97
OTTAWA
SUN

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^{o} 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?**

How is Aging Studied?

- 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
  - Glass of red wine/day

  - EAT LOTS OF BERRY PRODUCTS

Strategies for Successful Aging

- Exercise
  - Low impact exercise
    - Swimming
    - Walking

    - Never too late to start

Strategies for Successful Aging

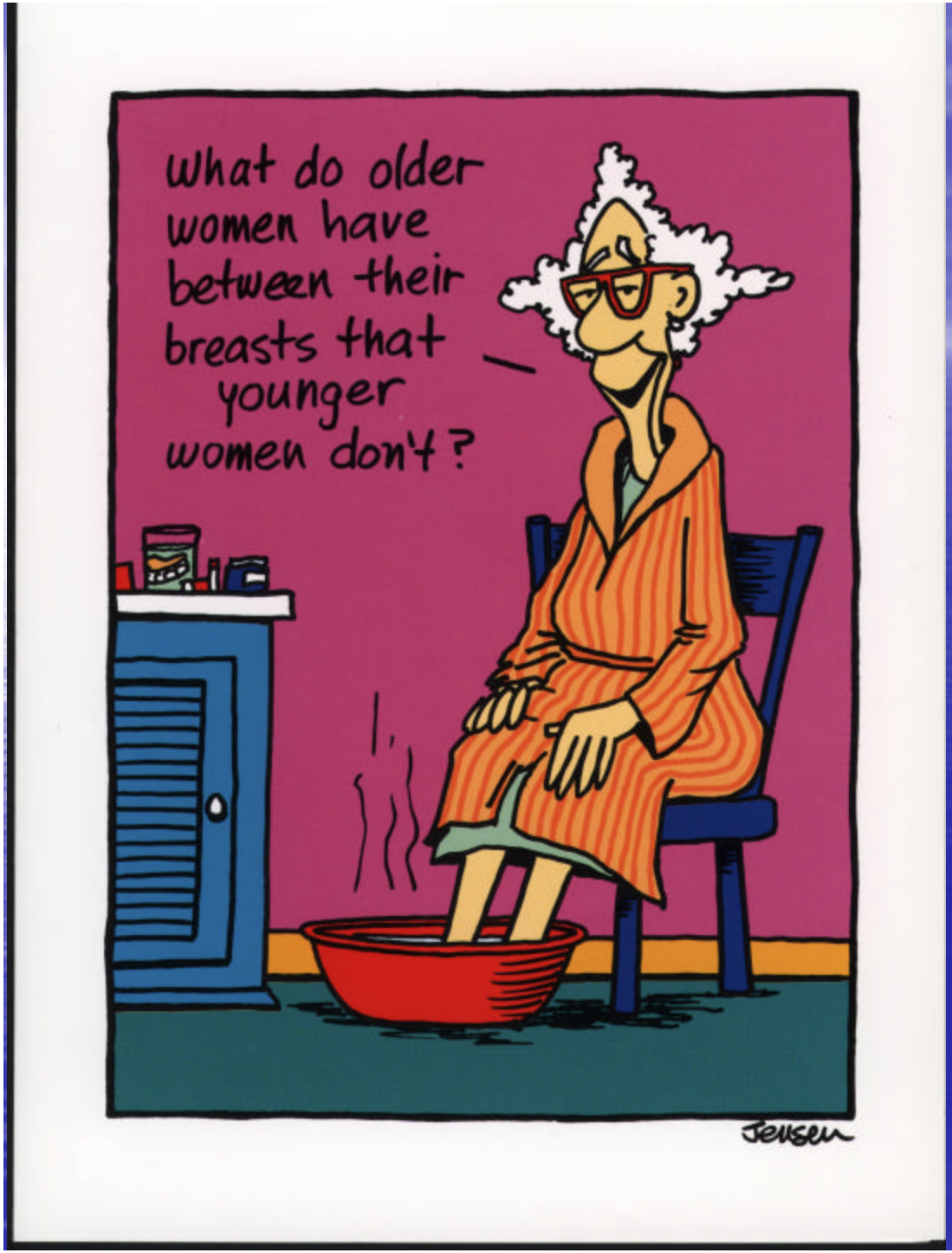
- Keep Mentally Active****
  - Stay active in family activities
  - Stay active in community activities
  - Educate yourselves – educated people live longer
  - Read
  - Crossword puzzles

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**

Cartoons

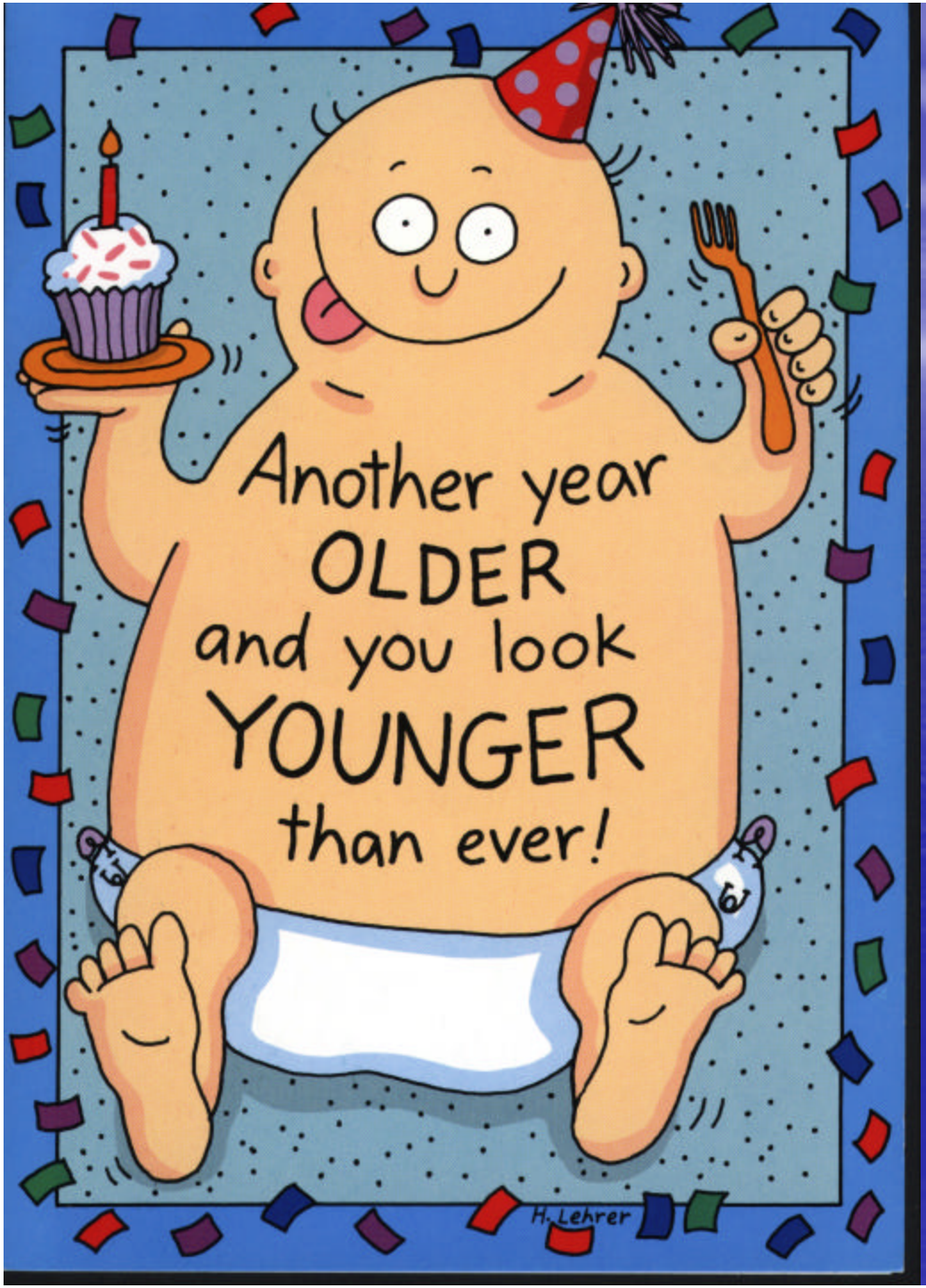
- Disclaimer—
  - View at your own risk
  - Maturity and understanding mandatory. If neither of these are present please change the channel or close your eyes



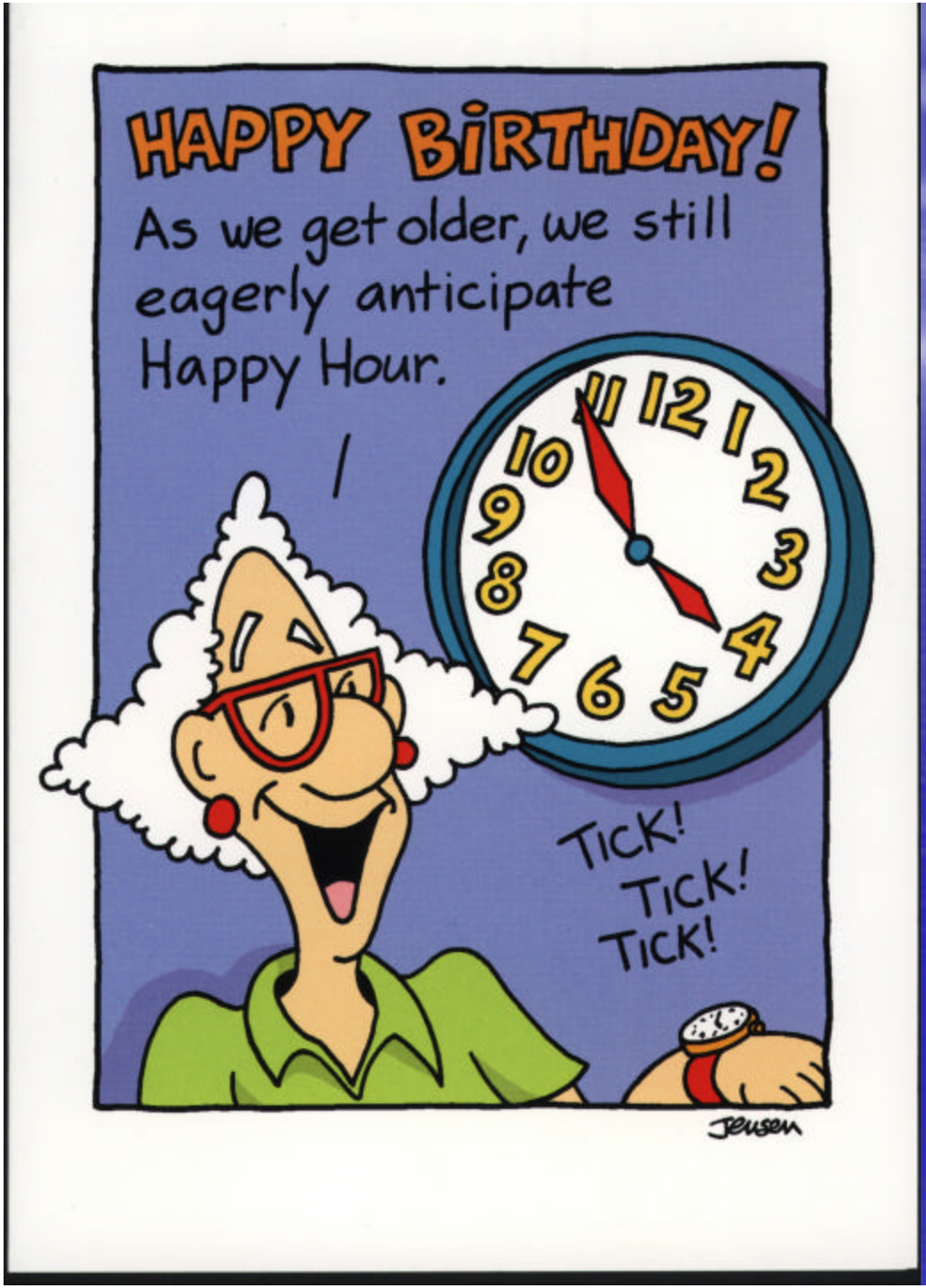
–A Belly Button

- .... Means the prune juice has done its job

- **Because that's all you can remember anyway**



- **Yeah, and your reality check is in the mail !**



- Only now it's called "Nap Time"

- ... and when you open them, the party's been over for hours

- **Hope you all age well !!**

Thank you !!