Chapter 2. Measuring Biological Aging

Measuring Biological Aging in the Individual

2.1. *True or false:* A cohort is a group of individuals with similar life experiences and ages.Answer: True

2.2. *True or false:* The genotype is all or part of the genetic constitution of an individual.Answer: True

2.3. *True or false:* The phenotype is the traits of an organism that are produced by the interaction between the genotype and the environment.

Answer: True

2.4. *True or false:* Selective mortality is the confounding effect on data collected in cross-sectional studies when comparing different cohorts.

Answer: False

2.5. *Fill in the blank:* ______ studies compare the average or mean rate of change in a particular physiological system between two or more age groups.

Answer: Cross-sectional

2.6. Which of the following is *not* an advantage of using cross-sectional designs in aging research?

a. simplicity

b. low cost

c. a general description of an aging phenomenon

d. a good mechanism to describe aging in the individual

Answer: d

2.7. *True or false:* Longitudinal studies are no better at predicting the rate of aging and establishing a biomarker for aging than are cross-sectional analyses.

Answer: True

2.8. In humans, an increased rate of aging seems to occur:

a. at the age of about 30.

b. at the time of decline in reproductive ability.

c. after the linear decline in the rate of aging.

d. at the age of about 80.

Answer: b

2.9. The intrinsic rate of aging most closely reflects the impact of ______ on the rate of aging.

- a. the phenotype
- b. the genotype
- c. selective mortality
- d. lifestyle

Answer: b

2.10. The extrinsic rate of aging most closely reflects the impact of the _____ on the rate of aging.

a. phenotype

b. genotype

c. environment

d. haplotype

Answer: c

2.11. *True or false:* The cohort effect is the inclusion in a cross-sectional study of individuals who have survived to a particular age.

Answer: False

2.12. The genotype interacts with the environment to produce the:

a. observable characteristics or traits called physical attributes.

b. observable characteristics called the phenotype.

c. observable characteristics that affect subsequent generations.

d. observable characteristics called epigenetic traits.

Answer: b

2.13. Choose the correct statement concerning the identification of a biomarker for aging.

a. Biogerontologists are faced with the problem of determining how much of normal aging

results from intrinsic factors and how much from things we do to ourselves.

b. Because the rate of aging is linear, it is just a matter of time until a biomarker for aging is found.

c. The common age-related phenotype is helping to identify a biomarker for aging.

d. The intrinsic rate of aging does not affect biomarkers for aging.

Answer: a

2.14. What was the key finding in the Baltimore Longitudinal Study of Aging (BLSA) that changed the purpose of other longitudinal studies?

a. The rate of aging appears to be similar in most people.

b. Aging is highly specific, not only for each individual, but also for different organ systems within the same individual.

c. Population averages work well as descriptors of individual aging.

d. There were no aging differences between males and females.

Answer: b

2.15. Choose the best description of an epigenetic trait.

a. a phenotype resulting from changes in the DNA sequence after conception

b. a genotype resulting from changes in the DNA sequence during meiosis

c. a phenotype resulting from changes in a chromosome without alterations in the DNA sequence

d. a genotype resulting from changes in a chromosome without alterations in the DNA sequence

Answer: c

2.16. Which process of epigenetic regulation unravels DNA from the histone?

- a. deacetylation
- b. methylation
- c. demethylation
- d. acetylation

Answer: d

2.17. *Fill in the blank:* The collection of data from the same person over several years is called a(n) _____.

Answer: longitudinal study

2.18. Currently, the major limitation in the use of personal genomics in humans is:

a. the biotechnology does not yet exist.

b. there are only a handful of known gene functions in humans.

c. cost.

d. government regulations.

Answer: c

2.19. Which is *not* considered a good practice in science when performing research on laboratory animals?

a. The life history of the model animal should be known.

b. Only one person should handle the animals.

c. The reproductive life span of the animal should be known.

d. Pathology and cause of death should be assessed.

Answer: b

2.20. *True of false:* Nutrition during fetal development and early childhood appears to be a factor that affects the extrinsic rate of aging.

Answer: True

2.21. *True or false:* Longitudinal studies have demonstrated that the rate of aging is linear with respect to time.

Answer: False

2.22. *True or false:* Like biomarkers for aging, biomarkers of childhood development are difficult to define.

Answer: False

Measuring Biological Aging in a Population

2.23. Maximum life span is:

a. the genetically determined longest possible life span for a species.

b. the time of death of the longest lived individual in the population.

c. the average age of those who have lived to 100 years of age.

d. a statistical estimation of longevity of a species.

Answer: b

2.24. *True of false:* The Gompertz mortality function accurately describes the trajectory of mortality at all stages of life.

Answer: False

2.25. *Fill in the blank:* The mortality rate for the 0- to 1-year interval in a current human life table is called the _____.

Answer: infant mortality rate

2.26. Which of the mortality variables is easily accessible and fairly accurate?

a. number of deaths in the population

b. number of individuals in a population

c. life expectancy

d. mean life span

Answer: a

2.27. *True of false:* A current life table uses a hypothetical birth cohort to estimate the death rate in a population.

Answer: True

2.28. *True or false:* Life expectancy at any age is defined as the average number of years remaining to be lived by those surviving to that age.

Answer: True

2.29. *True or false:* An abridged life table uses age intervals of one year.

Answer: False

2.30. Which variable provides an estimate for the extrinsic rate of aging?

- a. maximum life span
- b. life expectancy
- c. mortality rate
- d. mean life span

Answer: d

2.31. Which variable provides an estimate for the intrinsic rate of aging?

- a. life expectancy
- b. mortality rate

c. maximum life span

d. mean life span

Answer: c

2.32. *True or false:* Age-specific mortality rate reveals an individual's chance (probability) of dying of a specific cause.

Answer: False

2.33. *Fill in the blank:* The ______ life table is useful for species having short life spans or for historical populations having accurate birth and death records.

Answer: cohort

2.34. *Short-answer question:* Briefly describe the applications of a current life table.Answer: It applies the current death characteristics of a living population to a hypothetical birth cohort. These values are then used to forecast mortality statistics over the life span of an actual population, based on data collected at a single time point.

2.35. Infant mortality rate is defined as the death rate of:

a. individuals in a human population at birth.

b. individuals in a human population from birth to 1 year of age.

c. individuals in a human population from birth to 1 week of age.

d. mothers and infant in a human population at birth.

Answer: b

2.36. Death that is not the result of biological aging is known as:

a. age-independent mortality.

b. an accident.

c. fractional mortality.

d. age-specific mortality.

Answer: a

2.37. The difficulties associated with using Gompertz analysis for comparisons between

species can be partially reduced by using a simple calculation of:

a. the Gompertz mortality rate constant.

b. mean life span.

- c. maximum life span.
- d. mortality rate doubling time, MRDT.

Answer: d

2.38. The age-specific mortality rate can be described by a(n) ______ function.

a. linear

- b. curvilinear
- c. exponential
- d. quadratic

Answer: c

2.39. In the Gompertz mortality function equation, $m(t) = q_x e^{G(t)}$, G(t) is defined as the:

a. mortality rate as a function of age at time *t*.

b. Gompertz mortality constant at time t.

c. age-specific mortality rate.

d. mathematical constant.

Answer: b

2.40. *True or false:* An increase in slope of the Gompertz mortality function graph would suggest a decrease in the rate of aging.

Answer: False

2.41. Deceleration of mortality rates at the end of life suggests that:

a. the oldest individuals in the population may be genetically different from the rest of the birth cohorts.

b. age-specific mortality rates are inaccurate.

c. longevity is not determined by genes selected for reproductive success.

d. data in fruit flies are inconsistent with evolutionary theory.

Answer: a