

Radiation Biology

If you analyze levels of gH2AX expression of tumor cells (i.e. by immunocytochemistry) after a 6 Gy radiation exposure at several timepoints after radiation, which of the following would you expect to see? (1 point)

- A) The irradiated cells would show progressively increasing levels of gH2AX at 1, 6, and then 24 hours after irradiation
- B) The irradiated cells would show progressively decreasing levels of gH2AX at 1, 6, and 24 hours after irradiation
- C) **The irradiated cells would show an increase in gH2AX at 1 hour after irradiation and then progressively decreased gH2AX at 6 and 24 hours after irradiation**
- D) The irradiated cells would show progressively increasing levels of gH2AX at 1 and 6 hours after irradiation and then decreased levels at 24 hours after irradiation

Objectives: A) Molecular effects of radiation on DNA and chromosomes.

Reference: Radiat Oncol. 2009 Aug 24;4:31. High throughput evaluation of gamma-H2AX. Avondoglio D, Scott T, Kil WJ, Sproull M, Tofilon PJ, Camphausen K.

Which one (1) of the following is **TRUE** regarding the difference between an “effective survival curve” for multi-fraction irradiation and a single dose single hit multi-target survival curve? (1 point)

- A) The D_0 for an effective survival curve is equal to that of a single dose survival curve.
- B) **The slope of an effective survival curve is more shallow than that of a single dose survival curve.**
- C) The D_{10} for an effective survival curve is less than that of a single dose survival curve.
- D) The single dose survival curve is to the right of an effective survival curve.

Objective Terminology and abbreviations used in radiation oncology, radiation biology and radiation protection.

Reference: Radiobiology for the Radiologist, Hall, 6th ed., Chapter 3 Cell Survival Curves, p. 42.

General, Basic and Clinical Knowledge

Several retrospective studies of apocrine gland carcinoma of the anal sac in dogs have been published. Indicate whether the following statements are TRUE or FALSE. (1 point each)

TRUE or **FALSE**: The presence of lymph node metastasis is a consistent negative prognostic indicator.

TRUE or FALSE: Overall median survival times in treated patients in the recent literature are greater than one year.

Reference: Williams LE, Gliatto JM, et al. Carcinoma of the apocrine glands of the anal sac in dogs: 113 cases (1985-1995). JAVMA 2003, 223:825-831.

Polton GA, Brearley MJ. Clinical stage, therapy, and prognosis in canine anal sac gland carcinoma. J Vet Intern Med. 2007 Mar-Apr;21(2):274-80.

Withrow and MacEwen, Chapter 18, Cancer of the Gastrointestinal Tract

Objective: Case management of the radiation oncology patient, including diagnostic evaluation and tumor staging of cancer patients, prognostic factors and assessment of performance status.

Physics

1. **Kerma is the: (1.5 points)**

New-09

- A. Energy per unit mass absorbed along the path of a charged particle
- B. Energy per unit mass transferred from photons to charged particles
- C. Energy per unit mass transferred from charged particles
- D. Charge released by photons as they pass through a specified amount of air

The Physics of Radiation Therapy, Faiz M. Khan, Lippincott, Williams & Wilkins, Philadelphia, 2003
p 106

Objective 2: General terminology used in radiation therapy and radiation physics.

2. Which one of the following best describes the difference between x-rays and gamma-rays?
(1.5 points)

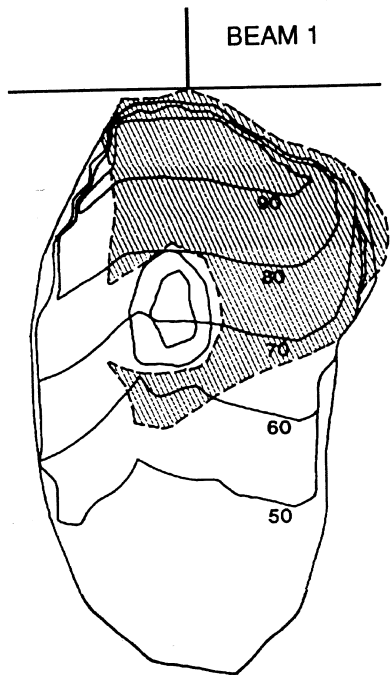
New-08

- A. Energy
- B. Origin
- C. Charge
- D. Velocity
- E. All of the above

Gamma rays originate from the nucleus, and x-rays originate from the electron shells of an atom.

Clinical

Evaluate the following (Cobalt-60) treatment plan. The anatomic part is a transverse section through a thigh. The femur is shown, and the PTV is the stippled area. Beam one (1) is at zero (0) on the machine gantry and the gantry rotates clockwise. Based on this information, please answer the following questions.



- A) **TRUE** or **FALSE**: The plan is adequate for treatment of the tumor. (1 point)
- A. True
B. **False**
- B) Which one (1) of the following treatment plan adjustments would be most likely to result in lymphedema in the future? (2 points)
- A. Addition of a beam at 90
B. Addition of a beam at 90 and 270
C. Electron therapy
D. **Addition of a beam at 180**
- C) Which one (1) of the following treatment plan adjustments will most improve dose distribution across the tumor and spare normal tissue? (2 points)
- A. Addition of a beam at 90
B. **Addition of a beam at 90 and 270**
C. Electron therapy

D. Addition of a beam at 180

Objective #1: Evaluation of isodose distributions in tissue regarding adequacy for treatment of tumors and effects on normal tissue, and be able to recommend how isodose distributions judged to be ineffective can be improved.

Reference: Thrall DE et al. A review of treatment planning and dose calculation in veterinary radiation oncology. Vet Radiol, 30:210, 1989.

Bentel; Radiation Therapy Planning, Page 62-63.

Vet Clinic North Am 27;1997.

Withrow S. et al: Small Animal Clinical Oncology, 2001

Contrast enhanced CT images from a South African cabybara from the local zoo are available for review (CT series, images 46). She presented with blindness and inability to navigate her exhibit pool. [See image(s) available for this question on the computer]

A) Which one (1) of the following would best describe the images and most likely differential diagnoses? (2 points)

- A. Cerebellar mass.
- B. Olfactory meningioma.
- C. Pituitary macroadenoma.**
- D. Normal study.
- E. Granulomatous meningoencephalitis.

B) Which one (1) of the following would be the best method for treating such a tumor? (2 points)

- A. 6 MV photons. Parallel opposed fields; 90, 270 degree beam orientation.
- B. 6 MV photons. Wedged pair; 90, 270 degree beam orientation AND open beam at 0 degree beam orientation.
- C. 6 MV photons. Four box field; 0, 90, 180, 270 degree beam orientation.**
- D. Radiation is not advised; perform surgery instead.
- E. Radiation is not advised; administer lomustine chemotherapy instead.