



Radiation Safety Officer & Authorized User Training For Veterinarians and Veterinarian Technicians 8-Hours

SYLLABUS

PRESENTED BY:

Applied Environmental Consulting, Inc.

COURSE OVERVIEW

Radiation History and Fundamentals
Radioactivity and Half-life
Radiation Biology and Risks
Protection Factors and How to use a Survey Meter
Regulatory Agencies & Compliance
Role of Personnel
Characteristics of Iodine-131
Contamination control: Fixed, Airborne, Removable
Swipes, Surveys, Spills and Waste
Administration of I-131 and Discharge
Cat Owners' Instructions
Dosimetry and Bioassays
Records Management
Transportation and Opening Packages

THE HISTORY OF RADIATION SCIENCE

The Beginning
Discovery of Radiation
Henri Becquerel
Wilhelm Roentgen
Madam Curie
(Plus others)
Development of Nuclear Technology
Manhattan Project
Albert Einstein
Enrique Fermi
Development of the Nautilus
Development of the Atomic Energy Act

RADIATION FUNDAMENTALS

Energy Spectrum
Ionization
Non-Ionizing
Atomic Structure
Nuclear
Proton
Neutron: Extra-nuclear
Electron: Classification
Atomic Number
Atomic Weight
Unstable Atoms & Emissions
Characteristics of Radioactive Materials
Unstable
Detectable
Spontaneous Emission
Emission from nucleus of atoms
Photons: Gamma
Particles: Alpha, Beta, Neutron
Emissions from outer shells of atoms
Photons: X-ray

RADIOACTIVITY & HALF LIFE

Units for Disintegrations

Radioactivity

Disintegration

Disintegration per Unit Time (dps, dpm)

Curie

Becquerel

Total Activity

Specific Activity/Activity Concentration

Background vs. Contamination

Half-Life

Carbon-14 Dating

Short/Long Half-Lives

INTERACTIONS OF RADIATION WITH MATTER

Energy Disposition in Air

Interactions

Ionizations

Excitation

Energy Deposition in Air

Roentgen

Exposure Rates

Energy Disposition in Matter

RAD

Gray

Relative Biological Effectiveness (RBE)

Linear Energy Transfer (LET)

Energy Disposition in the Body

REM

Sievert

Dose rates

RADIATION BIOLOGY

Sources of Dose

- External
- Internal
- Man-made and Natural

Types of Dose

- Acute
- Fractionated
- Chronic

Types of Dose Effects

- Somatic
- Genetic
- Teratogenic

Variable in Dose Effects

- Amount of Dose
- Critical Organ
- Type of Radiation
- Individual Biological Variations
- Radio sensitivity and Radio resistance

Types of biological effects in The Cell

- Types of Biological Variations
- Radio sensitivity and Radio resistance

Types of Risks

- Definition
- Comparisons with other types of risks

Causes of dose

- Stochastic
- Non-Stochastic

RADIATION PROTECTION

Time

- Principles of Exposure Control

Time

- Distance (Inverse Square Law)

Shielding

- HVL and TVL

As Low As Reasonably Achievable (ALARA)

Administrative Controls and Levels

Administrative Controls

Establishing administrative limits

Engineering (Mechanical) Controls

Signs, labels and postings

Radiation Dose Limits

Radiation Workers

Members of the Public (MOP) study

Monitoring External dose

Personnel Monitoring Devices

OSLDs/TLDs/Film Badges

Pocket Dosimeters

Monitoring Internal Dose

Bioassays

Direct and in vitro

Active Monitors (reading real time)

Pocket Ion Chamber

PORTABLE SURVEY METERS

Types

Geiger-Mueller (GM)

Scintillator

Reading Results

CPM vs. DPM

Scales and displays

Radiation Levels

Efficiency and Calibration

Efficiency

Calibration

Operating a Survey Meter

Battery check/Calibration check/Check source

Establish Background

cpm vs. mR/hour or uR/hour

High to Low scales

End window

LAG Time (GM)

Use & Care

REGULATORY AUTHORITY

Regulatory Agencies (Federal)

USNRC

Types of radioactive materials regulated:

By-Product Material

Source Material (Source of SNM)

Special Nuclear Materials (SNM)

Fissionable

USEPA

OSHA

FDA

Non-Federal Agencies

Agreement States and Licensing States

The Radioactive Materials License

Authorized Materials

Authorized Use

Authorized Users

CONDITIONS

Location

Inventory

Training

Record Keeping Requirements

“Catch all” Condition

Role of Regulatory Agencies

Issue licenses

Inspections

Amendments

RADIATION PROTECTION PROGRAM FOR VETERINARIANS

Handling Radioactive Materials

OPERATING AND EMERGENCY PROCEDURES

Radiation Protection Program

Radioactive Materials and Contamination Control

Volatility



Fixed, Removable and Airborne
Wearing PPE
Radioactive Waste Control (Decay-In-Storage)
Dosimetry Program
Monitoring Programs Using a Thyroid Phantom
Survey and Taking Swipes
Cat Owner's Instructions
Survey and Handling
Instrumentation Operation
Postings
Emergency Procedures
Spill Kit for Major and Minor Spills
Authorized Users and ALARA
Records Management
Disposal
Decay-In-Storage
Posting and Labeling
Emergencies
X-ray or Radioactive Materials Accidents

RADIATION SAFETY PERSONNEL

RSO Duties and Responsibilities
Authorized User

TRANSPORTATION

IATA/Agreement State Authority
Quantities
Excepted Quantity
Limited Quantity
Package
Excepted Package
Type A Package
Transport Index
Placarding
Shipping Paper
Receiving/Shipping Radiation Sources at Animal Hospital
Persons Who Need to Receive USDOT Radiation Training