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## Veterinary MRI with John Posh, RT (R)(MR) RACE Program Agenda

### Requirements for Course Enrollment and Completion:

Veterinarians and licensed veterinary technicians will enroll for the program through the AAVR website ([www.aavr.org](http://www.aavr.org)). The cost for the program is \$1,500, and participants may enroll at any time. There is no timeline to finish the course, and students may work at their own pace.

This online course will feature 13 videos created by John Posh, RT (R)(MR) for students to watch, followed by a 10- to 15-question exam (30-minute max given to finish) at the completion of each video. In order to advance to the next video, students must pass an online test with a score of 70% or higher, per RACE standards, for each video. They must complete and pass all 13 exams in order to receive CE credit for this course. Based on the length of videos and time allotted for taking each exam, this course takes approximately 16 hours maximum to complete. (Applied for 14.5 hours due to the rounding up or down of hours to meet RACE minimum CE credit time requirements.)

Session 1	<b>Introduction to MRI, Part I (1h:10m video + 0h:30m test) 1.50 CE Credits</b> <b>Objectives:</b> 1) Understand the history of MRI, 2) Understand the typical exams that can be done for the brain, spine, thorax, abdomen, pelvis, musculoskeletal (MSK), 3) Realize the potential of veterinary MRI.
Session 2	<b>Introduction to MRI, Part II (1h:00m video + 0h:30m test) 1.50 CE Credits</b> <b>Objectives:</b> 1) Understand the evolution of veterinary MRI, 2) Learn the similarities and differences between human and veterinary imaging, 3) Understand the positioning challenges, 4) Know the positioning challenges, 5) Know the anatomical differences and challenges with MRI, 6) Realize the range and type of patients we are able to scan.
Session 3	<b>What We Need to Perform an MRI (1h:01m video + 0h:30m test) 1.50 CE Credits</b> <b>Objectives:</b> 1) Understand basic magnetism and the role it plays in the imaging process, 2) Learn why we use hydrogen for imaging and how the hydrogen is manipulated for our use, 3) Understand the basics of resonance, the transfer of energy from one item to another, 4) Learn the basics of the gradient and RF systems and why we need them, 5) Realize that the signal generated must be manipulated and analyzed in order to be useful.

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- Session 4** Principles of Magnetism (0h:35m video + 0h:30m test) **1.00 CE Credit**  
**Objectives:** 1) Understand the history of magnetism, 2) Understand the types of magnets available, 3) Realize the benefits and drawbacks of the different types of magnets, 4) Understand the magnetic properties of matter and their relevance to imaging.
- Session 5** Excitation/Relaxation (0h:28m video + 0h:30m test) **1.00 CE Credit**  
**Objectives:** 1) Understand atomic structure and why we use hydrogen for clinical imaging, 2) Understand how hydrogen is bound in the body, 3) Understand how we organize the protons for imaging, 4) Understand the mechanisms of excitation and relaxation, 5) Basic understanding of T1 and T2 and how they are controlled
- Session 6** Image Contrast Mechanisms in MRI (0h:45m video + 0h:30m test) **1.00 CE Credit**  
**Objectives:** 1) Understand what image contrast is, 2) Understand contrast mechanisms in MRI, 3) Understand how contrast is controlled, 4) Understand the intrinsic and extrinsic parameters.
- Session 7** MRI Pulse Sequences (0h:39m video + 0h:30m test) **1.00 CE Credit**  
**Objectives:** 1) Understand what a pulse sequence is, 2) Understand the components of a pulse sequence, 3) Realize how pulse sequence choice affects imaging.
- Session 8** MRI Parameters (0h:56m video + 0h:30m test) **1.50 CE Credits**  
**Objectives:** 1) Understand contrast parameters (repetition time (RT), echo time (TE), flip angle, inversion time (TI), B-value, velocity encoding (VENC)), 2) Understand image quality parameters (frequency matrix, phase matrix, field of view, slice thickness, interslice gap, NSA (NEX), receiver bandwidth
- Session 9** Coils (0h:19m video + 0h:30m test) **0.50 CE Credit**  
**Objectives:** 1) Understand the basics of coils and how they are used, 2) Understand the types of coils available for veterinary use, 3) Know how coil choice affects image quality.
- Session 10** Gradient System and Spatial Localization (0h:38m video + 0h:30m test) **1.00 CE Credit**  
**Objectives:** 1) Understand what gradients are, 2) Learn how gradients control slice thickness, 3) Learn how gradients facilitate spatial localization, 4) Understand how gradients are measured in terms of power and quality.
- Session 11** Introduction to K-Space (0h:31m + 0h:30m test) **1.00 CE Credit**  
**Objectives:** 1) Understand what k-space is, 2) Learn what k-space represents, 3) Learn how k-space is filled, 4) Understand the role k-space plays in imaging.
- Session 12** Contrast Agents (0h:48m + 0h:30m test) **1.00 CE Credit**  
**Objectives:** 1) Understand why contrast agents are used, 2) Understand the mechanism of action of contrast agents, 3) Learn how contrast agents affect image contrast, 4) Learn the different types of contrast agents, 5) Learn the risks associated with contrast agents.
- Session 13** MRI Safety (0h:48m + 0h:30m test) **1.00 CE Credit**  
**Objectives:** 1) Understand the reasons for MRI safety, 2) Understand the bio-effects associated with the three magnetic fields, 3) Understand how the magnetic fields affect implants and foreign bodies, 4) Know what it means to have a safe facility.

## **Technical Portion:**

The technical portion of this course requires each applicant to independently perform and submit MRI studies from **one** of the categories below (Small Animal/ Exotic or Large Animal). A student is **not** to submit MRI studies from both categories, i.e. **just pick one**. All MRI studies submitted must be complete (see AAVR MRI guidelines). All studies must be done independently by the applicant and obtained after starting the online course. Studies will be assessed by a boarded specialist selected by the AAVR for study completeness, image positioning and proper sequence technique. Assessment of each series will be given an overall pass/ no pass and each applicant must receive a pass for the study to count towards the AAVR technical requirements. To arrange for the image sending procedures, please contact us at info@aavr.org or (858) 634-5430.

### **Small Animal/ Exotic**

Brain- 10 cases

Orthopedic- 5 cases

Nasal/ Orbit/ Brachial Plexus/ Abdomen- 5 cases

Spine- 10 cases

**OR**

### **Large Animal**

Brain/ Nasal/ Orbit- 5 cases

Carpus/ Tarsus / Elbow/ Stifle- 5 cases

Distal extremity (fetlock and distal)- 15 cases