SPECIAL REPORT

January 2014

AGFA *Agfa*
HealthCare

VETERINARY CARE

Taking a leap forward in animal care

Nothing in animal healthcare can be considered 'average'. A vet must deal with different species, in a wide range of sizes, with vastly varied health concerns – and often in challenging environments. Imaging – including X-rays – is as critical in animal care as human care, yet vets generally receive little training in radiology. Agfa HealthCare's dedicated imaging solutions for animal care help vets meet the challenge: they are easy to use, but are based on the same up-to-date technology and provide the same high and consistent image quality as for humans.

In this Special Report for Veterinary Care, we offer you animal healthcare stories from all over the globe. You will hear from your peers across Asia, the US, Europe, South America… Discover the challenges facing a turf club, an aquarium, and a new family pet clinic. But everywhere, vets and staff share a common focus: to ensure the best care for their patients, whether domestic animals or wild animals, efficiently and effectively.

And they must do this facing the realities of the world of animal care. Vet medicine, techniques and treatment have evolved at a considerable speed. While this opens amazing new possibilities for treatments, the investments required have to make sense financially. Every tool and technology must offer the care facility concrete advantages and a return on investment.

As the imaging specialist, Agfa HealthCare is committed to developing solutions that build on our long expertise and experience, while meeting the specific needs of animal healthcare. Whether for computed radiography (CR) or direct radiography (DR), our solutions offer concrete cost, quality, workflow and patient care advantages. They have proven themselves everywhere: from pet clinics, to the field, and even under water.

Our dedicated MUSICA image processing software for animals makes imaging easy for vets by automating the image optimization process. For any body part or size or type of animal, MUSICA ensures high-quality and consistent images, without any intervention by the vet.
We hope you enjoy the stories and articles we have put together for you!

Caroline Burm
Marketing Communications Manager

Animal Medical Center of Mid-America: ready for anything!

Digital imaging helps multi-site practice combine family pet care with animal rescue and large-scale emergencies.

INTERVIEW WITH DR. STEVEN SCHWARTZ, VMD, Animal Medical Center of Mid-America

"We have to keep an 'all hands on deck' mentality; in other words, we have to always be ready for anything, because we never know in advance what will happen." Dr. Steven Schwartz is explaining what it is like to work at the Animal Medical Center of Mid-America (AMCMA, formerly the Humane Society of Missouri), which not only runs private veterinary clinics at three sites in the St. Louis area, but is also responsible for animal rescue and first response in the event of an emergency. "We can have literally hundreds of animals come through at once following a rescue or natural disaster," he continues. "We may need to perform triage and then emergency care."
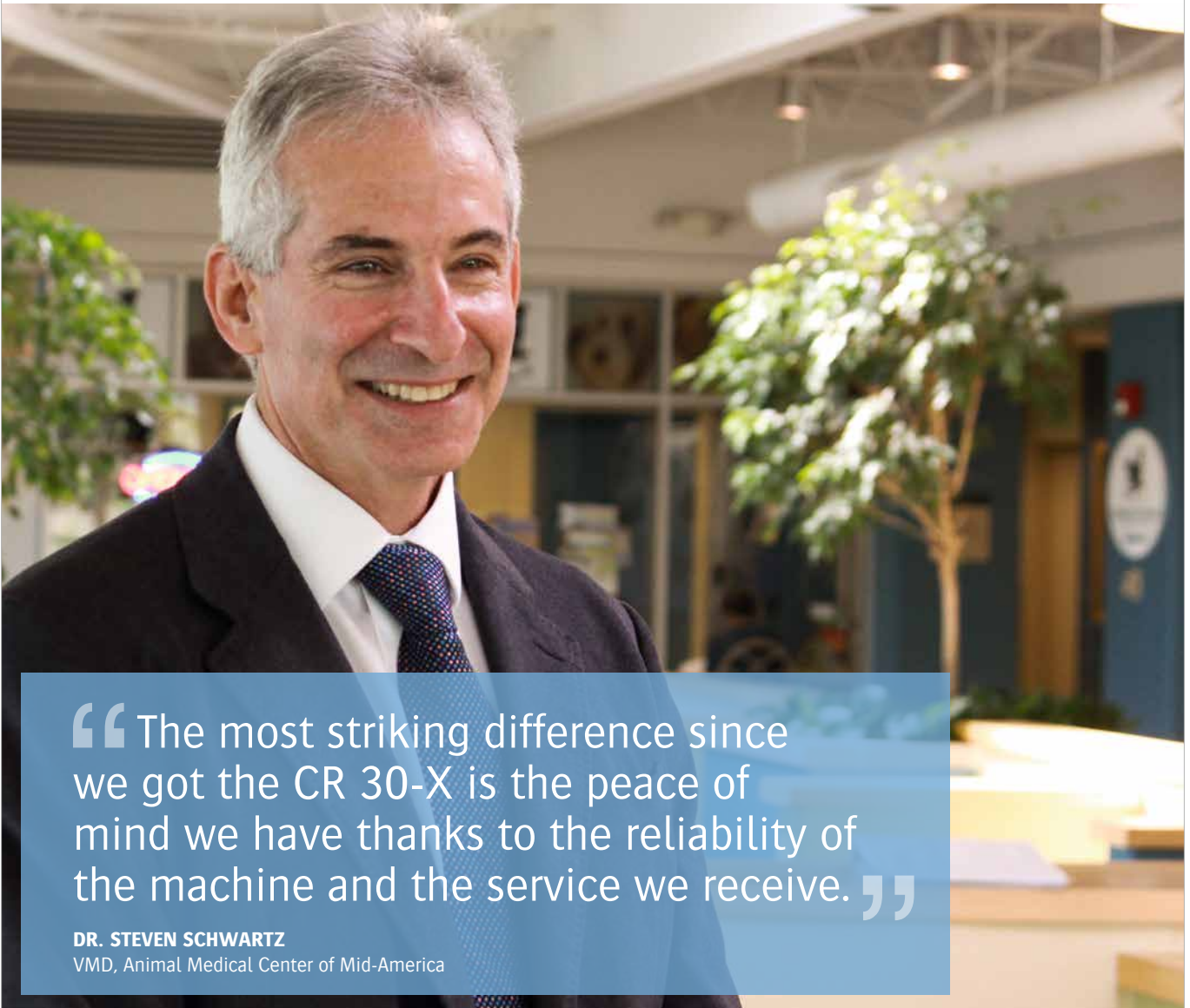
> "The most striking difference since we got the CR 30-X is the peace of mind we have thanks to the reliability of the machine and the service we receive."
>
> **DR. STEVEN SCHWARTZ**
> VMD, Animal Medical Center of Mid-America

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> DR. STEVEN SCHWARTZ

"All pets and their owners welcome!"

Up until recently, the AMCMA was known as the Humane Society of Missouri (HSMO). "We changed our name to better reflect the broad range of services we offer, not only in terms of the animal rescue that is associated with a Humane Society, but also the high-quality care we provide for private customers and their family pets," explains Dr. Schwartz. "People didn't realize that we offer very advanced procedures and technologies. Of course, the proceeds still benefit the Humane Society of Missouri, and we still offer our low-cost spay and neuter programs for sterilizing cats and dogs. We want people to know, as it says on our website, that all pets and their owners are welcome!"

Dealing with the dual demands of animal healthcare and rescue requires a good size team. There are 90 staff members who work in the three sites in St. Louis, Maryland Heights and Chesterfield, 20 of whom are veterinarians. And in total, some 230 people are employed by the organization, including the shelters, task forces and education department. "Education remains one of our core focuses," comments Dr. Schwartz. "We reach around 24,000 children each year with our messages about responsible behavior towards animals."

Animal care requires 100% confidence

Annually, the AMCMA treats some 40,000 animals, both family pets and rescued animals, so efficiency is naturally a major concern. In 2011, the AMCMA decided to replace the radiography system in its largest site, St. Louis City. In September 2011, it purchased an Agfa HealthCare CR 30-X computed radiography solution from dealer Radiologic Resources. "A local, Board certified radiology group put in a good word for the CR 30-X, and we knew that several local veterinary emergency and specialty facilities use it, so it was well recommended," recalls

Agfa HealthCare's solution

- CR 30-X computed radiography solution.
- Integrated MUSICA image processing software, providing consistent image quality and high contrast detail, without any manual intervention by the veterinarian.
- NX workstation including touch screen with intuitive interface.

Dr. Schwartz. "Of course, quality was of critical importance. But reliability and service are just as critical for us. With our rescue operations, we can suddenly be faced with an emergency situation that plays havoc on scheduling. When you work with animals, there is no such thing as 'convenient'; they just don't work

to human agendas! So we can't afford to have less than 100% confidence in our equipment, and in the service that backs it up."

Vet technology for the 21st century

The CR 30-X met all of Dr. Schwartz's requirements. "The quality is excellent, and when you are confident that you will get good images, you don't hesitate to take more, because you know that you will end up with useful information. Plus, the ability to manipulate and 'dissect' images allows us to diagnose things we might not be able to appreciate otherwise. We get more information."

He explains, "For example, sometimes we have surgical specialists come to our facilities to perform certain operations.
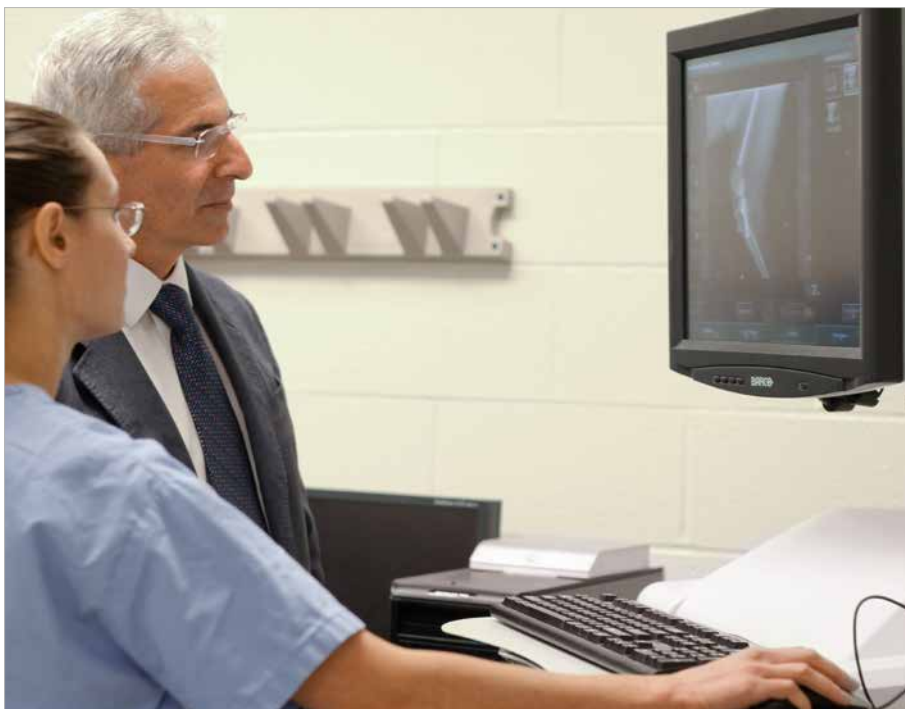
Recently, we had a dog that needed a complex knee surgery. This requires very precise measurements, and image quality is key. With the CR 30-X, we made the images ahead of time, and sent them directly to the orthopaedic veterinarian. The quality was so good, he could do all the measurements in advance, so when he got here for the operation, he was all set to go. The CR 30-X played a major role both in the quality of care he could give that dog, and in improving the efficiency of organizing the surgery."

Dr. Schwartz is enthusiastic about the other advantages the AMCMA has seen from the CR 30-X, as well. "As we have three separate clinic locations, and work with multiple specialist vets, the ability to send images between sites and to various referral hospitals makes our work easier. The doctors move around a lot, and this lets them view before and after images with outstanding image quality. But the most striking difference since we got the CR 30-X is the peace of mind we have thanks to the reliability of the machine and the service we receive. In the end, having the CR 30-X is like moving from the 20th century to the 21st century." ∎

Did you know...

- All three Animal Medical Center of Mid-America locations are fully accredited by the American Animal Hospital Association (AAHA): something only some 3100 animal hospitals in the US — just 10 of which are full service hospitals affiliated with humane organizations — can say!

- The Humane Society of Missouri cooperates but is not affiliated with the Humane Society of America. It receives no public funding, and is financed through donations and revenues from the AMCMA veterinary centers.

- In addition to the three veterinary clinic sites, the AMCMA has a fourth site, Longmeadow Rescue Ranch, where it cares for large and farm animals, such as horses, goats, cows, pigs and birds.

Malpertuus veterinary center, Heusden, Belgium

Using DR imaging to take top-quality animal care even further

With the DX-D 10, a flourishing full-service vet practice finds the image quality, speed and simplicity it has been searching for.

INTERVIEW WITH DR. PETER VANDEKERCKHOVE, Veterinarian, Diplomate ECVS, Malpertuus veterinary center

Malpertuus is a large-scale, full-service veterinary center that aims to take imaging and surgery for animal healthcare ever further. Surgery specialist Dr. Peter Vandekerckhove was convinced that direct radiography (DR) would best support the center's ambitions. Now the DX-D 10, combining excellent image quality with speed and ease of use, has given the center the DR technology it needs to support its flourishing practice.

Ensuring the quality needed for crucial images

Malpertuus was started up in January 2010 by long-time collaborators Dr. Vandekerckhove, Dr. Johanna Van de Vijver and Dr. Hugo Vinck. Since then, they have been joined by a fourth partner, Dr. Ilona Schwarzkopf, plus three additional vets, three assistants and a secretary. In their purpose-built premises, this team makes full use of a broad range of dedicated equipment, including an X-ray room with the DX-D 10 digital detector plate, a CT scanner room, an ultrasound room and two operating rooms.

For a top-line veterinary center, Dr. Vandekerckhove was convinced that DR was the path to the future, but he needed to find the right solution. His local

> " **I would certainly say 'go digital'. The DX-D 10 has been an excellent investment for us, and it definitely yields more each month than the cost.** "
>
> **DR. PETER VANDEKERCKHOVE**
> Veterinarian, Diplomate ECVS

> **" The digital detector is something we can no longer do without, not only for me as a surgeon, but also for my colleagues who are more involved in cardiovascular imaging. "**
>
> **DR. PETER VANDEKERCKHOVE**

DX-D 10 digital detector plate

- Easy and intuitive to use, right from the start.
- With increased speed, vets can take all the images they need.
- Image processing tools help surgery preparation and follow-up.
- Vets and owners can see images immediately on the monitor.
- Excellent image quality supports the veterinary center's role and reputation as a reference center.
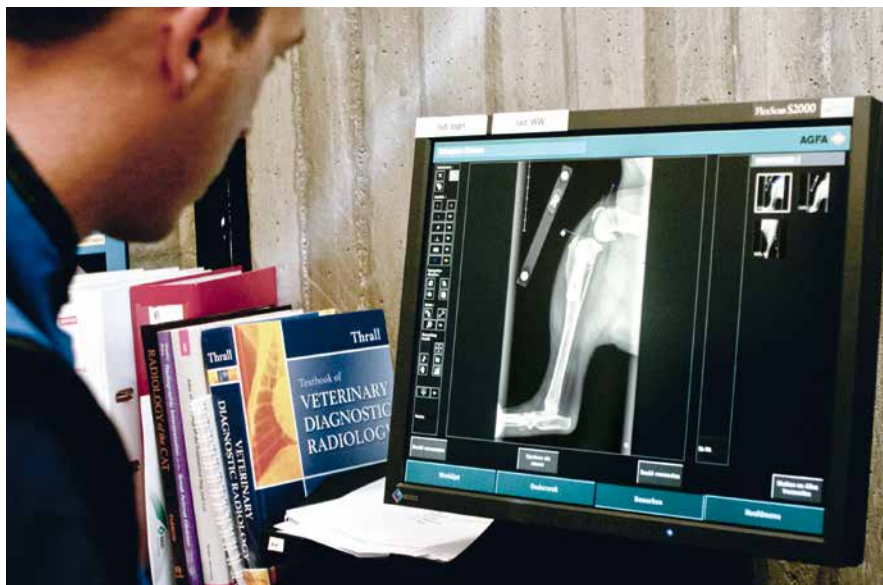
distributor, X-Ray Verachtert, introduced him to the DX-D 10, with MUSICA image processing software. "Sure enough, it was the solution I had been looking for," he comments. "It was very simple to learn to use and intuitive: all the vets could start working with it right away."

But ease of use was not the only advantage of the new system. "We make 10-20 images every day with the DX-D 10; there is little parameterization necessary, and over- or under-exposures are rare. We get a very good quality image in a few seconds, so the time savings are huge. Take as an example a situation where I want to do a full complement of images for a dog: five to eight images, of hip, knee, elbow and shoulder. Previously, this could take one and a half hour. With digital imaging, it takes me only 10 minutes."

Dr. Vandekerckhove finds the image processing tools especially handy for surgery. He uses the MUSICA software extensively for surgery preparation and

follow-up, and can make measurements, simulations, annotations and more. All the images are stored on a central server. From their own offices and computers, the center's vets can view images and initiate X-ray exams. The patient data is transferred to the worklist on the NX workstation in the X-ray room.

Dr. Vandekerckhove concludes, "I would certainly recommend to other vet practices to 'go digital', but pay close attention to the image processing software delivered with the system. In my opinion, the quality of the software is even more important than the quality of the detector plate." ■

Did you know...

- The name 'Malpertuus' comes from a classic tale in Flemish medieval literature. In the story, Malpertuus is the home of the family of Reynaerd the Fox, and is a caring haven for the fox cubs.
- The premises of the Malpertuus veterinary center, designed by the award-winning Belgian architectural team De Vylder-Vinck-Taillieu, received the first prize at Batibouw 2010 (Belgium's largest construction fair) in the non-residential building category.

Temaikèn Biopark's Veterinary Hospital, Escobar, Buenos Aires, Argentina

Daily challenges requiring maximum accuracy

Digitalization brings the best services and high-quality images to Biopark's Veterinary Hospital.

INTERVIEW WITH DR. GUSTAVO GABRIEL GACHEN, General Curator of the Temaikèn Foundation
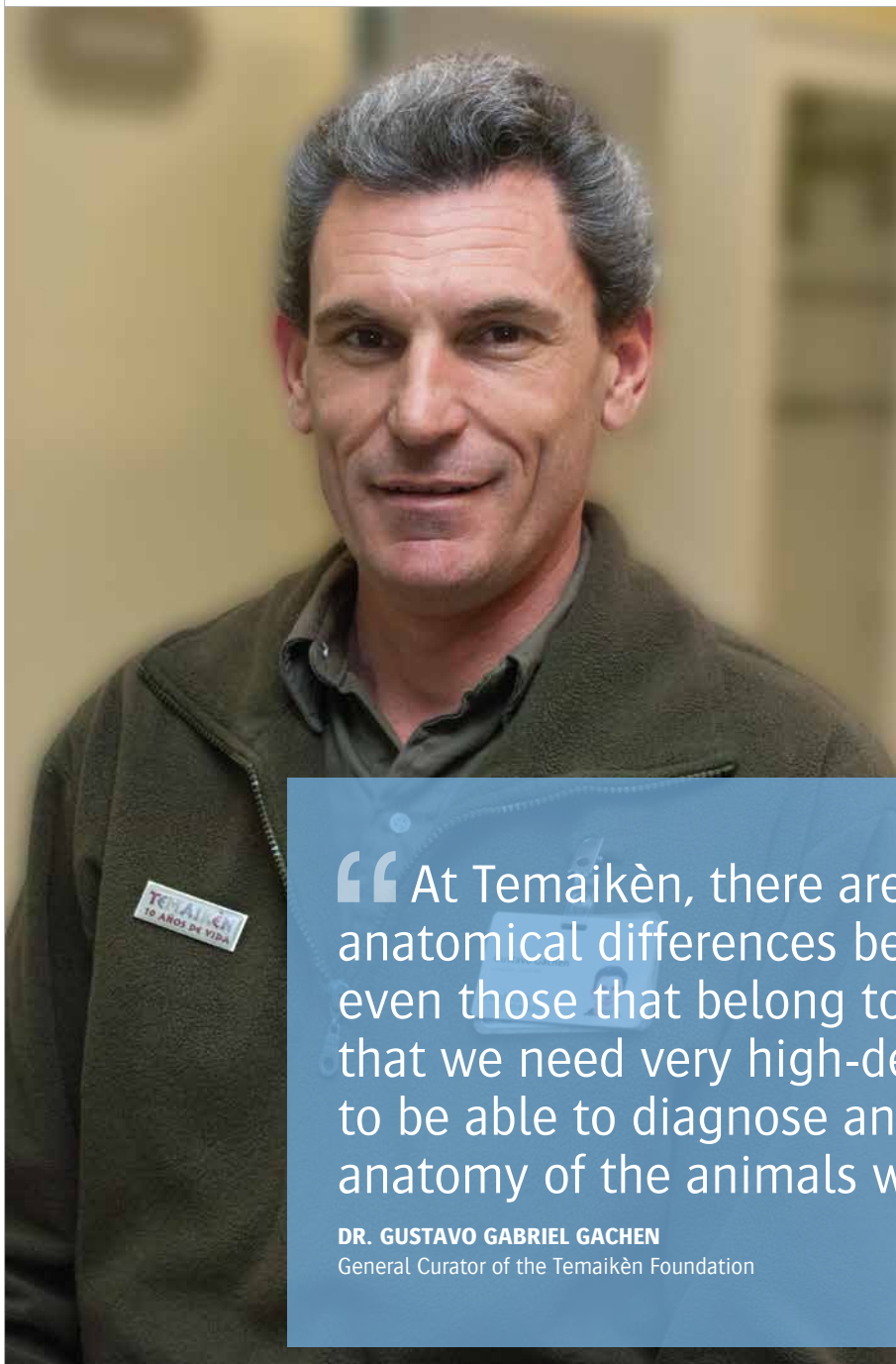
With more than 5,000 animals spread over 59 hectares of land, every day is a challenge for Temaikèn Biopark's Veterinary Hospital. This is where surgeries and check-ups are carried out, and species as diverse as the shark and the maned wolf are raised. In this beautiful setting in Escobar in the province of Buenos Aires, professionalism and the most advanced technology are indispensable. Agfa HealthCare's CR 30-x system has helped make life easier for the professionals who work there, by providing them with excellent services and high-quality images. These enable more precise diagnoses, and support the Foundation in attaining its most critical goals: the preservation of the environment and the improvement of the wellbeing of the animals that live in it.

Each year, Temaikèn receives 800,000 visitors, who are dazzled by the diversity of animals that live there and by the care put into displaying them. The animals are a living testimony to the admirable work that the Temaikèn Foundation has

> " At Temaikèn, there are so many anatomical differences between animals, even those that belong to the same class, that we need very high-definition images to be able to diagnose and understand the anatomy of the animals we're treating. "
>
> **DR. GUSTAVO GABRIEL GACHEN**
> General Curator of the Temaikèn Foundation

been carrying out in Argentina for over 13 years. The Foundation is renowned around the world for its meticulous environmental care as well as for its efforts in education, in research and in the conservation of indigenous and exotic flora and fauna.

Biopark's Veterinary Hospital sees a constant coming and going of different species. It is a place where mammals, reptiles, birds and both salt- and freshwater fish coexist. Dr. Gustavo Gabriel Gachen, the Foundation's General Curator, is the man in charge of it all. With the constant movement, and especially the incredible diversity of species and treatments dealt with daily, the Foundation needs the most up-to-date technology and the best professionals. The latter must be capable of handling the day-by-day challenges that come with working at the center: "It's a complex job. You don't only have to deal with pathologies, but also with the environment, with the way different species and members of the same species relate. Sometimes social conflicts arise, creating high-stress situations. These types of circumstances can lead to pathologies. So we need extensive knowledge as well as collaboration between handlers, nutritionists and veterinarians," explains Dr. Gachen.

A center equipped with the best technology available

The Veterinary Hospital has three separate departments. In the nursery, parts of which can be viewed by the public, young animals are raised when, for whatever reason, their parents cannot do so. The clinical analyses department then consists of the three laboratories where all the tests needed to diagnose pathologies are carried out. Finally, there is the clinical admission department, which is where animals go for treatment. This department has a fully equipped operating room, a consultation room with an X-ray machine and an autopsy room.

The hospital has always insisted on using top-grade professional equipment, and has slowly but surely been adapting itself to technological advances. Based on this philosophy, it was decided, over a year ago, that it was time to renew the hospital's radiology system.

> **The definition from the Agfa HealthCare CR 30-x is excellent, and we can carry out a variety of options: amplifying or reducing a certain area of an image, making it negative, etc.**
>
> **DR. GUSTAVO GABRIEL GACHEN**

Digitalization leads to improved diagnosis

Digitalization provided Temaikèn's Veterinary Hospital with exactly what it needed: high-quality imaging that allows the visualization of even the tiniest of details. "The definition from Agfa HealthCare's CR 30-x computed radiography (CR) system is excellent, and we can carry out a variety of options: amplifying or reducing a certain area of an image, making it negative, etc.," comments Dr. Gachen. The CR system has also supported the animal care professionals by reducing the number of X-rays necessary: rather than requiring multiple X-rays, they can do it in one shot with the digital system. Any necessary improvements are then made on the computer. This is essential for the kind of work that goes on in the hospital. "There are so many anatomical differences between animals, even those that belong to the same class, that we need very high-definition images to be able to diagnose and understand the anatomy of the animals we're treating," explains Dr. Gachen.

Technology that accommodates the environment

The Temaikèn Foundation has always had a clear idea of what it wants; from the beginning, it used an automatic developer to speed up X-ray development. Nevertheless, this solution required the use of environmentally hazardous liquids that went against its main mission: protecting nature. From the first contact with the digital system, Federation staff understood that this new technology marked a milestone in the world of radiology. Dr. Gachen: "I did have some initial doubts, since we had been diagnosing and solving problems adequately with the old system. But once we started seeing the benefits from the new system, the difference was outstanding. The diagnoses we can make with the CR system aren't the same ones we could make with the old system." In fact, digital radiography gives the professionals at the Veterinary Hospital a whole new advantage in surmounting their daily challenges. ∎

Did you know...

- At the Veterinary Hospital, 11 people look after the well-being of the Biopark animals and the recovery of animals seized by the National and Provincial Fauna Authorities.

- The Veterinarian Hospital is made up of a multidisciplinary team including veterinarians, lab technicians, handlers and maintenance personnel. Last year alone, this team of professionals treated over 2,000 animals, 500 of which were reared there.

- Temaikèn Biopark is home to some 280 different species of mammals, 229 reptiles, 1,470 birds, 900 saltwater fish and 3,600 freshwater fish. 60% of the animals are indigenous, while the rest come from a variety of locations and ecosystems around the planet.

Speed counts at racing club

Top-of-the-line IMPAX and high-volume CR keep equine hospital fit and 'in racing form'.

INTERVIEW WITH **DR. KOOS VAN DEN BERG,** Head of the Veterinary Department and Internal Medicine Specialist
DR. CURRY KEOUGHAN, Veterinary Surgeon and Lameness Specialist

Balancing the needs of valuable race horses, their owners and the prestigious Singapore Turf Club racing club is no simple matter. Confirming that health requirements are being met, testing and checking the horses before races, handling passports for traveling animals and making sure they don't export or import dangerous diseases... The vets at the Singapore Turf Club Veterinary Hospital deal with a broad variety of equine medical-related issues. But one thing these dedicated vets insist upon: the health of the animals is always the number one priority. The Turf Club itself supports them in these endeavors, ensuring that they have everything they need to carry out their work.

For over 170 years, the Singapore Turf Club has been making a name for itself as a top horse racing club, gaining an international reputation and producing prize-winning horses. This member of the Malaysian Racing Association is the only authorized operator of horse racing and totalisator (horse betting) services in Singapore. Its commitment to integrity, efficiency, effectiveness and social responsibility is reflected in its top-of-the-line veterinary hospital, which cares for the health needs of the approximately 1400 horses stationed at the Club.

> **"** With so many vets, so many modalities and so many images, access to the images is critical. All of the images are stored on the IMPAX: the ultrasound, radiography, scintography, endoscopy, arthroscopy... Every vet can see all images from one place: this is very advanced for vet medicine. **"**

DR. KOOS VAN DEN BERG
Head of the Veterinary Department and Internal Medicine Specialist

DX-G computed radiography system

- State-of-the-art image quality.
- Intelligent MUSICA image processing, dedicated for veterinary use.
- Choice of needle-based detectors and standard phosphor plates.
- Drop-and-go cassette buffer for cutting-edge imaging speed.

IMPAX 6.5.1 RIS/PACS/Reporting

- Streamlines the multiple stages in patient care.
- Connects images and information for improved diagnostic confidence.
- Enhances communication between colleagues.
- Helps save time and reduce errors.

> **"The DX-G cuts the imaging time in half: I've done 32 X-rays in 15 minutes! With the needle-based detector plates, we require less exposure and get better detail. And the MUSICA image processing software has been even further improved for veterinary use. Combined with Agfa HealthCare's excellent responsiveness, we are very pleased with the addition of the DX-G.**
>
> **DR. CURRY KEOUGHAN**
> Veterinary Surgeon and Lameness Specialist

A fully incorporated part of the Club, the Singapore Turf Club Veterinary Hospital employs a total of 44 people, including ten vets. Renowned for its expertise in equine care, it also attracts visiting veterinary students from around the world who are looking for an opportunity to learn more about this specialty in a cutting-edge environment.

High-volume healthcare needs

"We have a rather exceptional situation here," explains Dr. Koos van den Berg, Head of the Veterinary Department and internal medicine specialist. "The vet hospital itself is not a profit center, but it is a very important part of the Turf Club. Firstly, the Turf Club makes sure we get whatever equipment we need, so we don't really have to be concerned about the investment costs ourselves. Secondly, as the medical care is subsidized by the Turf Club, members don't pay the 'full cost' of treatment or check-ups. They are therefore more inclined to bring their animals to us at an earlier stage, for situations where owners relying on 'private practices' might choose to wait and see if they could deal with the problem themselves. So we see a lot more horses and deal with their health issues at more stages."

Every horse receives a check-up before each race. The vets perform blood tests, 'trot' up the horses to make sure they don't have any soreness, and then check them again after the race. In addition, horses have to be carefully weaned from any drugs, such as joint medication, well beforehand.

The hospital's vets also see a lot of 'common' horse injuries, especially to knees and fetlocks, as well as sore feet and condylar fractures – "the general wear and tear of the athlete," comments Dr. Curry Keoughan, veterinary surgeon and lameness specialist. And whereas 'traditionally' injuries such as fractures would generally spell the end of a race horse's competitive career – or worse – equine medicine has made leaps and bounds in successfully treating these injuries.

"One of our champion sprinters, Rocket Man, suffered a condylar fracture to his front leg a few years ago," explains Dr. Keoughan. "We inserted a screw into the bone, and after surgery he not only returned to the race circuit, but he continued winning! That was a very good result."

IMPAX image and data management brings it all together

To ensure the best care for the horses, the vets have access to a full complement of imaging equipment, including digital radiography and ultrasound. The vet hospital has long worked with Agfa HealthCare solutions, implementing a CR 25-X digitizer and Web 1000 image viewer in 2005, then adding a CR 30-X with DRYSTAR 5302 in 2009. In May 2013, the vet hospital upgraded its picture archiving and communication system (PACS), becoming the first vet practice in Singapore to install the IMPAX 6.5.1 image and data management solution. At the same time, it implemented the DX-G computed radiography (CR) solution, with Agfa HealthCare's specialized software for animals.

"With so many vets, so many modalities and so many images, access to all of the images is critical," comments Dr. Koos van den Berg. "All of the images are stored on the IMPAX: the ultrasound, radiography, scintigraphy, endoscopy, arthroscopy... Every vet can see all images from one place: this is very advanced for vet medicine."

"We have two high-resolution screens. While we can show multiple views on one screen, we can also put a separate image on each screen, for even greater clarity. We can also show the images and history to the owners and handlers, so they can clearly see the value of the procedures we have done."

The system is very easy for the vets to use, he continues. By opening the ID for one case, the vet can see a list of all the images stored, and follow the evolution of care for the animal. Providing injury reports is an important part of the hospital's service, and with the IMPAX 6.5.1, they are quickly generated.

Cutting-edge imaging speed and quality

Within this environment, speed of imaging is an absolute priority, comments Dr. Curry Keoughan. While the quality of the hospital's CR systems was excellent, even with two digitizers the workflow wasn't fast enough for the very high volume demands. "We check up to 200 horses a day: most afternoons we are packed, so efficiency is key. In a 20 minute slot, I want two sets of ten fetlock images. With the DX-G, and its drop-and-go buffer, I can do it; it cuts the time in half. I've done 32 X-rays in 15 minutes! With the needle-based detector plates, we require less exposure and get better detail. And the MUSICA image processing software has been even further improved for veterinary use. Combined with Agfa HealthCare's excellent responsiveness, we are very pleased with the addition of the DX-G!"

"As part of the Singapore Turf Club, we aim to always stay on the cutting edge of equine care. The IMPAX 6.5.1 and DX-G help us do that," concludes Dr. van den Berg. ∎

Did you know...

- The first race at the then Singapore Sporting Club took place on 23 February 1843. The prize money was a princely 150 US Dollar.

- The Singapore Sporting Club changed its name to Singapore Turf Club in 1924, to more clearly define its role. During its varied and colorful past, the racecourse grounds were used for activities ranging from polo matches to the landing of the first aircraft in Singapore.

- The Turf Club moved to its present premises at Kranji in 1999.

- After his surgery at the Singapore Sporting Club Veterinary Hospital for a condylar fracture, Rocket Man became the first Singapore-trained horse to win an International Group 1 race overseas, when he landed the 2 million US Dollar Group 1 Dubai Golden Shaheen in Dubai on March 26, 2011.

White paper

DIRK DE LANGHE
Solutions Development Manager – Agfa HealthCare

CR systems include one or more phosphor plates (available in different sizes), a laser scanner, a computer with a high-quality monitor and, optionally, a printer.

Digital radiography conquers the veterinary world

Increasingly, veterinarians are using medical imaging to diagnose their patients. There is a corresponding tendency towards replacing conventional film-screen systems with digital medical imaging systems, such as computed radiography (CR) and direct radiography (DR). With these systems, many veterinarians around the world are enjoying considerable benefits, including time savings and optimal image quality.

From analog to digital

X-ray generators are used to make radiographic exposures. As the X-rays pass through the patient, the way in which they are absorbed varies depending on the density of the body tissues (bone, fat, water, air, etc.). With a conventional exposure, the unabsorbed X-rays are captured in a special cassette with a fluorescent screen, and the remaining radiation is converted to visible light. This light hits the film, reacts with the silver bromide and causes the silver ions to precipitate. After the development, fixation, drying and rinsing of the film, a conventional X-ray image is obtained.

Conventional radiography delivers solid results, but the technology is labor-intensive and time-consuming. In addition, so-called 'wet' development requires the use of chemicals that must be dealt with in an environmentally-sound way.

Computed radiography gains ground

Computed radiography (CR) and direct digital radiography (DR) also use a standard X-ray generator. CR is an indirect digital imaging technology that became popular in the 1980s within the human healthcare domain. In the veterinary world, equine veterinarians, who must often work in the field, were the first to make use of this technology. Around the year 2000, veterinarians began using the technology – which had become more compact and affordable – on a larger scale.

With CR, the X-rays are captured using a phosphor plate – rather than a fluorescent screen in combination with conventional film. When the plate is exposed to X-rays, some of the radiation energy is absorbed, causing the excited electrons to create a temporary image on the imaging plate.

This latent image is then scanned with a reader using laser light, capturing the visible light that is released when the excited electrons return to their ground state under the influence of the laser beam. The energy that is captured is converted into electric signals. The result is an extremely accurate image that appears on the computer monitor some 30 to 60 seconds after the exposure.

After each exposure, the images on the phosphor plates should be erased. Some systems do this in conjunction with image reading, after which the plate can be immediately re-exposed to X-rays. The phosphor plates can be re-used thousands of times, but are eventually subject to wear and tear.

Imaging plates are available in many sizes. In addition to larger sizes, Agfa HealthCare also offers smaller plates for intra-oral applications, both for small pets and for horses.

High-quality images in seconds

DR moves another step forward. These systems use a detector plate (flat panel detector) to capture the X-rays. A scintillator converts the X-rays into visible light that is then converted into a digital signal using photodiodes and 'Thin Film Transistors' (TFT). Just a few seconds after the exposure, the image already appears on the computer screen. There is no need for a reader or scanner to process the image.

The type of scintillator determines to a large degree the quality and cost of the detector. Scintillators with powder phosphor are relatively easy to produce, as opposed to scintillators with needle phosphor. But the latter offer greater sharpness and better noise, at an identical exposure.

The major benefit of DR is that it is even faster than CR. If necessary, retakes can be performed immediately; there is no need to replace the cassette. Moreover, the intrinsic image quality can be considerably better.

The reverse side is that this technology is much more expensive and requires a higher investment compared to CR. In addition, the detector plate is more sensitive to damage: a kick from a horse, for example, could require the complete replacement of the system. Considering the cost, many veterinary practices prefer CR.
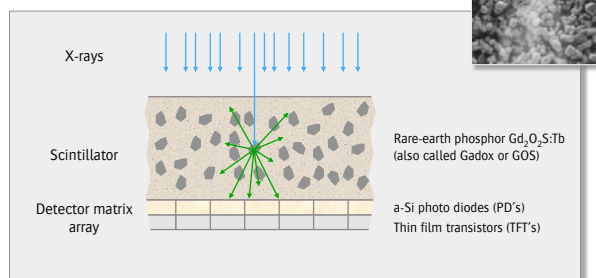
Ease of use

In general, digital imaging systems such as CR and DR are easy to operate. The veterinarian selects an exam type on the computer and the correct parameters are transmitted to the X-ray generator.
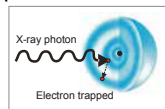
Indirect DR detector with GOS scintillator

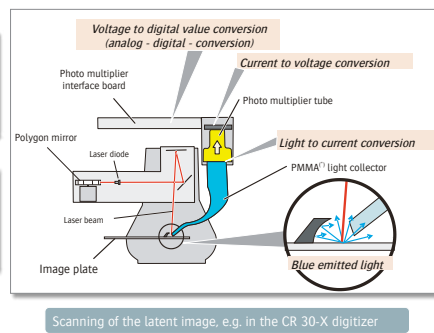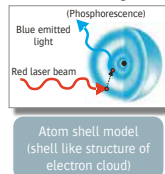- Granular powder scintillator compound

X-rays

Scintillator — Rare-earth phosphor Gd_2O_2S:Tb (also called Gadox or GOS)

Detector matrix array — a-Si photo diodes (PD's)
Thin film transistors (TFT's)

Principle of computed radiography (CR)

Exposure

X-ray photon

Electron trapped

Stimulation (scanning)

(Phosphorescence)

Blue emitted light

Red laser beam

Atom shell model (shell like structure of electron cloud)

Voltage to digital value conversion (analog - digital - conversion)

Current to voltage conversion

Photo multiplier interface board

Photo multiplier tube

Polygon mirror

Laser diode

Light to current conversion

PMMA(*) light collector

Laser beam

Image plate

Blue emitted light

Scanning of the latent image, e.g. in the CR 30-X digitizer

(*) PMMA: polymethyl-methacrylate known as plexiglass

As soon as the images are taken, they are sent to the workstation, where they can be optimized for interpretation. With the more advanced systems available, the entire workflow is automated.

When a hardcopy is needed, the image can be printed on paper or transparent film, similar to conventional X-ray film. Paper images from an office printer can be useful in client communication, while prints from high-quality film printers produce diagnostic-quality films.

Both CR and DR are particularly suitable for mobile applications. A small footprint CR system, used together with a laptop computer, can easily be transported in a car. There are also smaller, light-weight and very practical DR detectors on the market. The cream of the crop for house calls – e.g. for equine healthcare – are the wireless flat panel detectors.

Excellent image quality

Conventional silver film has a number of disadvantages. Film has a limited linear response to radiation, which means that it cannot tolerate a wide radiation exposure range without risking saturation. In some studies, that latitude limitation means certain areas may be overexposed while others will be underexposed on the same film.

Digital radiography eliminates this disadvantage. With the linear character of the system and its higher dynamic range (more shades of grey) an image can be made darker or lighter, enabling the possible detection of lesions not visible on conventional film. Moreover, details of both soft tissue and bone are visible on the same image. Retakes, which require additional radiation exposure
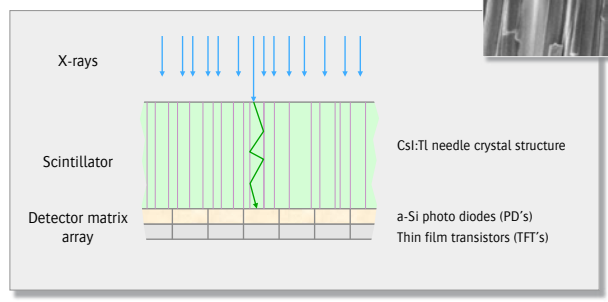
for both operator and patient (along with the possibility of additional sedation for the latter) can be avoided; the exam is completed more quickly, at a lower cost.

In addition, digital images can be manipulated: the veterinarian can adjust contrast and brightness, invert or crop the image, zoom in on a specific lesion, and even make text annotations. The software also makes it possible to perform measurements, such as heart dimensions, hip angle in a dog or hoof angle in a horse, etc. The manipulated image can be stored next to the original image.

Proper image processing is an important component of the chain. Nearly all suppliers have built image processing software into their CR and DR systems, but the methodology and quality of this software determine to a large extent the quality of the diagnostic image. The best systems offer software that is specifically tailored for veterinary applications, with settings for various species. This results in high-quality images for both small and large animals. One example is Agfa HealthCare's MUSICA image processing, which today is considered the gold standard in both human and veterinary radiology. This software analyzes each image and automatically applies the appropriate image

Indirect DR detector with CsI scintillator

- Crystalline needle scintillator compound

X-rays

Scintillator — CsI:Tl needle crystal structure

Detector matrix array — a-Si photo diodes (PD's)
Thin film transistors (TFT's)

enhancement parameters independent of the exam type.

Time savings

In addition to the generally better image quality, CR and DR also offer significant time savings. As film development is no longer necessary, images are available considerably more quickly. CR produces images in 30 to 60 seconds, while DR takes just a few seconds.

The subsequent workflow steps have also become much easier. Images can be stored electronically and sent to another veterinarian for a second opinion. And after the exam, they are easier to retrieve. Physical storage space and a darkroom are no longer necessary.

The client no longer needs to wait till the image is developed, and treatment can be started sooner. Veterinarians can also present their clients with a CD containing the X-ray images of their animal. ■

Century Animals Medical Centre, Sabah, Malaysia

Animal welfare
starts with awareness

Ambitious Malaysian vet clinic uses CR 10-X to promote
the importance of diagnostic medicine.

INTERVIEW WITH DR. DENNIS LIM, Veterinarian at Century Animals Medical Centre

Animal healthcare is evolving in Malaysia, says Dr. Dennis Lim of Century Animals Medical Centre, and he and his team are keen to play a role in enhancing the quality and range of services available and increasing awareness amongst pet owners. In April 2013, the clinic became the first vet practice in the city of Sabah to install an in-house digital radiography system for diagnostic evaluations – the CR 10-X computed radiography (CR) solution plus a DRYSTAR 5302 tabletop printer.
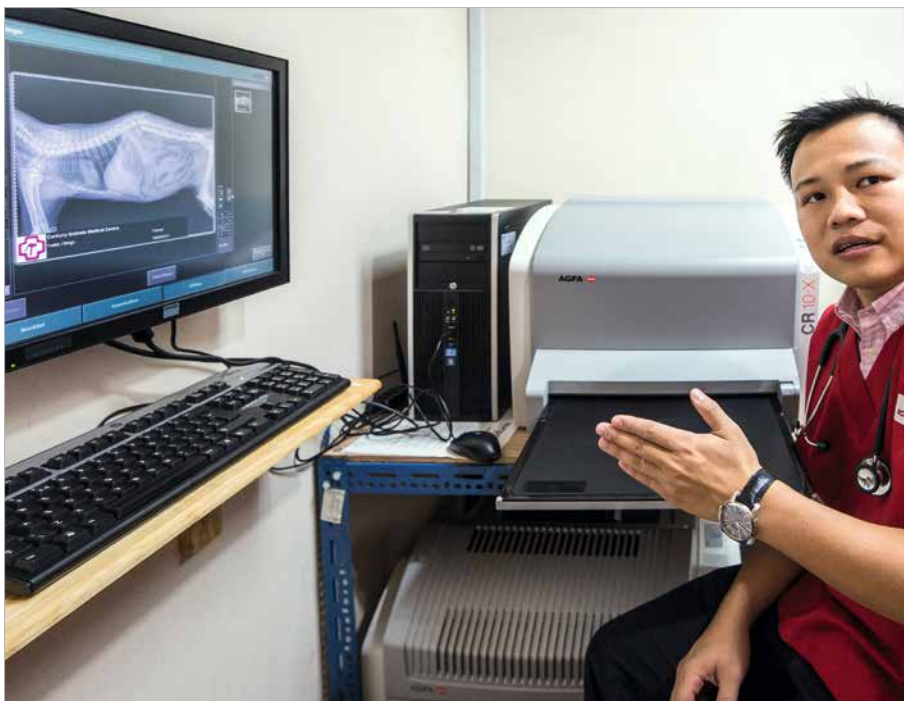

" The digital world is changing everything, including animal healthcare. We are proud to play a role in improving animal welfare in Malaysia. "

DR. DENNIS LIM
Veterinarian, Century Animals Medical Centre

Did you know...

As part of its efforts to promote animal welfare, Century Animals Medical Centre cooperates with NGOs and not-for-profit organizations. Recently, Dr. Lim travelled to the Santavana Forest Hermitage, a Buddhist retreat, to help deal with an outbreak of distemper amongst the many dogs living at the hermitage.

> " The CR 10-X offers the right quality and affordability balance. We were also impressed with Agfa HealthCare's staff, who were very supportive. Their responsiveness gives me confidence for our continued relationship. "

DR. DENNIS LIM

Balancing speed, quality and affordability

At the practice, three full-time vets and ten support staff care primarily for small animals such as cats and dogs. They are currently setting up an outpatient clinic about 10 km from the main site, and aim to establish similar centers in towns around the region over the coming years.

The installation of the CR 10-X is part of this on-going mission. "The 'younger generation' of vets like myself are accustomed to using X-rays and imaging as part of our diagnostic approach," explains Dr. Lim. "But we also need to make sure that new vets are being trained in the basics of diagnostic medicine."

After researching the options, Dr. Lim found that the CR 10-X was the right fit. "It offered the best quality and affordability balance," he explains. "We were also impressed with Agfa HealthCare's staff, who were very supportive. Their responsiveness gives me confidence for our continued relationship."

The CR 10-X has fit smoothly into the clinic and workflow, says Dr. Lim. "The vets decide which views they want and the nurses then make the images. Everyone is very pleased! With all the tools, the vets can zoom in, make measurements, adapt the contrast, and mirror or flip-flop the images, giving

much more diagnostic information. We can take more images and do lots of studies. The nurses and other staff are happy that the system is straightforward to use and very fast."

The customers, as well, are impressed with the system. "They enjoy receiving a copy of the images and we can show them what the problem is, so that they can see for themselves why imaging is important and why we recommend a specific treatment," he continues. "The digital world is changing everything, including animal healthcare. We are proud to be associated with Agfa HealthCare, and to play a role in improving animal welfare in Malaysia." ■

Bringing the benefits of digital radiography solutions to veterinarians

Total imaging solutions make animal care imaging easy and convenient.

INTERVIEW WITH RALF GEORGI, CEO Gierth X-Ray International GmbH
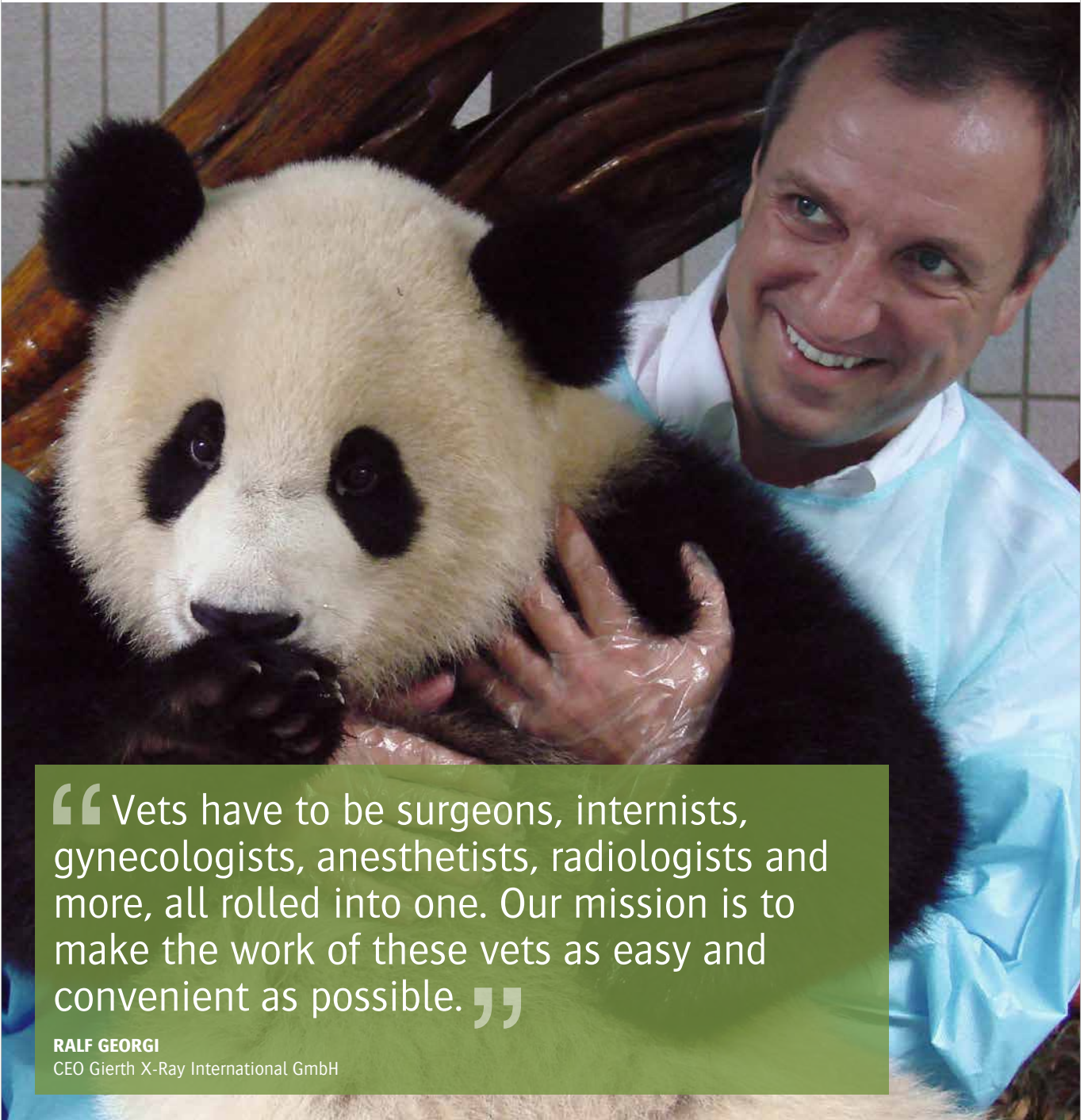
> " Vets have to be surgeons, internists, gynecologists, anesthetists, radiologists and more, all rolled into one. Our mission is to make the work of these vets as easy and convenient as possible. "
>
> **RALF GEORGI**
> CEO Gierth X-Ray International GmbH

Not that long ago, radiography for the treatment of animals lagged well behind developments in human medicine, and remained predominantly a film-based process. But throughout Europe, and certainly in Germany, that is changing fast. Gierth X-Ray International GmbH and Agfa HealthCare are partnering to play a role in that evolution, including through the implementation of complete, jointly-branded CR and DR solutions at all five of Germany's veterinary medicine schools.

Innovative digital radiography solutions for Germany's vet schools

Gierth, located in Riesa (near Dresden), Germany, is not only a successful distributor and complete solutions provider to veterinarian practices. This company, led by CEO Ralf Georgi, also develops and builds a range of X-ray accessories (including X-ray tables and stands), creating total solutions for all veterinary needs. As a trained veterinarian, Ralf Georgi is in an ideal position to understand the needs of animal care providers, from the inside out.

Compact dimensions, lightness and portability are the hallmarks of Gierth's innovative portfolio. "Many of our customers are veterinarians working on their own. Vets have to be surgeons, internists, gynecologists, anesthetists, radiologists and more, all rolled into one," explains Mr. Georgi. "At Gierth, our mission is to make the work of these vets as easy and convenient as possible, specifically when it comes to performing imaging exams. Today, high-resolution digital systems have fully caught up in terms of image quality. What is more, they open up a wealth of new opportunities in diagnostics and digital image communications."

Since 1999, Gierth has partnered with Agfa HealthCare, and now distributes a complete range of Agfa HealthCare digital radiography systems, typically as part of fully integrated, customized solutions. "In the scope of our partnership with Agfa HealthCare, we have supplied all five schools of veterinary medicine in Germany with complete Agfa HealthCare- and Gierth-branded radiography solutions. That alone is a great success," concludes Mr. Georgi. ■

Agfa HealthCare's solutions

■ Gierth distributes Agfa HealthCare's comprehensive range of CR solutions meeting high standards for productivity and workflow improvement, as well as for very high image quality.

> " Today, high-resolution digital systems have fully caught up in terms of image quality. What is more, they open up a wealth of new opportunities in diagnostics and digital image communications. And even for very small practices, the cost of digitization is no longer prohibitive. "
>
> **RALF GEORGI**

Did you know...

Several times a year, Ralf Georgi carries out field work at zoos and animal refuges around the world, using his X-ray generators and detectors. In 2007, he and his images helped diagnose pneumonia in Jing Jing, a female giant panda cub in China. Successfully treated, she went on to become famous as the mascot of the 2008 Beijing Summer Olympics.

Cornell University Hospital for Animals, Cornell University College of Veterinary Medicine, Ithaca, USA

Teaching with technology

DX-G supports education goals and quality animal care at top US veterinary college.

INTERVIEW WITH DR. MARGRET THOMPSON, DVM, DACVR, Associate Clinical Professor, Imaging – Section Chief

"We focus on ensuring that our students have the skills and knowledge they need for veterinary practice, and on acquiring the highest quality diagnostic examinations possible for our clinical patients" begins Dr. Margret 'Meg' Thompson, Associate Clinical Professor, Imaging and Section Chief at the Cornell University College of Veterinary Medicine. *"State-of-the-art solutions help us prepare new veterinarians and care for all types of veterinary patients."*

Teaching, research and service are the pillars that support the mission of Cornell's renowned College of Veterinary Medicine. An important part of the students' education takes place in the Cornell University Hospital for Animals, where each student participates in clinical rotations during the second half of the program. Clinical teaching is case-based, using the most up-to-date knowledge and educational strategies, while the best technologies for diagnosis and prognosis support patient care and research.

Advanced, automated image processing

Agfa HealthCare's MUSICA image processing adapted for veterinary use helps support the case-based approach. "There is no need to specify the processing algorithms; MUSICA uses data it already has. It provides absolutely consistent, reliable processing while being very easy to use. Because the image quality is so consistent, we can use the results to create high quality material for our case-based teaching. The images make better slides and didactic teaching materials," she continues.

> " We have to radiograph animals ranging in size from parakeets to dairy cows. The DX-G with needle plates gives us the resolution for the very small animals and the detector efficiency for the larger ones. "
>
> **DR. MARGRET THOMPSON, DVM, DACVR**
> Associate Clinical Professor, Imaging – Section Chief

In addition, the DX-G is the preferred X-ray modality of the technicians at the Cornell University Hospital for Animals, says Dr. Thompson. MUSICA gets all of the parameters it needs directly from the input image itself, automatically analyzes the characteristics of each image, and then optimizes the processing parameters.

Consistent and reliable images 'from parakeets to cows'

As a teaching hospital, it is critical for the Hospital for Animals to implement up-to-date technologies. Advanced imaging equipment includes CT, MRI, digital radiography, fluoroscopy, ultrasound and nuclear medicine. Radiographs are used widely for all types of animals and for all parts of the body. They are often the first imaging scan to be performed when investigating a problem and can be diagnostic on their own or useful when recommending additional types of imaging.

In 2012, the hospital installed a DX-G computed radiography (CR) solution with needle plates (NIP). The solution includes the NX workstation and MUSICA image processing software. Dr. Thompson comments; "We have to radiograph animals ranging in size from parakeets to dairy cows. The DX-G with needle plates gives us the resolution for the very small animals and the detector efficiency for the larger ones."

Imaging in the evolving veterinary practice

"The evolution in imaging has certainly had – and will continue to have – an increasing impact on animal care and the veterinary practice," she continues. "There is a trend for veterinarians to want to be 'certain' of a diagnosis, and imaging supports this. But the business side of the practice cannot be ignored. Whereas before a vet might have kept a film-based X-ray system for 20 years without needing to make a new investment, that is no longer practical. Imaging systems are more critical to the service the veterinarian is providing, and the systems are constantly evolving and improving. Imaging must be seen as an on-going investment. Individual vet practices will continue to offer imaging services, but the advantages of digital imaging are also driving forward the concept of imaging centers." ■

Holmes and Murphy, Llandudno, Wales, United Kingdom

Small clinic offers big service

Personal approach plus top technology add up to success.

INTERVIEW WITH SARAH HOLMES and **FIONA MURPHY,**
Veterinarians & partners, Holmes & Murphy

" Digital radiography is no longer a luxury for vet practices… Our CR 30-X has been invaluable for us not just in caring for our patients but in connecting with their owners. "

SARAH HOLMES (left)
Veterinarian & partner, Holmes & Murphy

The system was so easy to learn and use. It was one less thing for us to worry about and has proved itself a real asset for us!

FIONA MURPHY
Veterinarian & partner, Holmes & Murphy

Vets Sarah Holmes and Fiona Murphy had a clear vision: to open an animal care practice that reflects how they would want their own pets treated. But their two-vet practice in Llandudno, Wales (UK), with two vet nurses and three receptionists, has exceeded even their own dreams, experiencing a gratifying success over the seven months since it opened.

Taking the time to listen

"We book appointments starting earlier and ending later in the day, to better fit our clients' schedules. Each appointment is 20 minutes, which gives us the time to really listen to the pet owners, find out any problems and discuss treatment options. We are the only local vet with separate dog and cat areas," Dr. Holmes lists some of the service aspects that she believes have helped this new, small vet practice thrive.

Did you know...
The CR 30-X at Holmes & Murphy is the 400th sold by distributor Celtic SMR.

> " The CR 30-X is compact enough to keep in the X-ray room. So if we have sedated an animal for an X-ray exam, we can keep an eye on it while we make the images. For a small practice like ours, with a limited and busy staff, this has been a real advantage! "
>
> **SARAH HOLMES**

CR 30-X computed radiography solution for veterinary use

This high-volume tabletop CR system is ideal for vet practices. It includes:

- MUSICA image processing which analyzes each image and automatically applies the appropriate image enhancement parameters independent of the exam type.
- NX workstation, which provides very fast image acquisition and a smooth workflow.
- The intra-oral dental option for veterinary practices, which is available in all sizes, for different types of animals.

The two vets planned their clinic literally from scratch, down to the empty building that was, says Dr. Holmes, "a blank canvas for us to work with." One thing she knew they needed from the start, though, was an Agfa HealthCare CR 30-X tabletop computed radiography (CR) system. "Digital radiography is no longer a luxury for vet practices," she explains. "Our competitors all have it, so we knew it was a necessary investment. But it has really paid off! In fact, it's been invaluable for us not just in caring for our patients but in connecting with their owners."

Dr. Holmes had worked with the CR 30-X before, while Dr. Murphy was familiar with another system. Dr. Holmes: "I knew the CR 30-X was right for us. It makes great images and fits into our limited space. We can send images by email – whether to clients or to get a second opinion. The cassette system is sturdy – which my colleague really liked, as the system she had worked with was harder to handle. And while like any new business, we had some 'teething' problems getting started, we've had absolutely no problems with the CR 30-X." ∎

Acquario di Genova, Genova, Italy

Agfa HealthCare and Acquario di Genova: acting together for animal welfare

CR 30-X's excellent image definition helps diagnose sea creatures in a safer environment.

INTERVIEW WITH DR. CLAUDIA GILI, DVM, PhD, Director of Science and Veterinary Services of the Acquario di Genova

" I wasn't expecting such a detailed image definition: we can observe the smallest details in all kinds of species, from a tiny sea horse to a 300 kilo dolphin! "

DR. CLAUDIA GILI
Director of Science and Veterinary Services of the Acquario di Genova

Imagine needing to X-ray a shark! This is just one of the challenges faced by the team at the Acquario di Genova. As fast and safe diagnosis of her patients is critical for Dr. Claudia Gili, Director of Science and Veterinary Services of the aquarium, she needed to find a solution that would allow thorough X-ray examinations with a good image quality while ensuring complete safety for the veterinarians. "Sea animals that are especially large or very small add to the difficulties," she comments. Implementing the CR 30-X computed radiography solution has been a major breakthrough for the aquarium's veterinary activities.

A unique environment for animal care

While the mission of Acquario di Genova is to educate visitors about safeguarding aquatic environments, it is of course also very active in research and conservation.
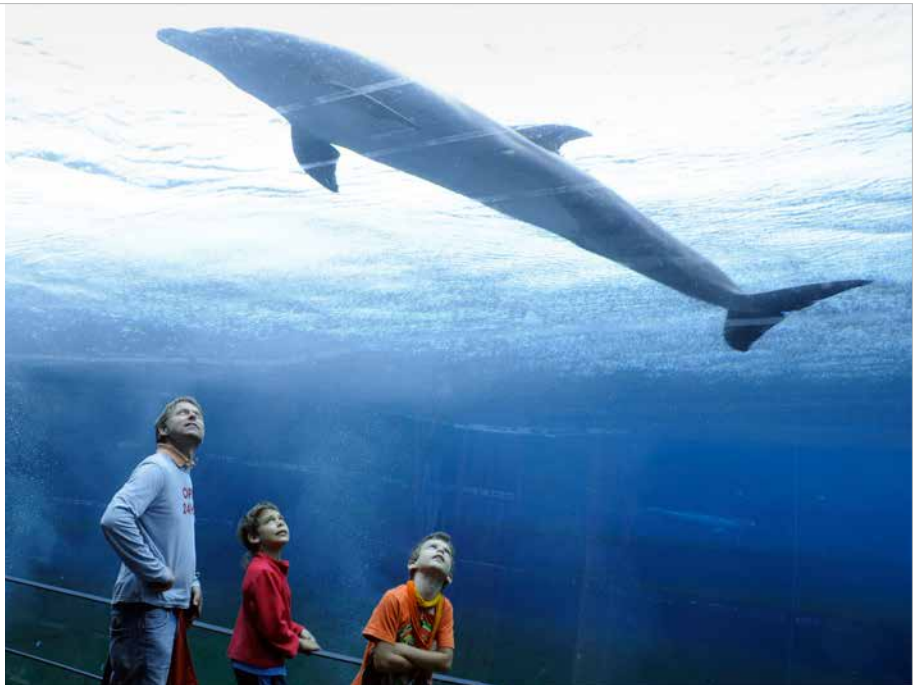
> " We were looking for a portable system: we need to be able to go to our patients, not the other way around. "
>
> **DR. CLAUDIA GILI**
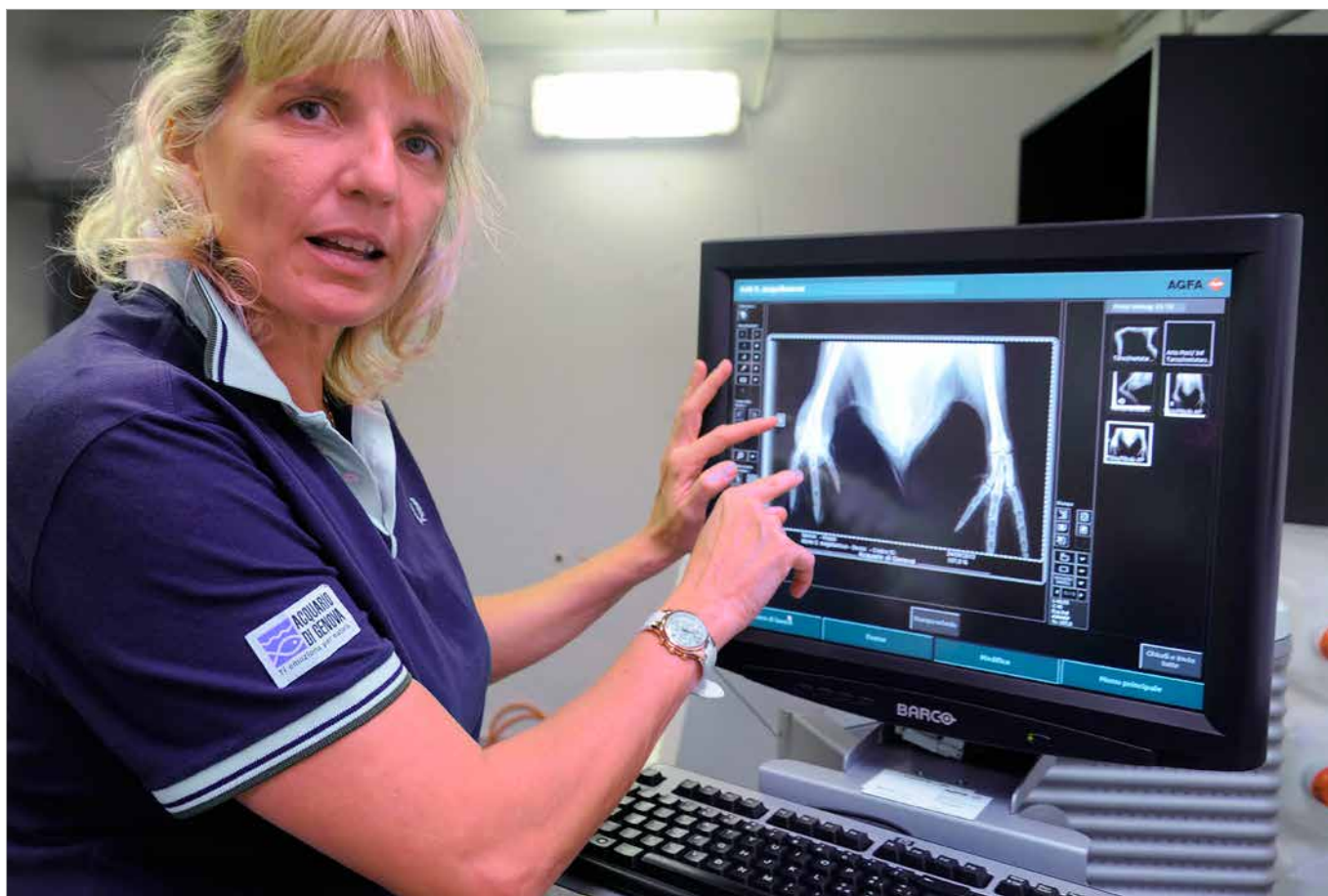
Dr. Gili's scientific research mainly revolves around conservation of corals, reptiles and cetaceans, plus veterinary activities. "The vet laboratories are equipped to treat patients for trauma and infections, and to carry out the related rehabilitation projects," she explains.

Up-to-date equipment is vital for the smooth functioning of healthcare activities in all fields of medicine, and animal care is no exception. But at the aquarium, the challenges can take on unique aspects. For example, to carry out X-rays, the veterinarians can be exposed to radiation in exceptional conditions – such as the shark imaging! Before, as the aquarium had no X-ray equipment, the animal patients had to be sedated and transported to other facilities for imaging. This was both stressful and dangerous for the animals. So when Dr. Gili decided it was time to find a solution that would eliminate the need to move the animals around, she turned to a colleague for advice: Dr. Daniel García Párraga from Oceanogràfic in Valencia. He recommended Agfa HealthCare and its CR solutions.

Safety, flexibility and the ability to share digital images in real time

The CR 30-X answered all of the aquarium's special needs. Compact, portable and flexible, it can be adjusted to the various species and sizes of sea creatures. Dr. Gili continues: "With the CR 30-X we can perform X-ray exams on even our most delicate patients in the various enclosures without causing them distress, and subsequently adapt the images with the CR 30-X. And with certain precautions – such as carefully wrapping the equipment – we can even occasionally use the system in a very wet environment."

While the CR 30-X has made imaging much easier on both veterinarians and patients, the excellent image quality was a bit of a surprise for the team. "The MUSICA image processing technology offers extraordinary image definition, beyond what I was expecting!" says Dr. Gili. "We can observe the smallest details in all kinds of species, from a tiny seahorse to a 300 kilo dolphin. For example, we have used it to diagnose egg retention in fish and reptiles, which can be a serious problem


CR 30-X

- The CR 30-X is ideal for the diagnosis of the sea animals at the aquarium.

- MUSICA image processing automatically applies the appropriate image enhancement parameters for a consistent image quality, for both small and large animals. This helps eliminate the need to retake images, reducing the number of times an animal must be restrained and decreasing the impact of the handling on the animal's wellbeing.

- The NX workstation allows a smooth workflow and sharing of images for a faster diagnosis.

- The digital solution is environmentally friendly.

> **The cooperation with Agfa HealthCare was excellent: everything went smoothly, the team was extremely professional and the quality of the digital images is fantastic!**
>
> **DR. CLAUDIA GILI**

for the little animals. The possibility to adapt the images can eliminate the need to recapture and further restrain the animals in order to perform retakes; this is very important for preserving the animals' safety and welfare."

She also explains that being able to share results instantly with colleagues around the world has become a vital asset for a prompt and correct diagnosis of the patient. "When the health of our patients is at risk, there's no time to lose! But with digital radiography, we can start the workflow for treatments immediately. The CR 30-X solution has really proved itself ideal for our human staff and our animal patients."

"Finally, Acquario di Genova is certified for environmental protection (ISO 14001) and we are very careful about the sustainability and impact of our activities. A solution that does not require processing chemicals for X-rays is certainly a winning choice for our planet," Dr. Gili concludes. ■

Did you know...

- The Acquario di Genova welcomes between 1 and 1.2 million visitors per year. It directly employs 100 people, but thanks to its related tourism, the area enjoys a spillover effect in terms of employment.

- Sharks, salamanders, turtles, snakes, penguins, dolphins and much, much more: the Acquario di Genova features the greatest variety of eco-systems of any aquarium in Europe. Dr. Gili's team sees over 500 species each year.

- Acquario di Genova is involved in many projects for the conservation of aquatic species, in particular: bottlenose dolphins, seals, aquatic reptiles and amphibians, seahorses, finfish and sharks, corals and many more. In 2013, Acquario di Genova was made project leader of the new, 1.3 million euro LIFEEMY project funded by the European Union, to support conservation activities for European pond turtles. In July, 70 species of European pond turtles, which were raised for the first years of their lives at the aquarium, were released into the wild.

Vet practice Sarah Huybrechts, Lokeren, Belgium

Digital imaging for 'first line' care

Small vet practice enhances service and increases revenue streams with CR 10-X.

INTERVIEW WITH SARAH HUYBRECHTS, Veterinarian at vet practice Sarah Huybrechts

Limited space and careful management of resources never stopped veterinarian Sarah Huybrechts from offering top-notch, first-line, personalized animal care. To move forward, however, she decided to add digital imaging to her range of services – and the CR 10-X fit her space, needs and budget. Already, the increased productivity and business opportunities are supporting her in ensuring her animal patients receive the care they need and in giving their owners peace of mind.
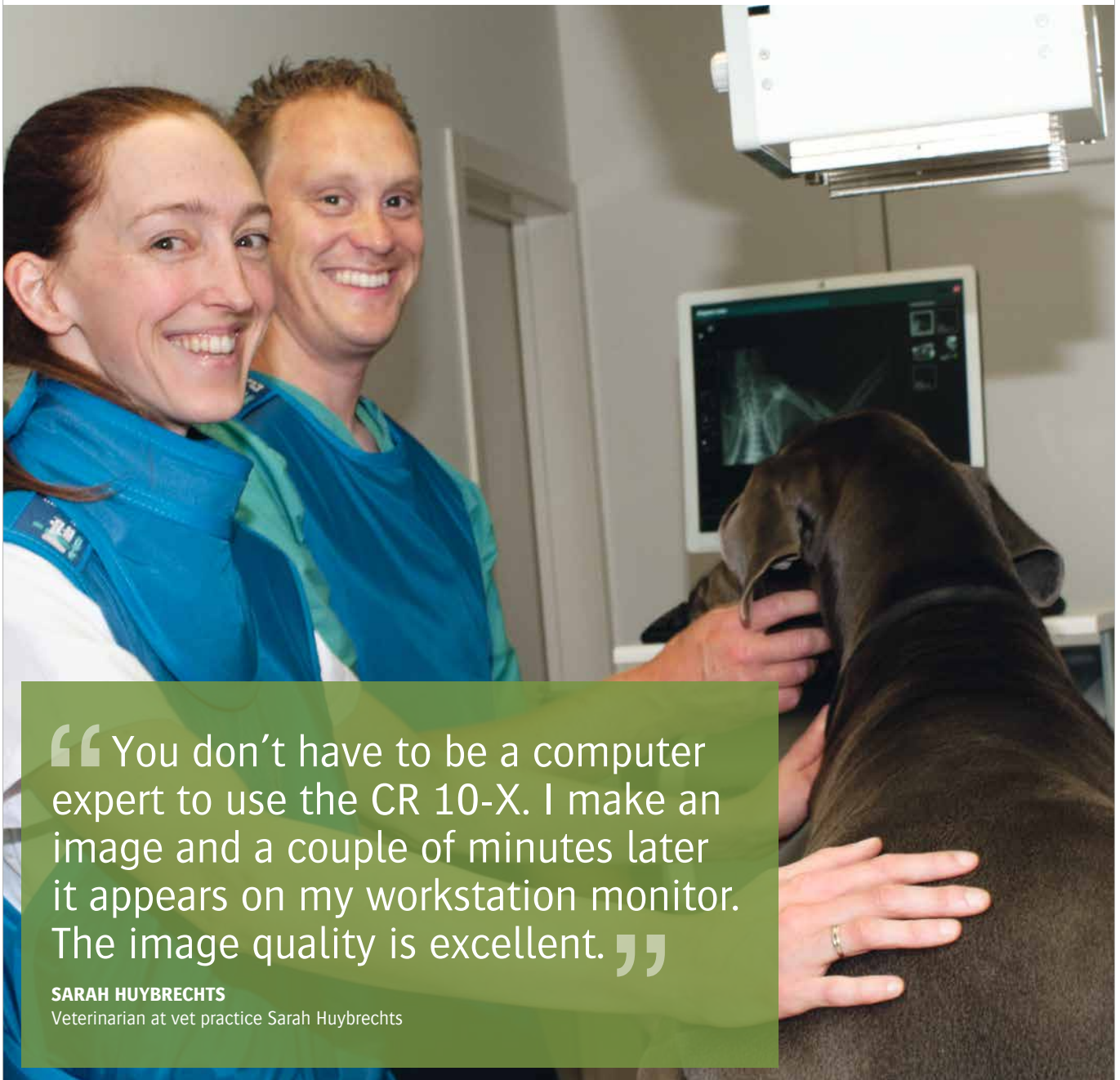
> **"** You don't have to be a computer expert to use the CR 10-X. I make an image and a couple of minutes later it appears on my workstation monitor. The image quality is excellent. **"**
>
> **SARAH HUYBRECHTS**
> Veterinarian at vet practice Sarah Huybrechts

Compact, economical CR system helps improve patient care

Working out of her dedicated practice space in her private home in Lokeren, Belgium, Sarah Huybrechts offers first-line care primarily for cats, dogs, rodents and ornamental poultry. Until recently, she didn't believe it was feasible for her to offer imaging in-house. "Animals that needed X-rays would stay at my clinic, and in the evening after consultation hours I would take them myself to a colleague with the equipment," she explains. As more practices introduced digital imaging, however, Sarah Huybrechts became aware that these solutions could fit into even a smaller practice such as hers.

After visiting several other practices and speaking with well-respected distributor X-Ray Verachtert Digital, Sarah Huybrechts decided the CR 10-X offered the quality and ease of use she wanted, in a compact, economical computed radiography (CR) solution. "You don't have to be a computer expert to use it. I make an image and a couple of minutes later it appears on my workstation monitor. The image quality is excellent," she describes.

With the new system, a complete consultation with X-ray takes her no longer than half an hour. The pet owners are pleased to see the images directly on the screen, and Sarah Huybrechts found this led to an unexpected benefit:

> " With my CR system, imaging is so fast and easy that my clients are much more open to having imaging procedures carried out. This definitely improves patient care. "
>
> **SARAH HUYBRECHTS**

CR 10-X

Affordable computed radiography (CR) solution that makes no compromises on image quality:

- Convenient and fast workflow.
- Fits in small spaces.
- Robust yet easy to install and maintain.

> " Acquiring a CR system is certainly an investment, but even for a smaller modern practice, it definitely yields a return! I would say to other vets: just do it. "
>
> **SARAH HUYBRECHTS**

"Before, the pet owners hesitated before having their animals X-rayed: they might just go home and try to treat the problem with pain killers for example. But now it is so fast and easy, they are much more open to the fact that imaging can help solve their pet's problem. This definitely improves patient care: for instance, if a rabbit is not eating, an X-ray can help determine the cause, such as gas or an obstruction in the bowel. Acquiring a CR system is certainly an investment, but even for a smaller modern practice, it definitely yields a return! I would say to other vets: just do it." ■

Did you know...

"X-Ray Verachtert Digital has an excellent reputation among vets in Belgium. They deliver excellent service and can always be reached... My full system (X-ray table + CR) was up and running in one day."
Sarah Huybrechts

White paper

FRANS FEYTENS
Sr. Application Manager – Solutions Development – Agfa HealthCare

Image processing can make or break digital X-ray images

In recent years, new technologies in medical imaging, in particular computed radiography (CR) and direct radiography (DR), have become both more compact and more affordable, making them increasingly appealing alternatives to conventional film and development.
In this article, we consider the important role of image processing software for these digital radiography solutions.
In effect, when you are preparing to make the change to digital radiography, it is important to consider not only the quality of the detector itself, but also the image processing software that is delivered with the solution. Here's why, and what to consider.

Image processing: an absolute necessity

Some people claim that digital images cannot offer the same image quality as conventional film, but this is only partially true. Classic film/cassette/screen systems do intrinsically offer a very simple sort of image processing, which results, for example, in images in which soft tissue and bone are often not visible at the same time. But with computers, we have many more possibilities; in principle, all information from a raw image can potentially be provided in a balanced and easy-to-interpret way.

Digital detectors capture almost all of the information from X-ray images. However, the radiation range is so large that raw, unprocessed images are unclear. Without image processing, they become more or less impossible to interpret for the human eye, and consequently cannot be used for diagnosis.

To enhance the visibility of the details, CR and DR systems always include image processing. This function is usually integrated within the workstation used for making the images. However, the possibilities and the quality of the software can vary a lot, so be alert.

The systems currently available on the market can be broadly classified into three groups:
1. basic image processing systems;
2. conventional systems with multi-resolution image enhancement;
3. sophisticated, automated systems with multi-resolution image enhancement.

Basic image processing systems

The most basic systems for image enhancement offer a limited set of basic functions. With such a system, the veterinarian can perform a number of general processing tasks, such as adapting the grey tones for the anatomical part he wishes to examine; using a filter to make the image sharper; adjusting the contrast by equalizing the histogram; optimizing the image noise; etc.

This type of software first emerged from 1985-1990; it is still supplied today in combination with CR and DR systems by a number of, mostly local, veterinarian suppliers.

But to get a good result with these elementary software systems, you will usually need to do quite a lot of manual post-processing for each individual image. Not only is this time-consuming, but it isn't always easy to visualize all the relevant information that is potentially available in the image in an optimal way. In other words, the image quality may not always be satisfactory.

Conventional systems for image processing

When CR systems were introduced for human healthcare in the beginning of the 1990s, they stimulated the need for a more powerful and convenient image processing. This led to the development of a new generation of software based on multi-resolution technology. Essentially, these software systems split the image into different frequency components, each of which is processed separately. The image is then recomposed, resulting in an image with enhanced contrast and more visible information.

When the veterinarian selects an exam type on the workstation, an image processing algorithm is applied automatically, based on an extensive range of values that have been predefined for that specific exam type. So it is important to configure the correct image processing for each exam, including factors such as the body part, exposure dose, patient position, patient weight, possible use of contrast media, etc.

This is rather labor-intensive, but when done properly, the images are easy to interpret, and require only limited manual post-processing by the veterinarian. In practice, the configuration is not always carried out perfectly, so more post-processing is required.

An example of this type of technology is Agfa HealthCare's first-generation MUSICA image processing software, which was released in 1993. The acronym MUSICA stands for *MUlti Scale Image Contrast Amplification*.

Advanced, automated image processing

Second-generation multi-resolution image enhancement software has been available since 2007. This software analyzes the incoming raw image and then independently applies a very extensive set of parameters for image optimization. All the parameters needed to generate an optimal image are automatically derived or calculated based on the raw image.

RAW IMAGE

PROCESSED IMAGE

With this software, the image is first split into its different frequency components (the multi- resolution decomposition). Next, a number of adjustments take place: details with too-high contrast are attenuated; details with subtle contrast are enhanced; edges are sharpened when relevant; noise in lower contrast areas is minimized. The image is then recomposed (the multi-resolution reconstruction). All of this takes only a fraction of a second, and is completed automatically.

After the image acquisition, the user receives a turnkey image on the screen, which visualizes all clinical information from the raw image in a balanced way. This almost always allows the user to make a diagnosis at a glance.

So as we see, the newest generation of software for image processing delivers images with a consistently high quality, while making manual post-processing almost redundant. Very little pre-configuration of the system is necessary, allowing an easier and quicker installation.

Another important advantage is that both soft and bone tissue are visible simultaneously in the same image, which was unthinkable with conventional X-ray images. This can be interesting in cases such as, for example, a tiny fracture that is hardly visible in the bone, but with a clearly visible injury of the surrounding tissue.

Agfa HealthCare's second-generation MUSICA is an example of this type of more recent technology.
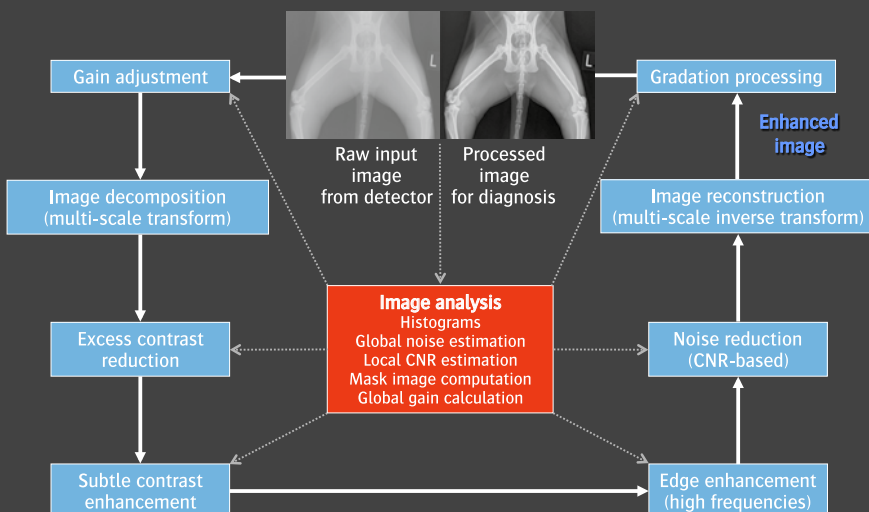
Specific modules for veterinarians

Vendors of these sophisticated systems offer both universal versions for veterinary radiology and specialized packages that are optimized for either small or large animals. This allows the same digital radiography system to deliver excellent images for every sized animal from cats to horses, and more.

Conclusion

Veterinarians who are considering making the change to digital radiography are well advised to extensively evaluate the quality of the CR or DR detector. But just as important is the quality of the image enhancement software that comes with the solution. The basic systems don't always deliver images that meet your expectations, while the first generation of the more advanced multi-resolution image processing software still requires quite a bit of manual configuration. If you want your images to appear on screen automatically and with optimal quality, a second-generation advanced image processing system may be the best choice for you. ■

Advanced, automated image processing: main steps

Gain adjustment

Raw input image from detector

Processed image for diagnosis

Gradation processing

Enhanced image

Image decomposition (multi-scale transform)

Image reconstruction (multi-scale inverse transform)

Image analysis
Histograms
Global noise estimation
Local CNR estimation
Mask image computation
Global gain calculation

Excess contrast reduction

Noise reduction (CNR-based)

Subtle contrast enhancement

Edge enhancement (high frequencies)

Precision diagnostics lead to a bright future

By reducing costs and sharing images, multi-site Brazilian vet center keeps moving forward.

INTERVIEW WITH EDGAR SOMMER, Veterinarian & owner, Provet

With its CR 30-X computed radiography (CR) system and SE Suite of image data management software, Brazilian veterinary diagnostic center Provet has found the ideal partners to help it reduce costs, improve workflow and even avoid being caught in São Paulo's daily traffic congestion. Provet's owner, veterinarian Edgar Sommer, explains the benefits of implementing these solutions and how they fit his center's unique needs in this bustling metropolis.
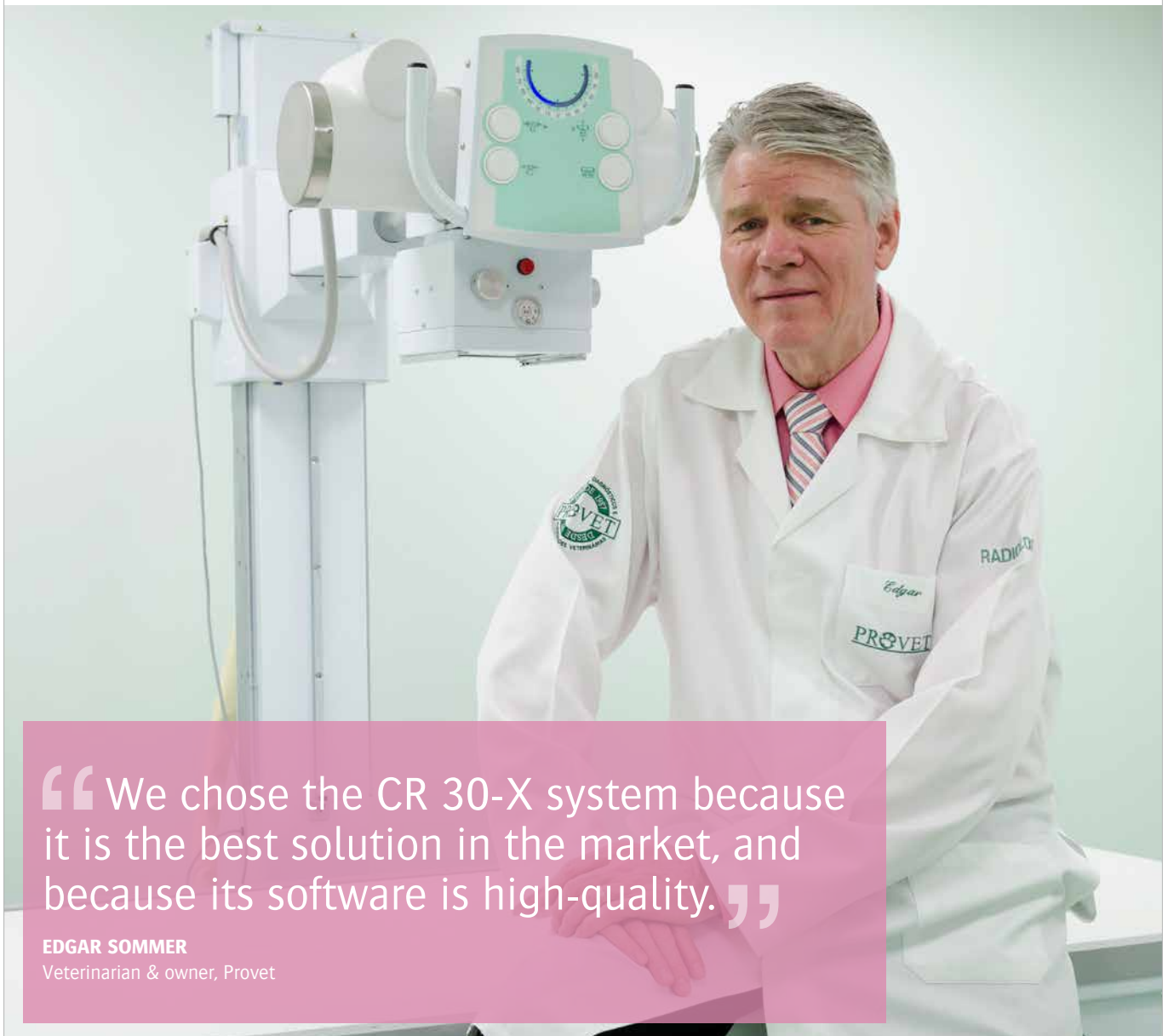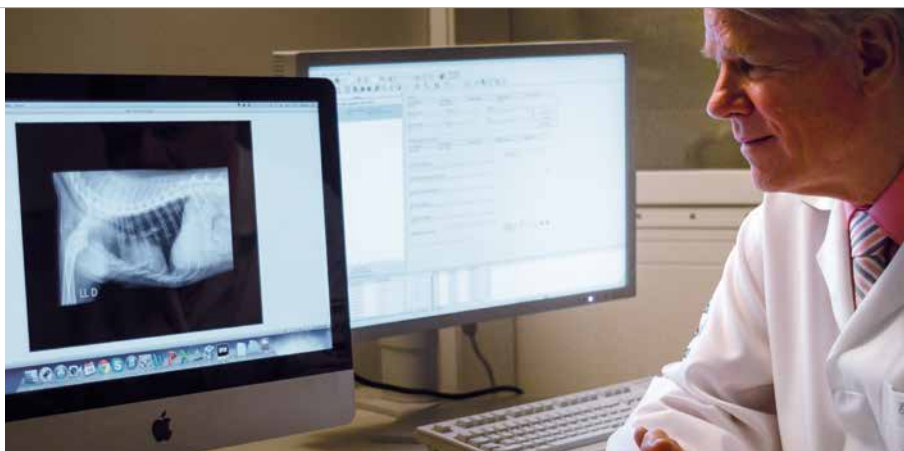
> " We chose the CR 30-X system because it is the best solution in the market, and because its software is high-quality. "
>
> **EDGAR SOMMER**
> Veterinarian & owner, Provet

> **"** Once you have adapted yourself to this new technology, it is impossible to go back. You even forget how to use those old-fashioned machines and feel awkward around them. Humans were not made to go backwards. **"**

EDGAR SOMMER

CR 30-X
- High-volume tabletop CR system is ideal for vet practices.
- MUSICA image processing analyzes each image and automatically applies the appropriate image enhancement parameters independent of the exam type.
- NX workstation provides very fast image acquisition and a smooth workflow.

SE SUITE
- Complete and self-contained software solution includes comprehensive image archiving and distribution solution, with integral viewing functionality.
- Manipulation, management and centralization of medical imaging data offers greater diagnostic confidence across sites.
- Competitively priced to make it accessible to veterinary centers.

Avoiding bottlenecks – in traffic and workflow

Provet's story almost ended in 1987, when investors decided to pull out of the business. But since then, this center has made an inspiring come back and is now known as one of the most advanced veterinary diagnostic centers in South America. Having implemented the SE Suite client and server along with the CR 30-X in two of its four sites, Provet is looking forward to an even brighter future.

The direct clients of the center are referring vets, and Dr. Sommer knows how important it is to be where they are. But in this incredibly busy city, being physically present is often a real challenge. Previously, two veterinary radiologists lost about three hours every day travelling between the sites. "Traffic jams are a massive problem in São Paulo. But with the SE Suite and CR 30-X, our reports and images can be easily transmitted in a digital way. So there is less need to face the streets – a big consideration for us," he explains.

For Provet, two of the most important benefits of the CR 30-X and SE Suite are cost reduction and greater agility in everyday tasks. Dr. Sommer explains that, "it is possible to quickly retrieve all the saved images for a patient, which makes our work much easier." In terms of costs, he appreciates that "repeating an image is almost never needed, because if you make a small mistake, the MUSICA software corrects it. This reduces the radiation received by technician, owner and pet, as well as prolonging the life of the X-ray tube. It's all good."

With many years of experience in the industry, Dr. Sommer knows what animal owners in Brazil want from their vets. "They expect to leave the vet's office with something to show for the appointment, not empty-handed. It's great to be able to provide the owner with a CD containing all of the images, so they can present these straightaway to the referring vet," he explains, with a proud smile. ∎

Did you know...
- At least 270,000 exams are processed by Provet every year. The four sites in São Paulo offer more than 600 types of exams, including MRI.
- With the MUSICA image processing tool, Provet was able to finally discover the cause of a dog's discomfort: a piece of wood lodged deep inside his nose, which was not found by other radiographic equipment.

Univet Finland Kouvolan Eläinlääkäriasema

Direct radiography:
getting into the details

For large Finnish vet practice specializing in orthopaedics,
DX-D 400 proves the perfect fit.

INTERVIEW WITH DR. ESA KESTI, DVM, Specialist in Vet. Med. M Small Anim. Dis. and CEO Vet of Kouvolan Eläinlääkäriasema

> **"** When you do as many images as we do, they have to be good the first time and they have to be fast. With the DX-D 400, we have few retakes and we get our images very quickly. **"**
>
> **DR. ESA KESTI, DVM**
> Specialist in Vet. Med. M Small Anim. Dis. and CEO Vet of Kouvolan Eläinlääkäriasema

While many vet practices opt for the compact imaging solutions that best fit their space constraints, Kouvolan eläinlääkäriasema of Finland, part of the Univet/Evidensia Group, went the other way: installing Agfa HealthCare's scalable DX-D 400 direct radiography (DR) solution. Configured with the wireless DX-D 30C digital detector and MUSICA, Agfa HealthCare's dedicated veterinary image processing software, this solution offers the larger X-ray table and high resolution they need for modern small animal orthopaedics, says orthopaedic veterinarian and CEO Vet of Kouvolan eläinlääkäriasema, Esa Kesti. At the same time, the productivity benefits are helping from the business side. "If you invest in good quality, you'll get your investment back," he affirms.

> " In orthopaedics, it is absolutely critical to have excellent resolution... I can always tell when an image came from an Agfa HealthCare solution. "

DR. ESA KESTI, DVM

With its seven veterinarians and fourteen nurses, Kouvolan eläinlääkäriasema is one of the larger clinics in the 16-clinic Finnish Univet Group. Seeing between 14-16,000 patients a year, the clinic has serviced the healthcare needs of family pets in Kouvola, Finland, for over 20 years. In addition to general animal healthcare, the clinic specializes in orthopaedics and back problems.

Meeting vets' unique needs – in orthopaedics and beyond
Over his many years, Dr. Kesti has seen a lot of evolution in the specialty. "10-15 years ago, we had to use equipment used for humans for small animals, which obviously wasn't ideal," he comments. "It was hard to find suitable implants for very small orthopaedic patients."

But orthopaedic and other animal healthcare technology has been shadowing human healthcare developments, in Finland as in other countries, he continues. "Suppliers are much more aware of our specific needs."

Imaging technology for vets has also evolved, which is why the clinic decided to replace its existing X-ray system with a new DR solution.

"In small animal orthopaedics, it is absolutely critical to have excellent resolution," says Dr. Kesti. "The average weight of our patients is under 10 kilos, so it can be very hard to make out details." Other Univet clinics have worked with the CR 30-X computed radiography (CR) solutions for years, and Dr. Kesti says he could see the good quality of the resulting images. "We collaborate a lot with our colleagues, and often send images back and forth. I can always tell when an image came from an Agfa HealthCare solution." With that in mind, he looked to Agfa HealthCare to find a solution that would meet the specific needs of his clinic.

Configurable DR solution accommodates specific needs
"With Kouvolan eläinlääkäriasema's specialization in orthopaedics, they wanted a big X-ray table, which is less
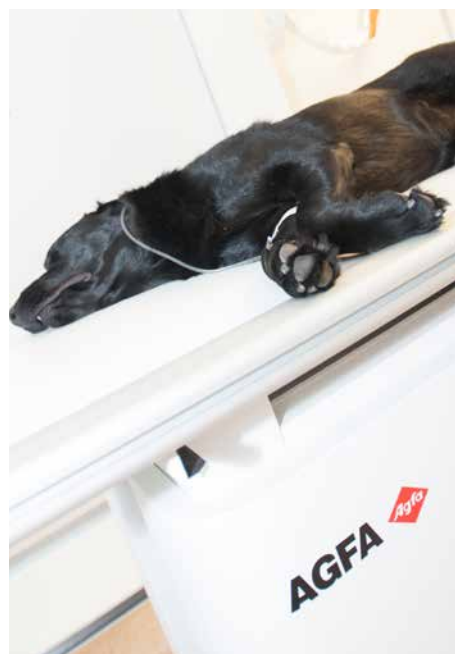
> **"** If you invest in good quality, you'll get your investment back. **"**
>
> **DR. ESA KESTI, DVM**

DX-D 400 with DX-D 30C Cesium Iodide (CsI) wireless detector

- Compact and versatile, with robust, high-quality, precision hardware.
- Fast and reliable imaging system with large X-ray table.
- Wireless detector, for enhanced flexibility and convenience.
- Includes MUSICA image processing, optimizing images for both large and small animals.

> **❝ With the DX-D 400, we are getting better details. When we can see more, we can make more confident diagnoses. ❞**

DR. ESA KESTI, DVM

Did you know...

■ Univet owns and operates 16 vet clinics in Finland. The company was founded in 2008 and is based in Espoo, Finland. Kouvolan eläinlääkäriasema is one of the group's largest clinics.

■ Univet is part of Evidensia, Northern Europe's largest veterinary chain consisting of more than 80 animal hospitals and clinics in Finland, Sweden, Norway and Denmark.

usual for a vet clinic," comments Arja Väyrynen, Key Account Manager at Agfa HealthCare Finland. "But since we have a complete range of CR and DR solutions, we knew we could accommodate them. This is the first DX-D 400 to be installed in a vet clinic: it's a very configurable system, which we fitted with the wireless DX-D 30C digital detector. This solution adapted very well for their specific needs and proved the right fit. Univet clinics have now installed both our CR and our DR solutions, which shows how we have solutions and packages that meet the broad range of veterinary needs."

Dr. Kesti agrees: "The resolution is as excellent as I had hoped: I'd never seen anything like it! The image processing software MUSICA is very easy to configure and use, and is specific for

animals. While this is important for all our imaging needs, it is especially critical for the orthopaedic work we do. Surgery to e.g. fit a hip prosthesis on a large dog requires careful planning, and the images are key. But also with thorax or abdominal images, we are getting better details. When we can see more, we can make more confident diagnoses."

Faster workflow supports return on investment

But Dr. Kesti says that the DX-D 400 with DX-D 30C wireless detector has supported the clinic's business needs, too. "When you do as many images as we do, they have to be good the first time and they have to be fast. With the DX-D 400, we have few retakes and we get our images very quickly. We chose the wireless DR detector to make it even easier for us

to move around the table. The solution is fast and reliable, and it speeds up our workflow!"

What's more, Dr. Kesti explains that installing the DX-D 400 fit with the clinic's goal of staying at the forefront of vet technology in Finland. "Pet owners demand high technology; I don't think that is unique to Finland. We are fortunate that as a large clinic we can justify investing in top-of-the-line equipment. For example, we were the first vet clinic in Finland to install a CT."

"Maybe not every vet clinic needs DR: you have to use it enough to get a return on the investment. But digital imaging, yes: whether with CR or DR, you have to keep moving forward," Dr. Kesti concludes. ■

When East meets West,
diagnosis is key

Digital imaging helps support a unique blend of treatments at fast-growing vet clinic.

INTERVIEW WITH DR. APRIL LINSON, Veterinarian, co-owner Woodland Hills Pet Clinic

> **❝ With the CR 10-X, we get more patients through, and we don't hesitate to say 'We need X-rays, it will just be a few minutes'. ❞**
>
> **DR. APRIL LINSON**
> Veterinarian, co-owner Woodland Hills Pet Clinic

At Woodland Hills Pet Clinic, modern and traditional treatments, from the east and the west, come together in what co-owner and vet Dr. April Linson describes as still a fairly unique blend: "A small percentage of practices now offer some 'traditional' or herbal medicine or acupuncture. But I don't believe they are as integrated as we strive to make them at our clinic." But turning to these alternative treatments doesn't mean rejecting modern technology. On the contrary: Dr. Linson sees technologies such as digital imaging as crucial for diagnosis.

Giving more patients better care

"Technology helps us to be better vets: the more information we have, the better diagnosis we can make. And that is critical whether you are choosing to follow a treatment based on western or eastern medicine," she insists. "It is even critical to helping us to determine if a western or eastern treatment is most appropriate. Digital imaging can be especially useful for musculoskeletal cases, but it goes far beyond, as well."

An experienced vet who formerly had her own practice in Ohio, Dr. Linson and business partner Kim Moore opened the Woodland Hills clinic in 2007. "We purchased an existing vet clinic site, which came with an old X-ray machine with hand-tank processing. Unfortunately, the economic downturn affected our ability to make technology investments, but when we moved to our new location in January 2013, upgrading to digital imaging was high on our list."

The clinic chose the CR 10-X computed radiography (CR) solution. "I was already looking at Agfa HealthCare solutions, and I had a contact I trusted at their distributor, ClienTrax. I asked around, as well. The CR 10-X was the right price point; the image processing software requires little manipulation and you get a great image with few repeats."

But Dr. Linson had two main concerns when selecting a digital imaging solution. "I had worked with another brand of digital imaging system in the past, and we were always having problems: we needed to repeat shots, the manipulation wasn't good. Agfa HealthCare promised that wouldn't happen with their solution, and they were right!"

Her other concern was ensuring that the solution would allow the clinic to continue growing. "Since we've moved,

> **"** In eastern or western medicine, you need the right diagnosis in order to find the right treatment. Imaging helps reach that diagnosis. **"**
>
> **DR. APRIL LINSON**
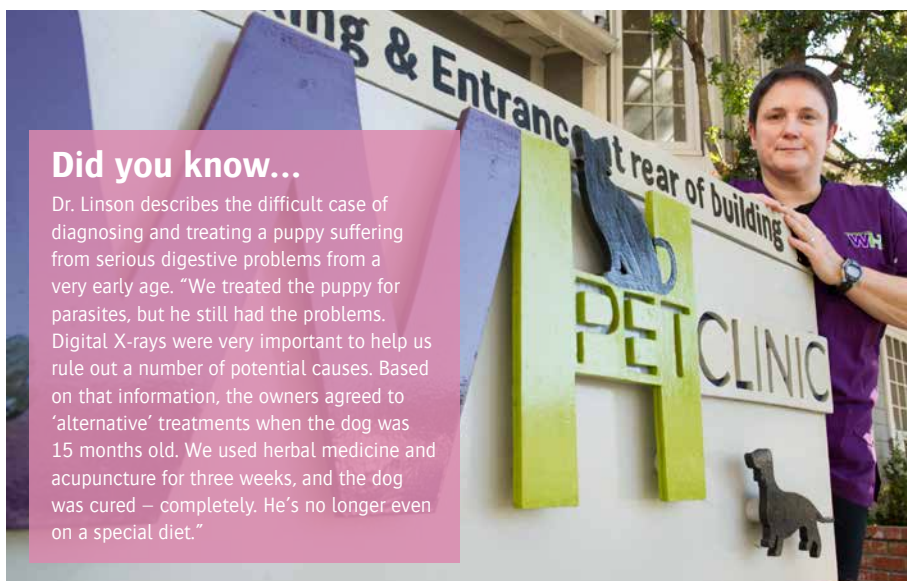
Did you know…

Dr. Linson describes the difficult case of diagnosing and treating a puppy suffering from serious digestive problems from a very early age. "We treated the puppy for parasites, but he still had the problems. Digital X-rays were very important to help us rule out a number of potential causes. Based on that information, the owners agreed to 'alternative' treatments when the dog was 15 months old. We used herbal medicine and acupuncture for three weeks, and the dog was cured – completely. He's no longer even on a special diet."

our business has already grown 38% so far this year! With the CR 10-X, we can get more patients through, while also taking more images. That means that,

in addition to allowing us to improve the care we offer, the CR 10-X has proved to be an investment that both supports and enhances our growth." ∎

Spreading the word

‘Old school’ vet helps Malaysia keep up
with modern animal care technology.

INTERVIEW WITH DR. ENG CHANG YEOH, Veterinarian at Yeoh Veterinary Clinic and Surgery

> " I knew for a long time that I wanted to go digital for the ease and convenience. A few years ago, I made the decision that it was time. It has made such a difference and certainly paid back the investment! "
>
> **DR. ENG CHANG YEOH**
> Veterinarian at Yeoh Veterinary Clinic and Surgery

When Dr. Eng Chang Yeoh first began practicing vet medicine in Malaysia in 1975, vets were rare there, he says. "I'm an old-school vet: we didn't even have computers when I started out. And people didn't realize their pets could get sick. Now, it's very different; the world has become small and people know more. They even bring in information they find on the internet."

See more, do more, help more

From the beginning, Dr. Yeoh was committed to doing what he could to improve vet care in his country. "I stay connected with the Faculty of Veterinary Medicine, Putra University, Malaysia – which is the only vet school in the country. They send students to my clinic to get experience. I believe that it is important in our society for everyone to contribute, and this is how I do it." This attitude has led to impressive success: in addition to his main clinic in Taman Megah, he has two smaller branches in Bangsar and Putra Heights.

Imaging has always played an important role in the care he provides his clients. Dr. Yeoh first began making X-rays in his practice in 1978. But 5 years ago, he switched to digital imaging in his Taman Megah clinic, with a CR 30-X computed radiography (CR) system plus DRYSTAR 5502 imager. "Moving to digital imaging was important to help me stay abreast of modern vet care. Pet owners expect more now, and from my travels to visit vet clinics around the world I knew I could do more with digital imaging."

> ❝ The images are very clear... and the speed is so fast: I can X-ray a dog, and by the time I take it out of the X-ray room the images are ready. ❞

DR. ENG CHANG YEOH

Once he was using the CR system, he found this was true. "The number 1 benefit was the excellent resolution. The images are very clear: before, we could miss things on images, but now we see so much. Foreign objects, for example. And the speed is so fast: I can X-ray a dog, and by the time I take it out of the X-ray room the images are ready. Repeats are rarely needed!"

The experience was so successful that Dr. Yeoh implemented two CR 10-X solutions in his smaller clinics. But even more, he has been a big proponent of digital imaging for other vets in Malaysia, and has become a reference for Agfa HealthCare. "I was the first vet in Malaysia with an Agfa HealthCare digital solution. I'm very happy with my CR 30-X and CR 10-X systems: the software is excellent and the monitors are medical-grade. When other vets come to me, I tell them that digital imaging is like buying a computer; it's not one piece. There is hardware, software, programs – a lot of variables. The buyers have to decide if they are happy with the quality of the

image, and also consider their budget of course. But I think all the vet clinics will go digital: it's just a matter of time." ∎

Did you know...

When Dr. Yeoh first started practicing, many of the animals he saw were large pedigree dogs, which were popular with the wealthy at the time. Now, he says it is the opposite: his customers bring in dogs so small they fit into purses and bags.
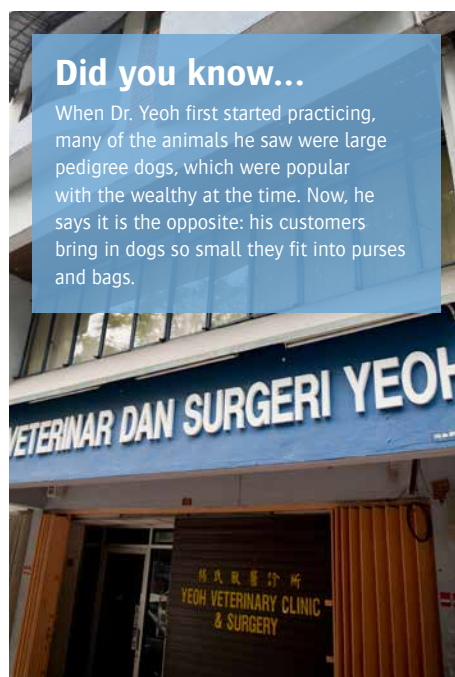
Get bitten by the
digital bug...

Our affordable veterinary digital imaging solutions make it easy for you to get all the benefits of a Computed Radiography (CR) or Direct Radiography (DR) system that includes the specialized features and settings you need for your animal practice. Whether you choose CR or DR, you can be sure of faster image acquisition and stable and consistent image quality. Compact, mobile and easy to use, these solutions fit where you want, integrating easily into your practice. And moreover, no more dark room, chemicals or film storage and space costs. All of our veterinary CR and DR solutions come with our gold-standard MUSICA image processing software. It automatically analyzes and optimizes the characteristics of each image, ensuring you clear images, quickly and without retakes.

Insight. Delivered.

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