（Abroad・Domestic）Internship report form（Student） 2017/09/08 (Year/Month/Day)

Name	Khoirun Nisa
Laboratory	Veterinary Internal Medicine
Year (Grade)	3
Internship institution	Department of Veterinary Medical Imaging and Small Animal Orthopedics, Faculty of Veterinary Medicine, Ghent University
Internship period	Internship period: 08/04/2017 - 09/03/2017 (Departure Date from Sapporo: MM/DD/YYYY, Arrival Date in Sapporo: MM/DD/YYYY)
Purpose	1. To gain knowledges and experiences on the application of diagnostic imaging modalities in veterinary practice 2. To be aware of how residency program take place as preparation in pursuing career as a specialist in veterinary diagnostic imaging

- The reason why you chose this institute

My supervisor has connection with Prof. Jimmy Saunders, the head of Department of Veterinary Medical Imaging and Small Animal Orthopedics, Faculty of Veterinary Medicine, Ghent University. One of research interest led by Prof. Katrien Vanderperren in this department is analyzing organ perfusion using contrast-enhanced ultrasonography (CEUS), which is similar to my PhD research theme. Not only CEUS, in this department they also analyze organ perfusion using another imaging modalities such as scintigraphy which I also interested to learn. Later I found that the Faculty of Veterinary Medicine Ghent University is one of the leading institutions which provide an advanced training program to fulfill the requirements of becoming European College of Veterinary Diagnostic Imaging (ECVDI) diplomates. More than 6000 cases subjected for diagnostic imaging including small and large animals come to this institution every year. Beside ultrasound and scintigraphy, this institution is facilitated with other various imaging modalities. For this reason, the institution will be an ideal place for having my internship so that I can both deepen my understanding on my current research topic as well as prepare myself for my future career plan as a specialist in veterinary diagnostic imaging.

- Result of the activity （about 800 words、provide photos, tables and figures that clearly show

the activities during the period)

1. **Observation of small animal radiography, ultrasound, CT, and MRI**

The division of medical imaging is divided into small and large animal. I joined the activity in small animal most of the time, but I also visited the large animal. The activity in the division of medical imaging starts from 9 a.m. to 5 p.m. Monday to Friday. The division accepts requests to perform diagnostic imaging of patients from other divisions including internal medicine, surgery, orthopedic, neurology, theriogenology, and exotic animals. In radiography, I could get involved together with students and interns as they were trained to take radiograph properly. I could refreshed my mind about the radiographic techniques of thorax, abdomen, skull, pelvic and extremities. I have learned the radiograph techniques both in Hokkaido University Veterinary Teaching Hospital and during my undergraduate study back in Indonesia, but here I could study more intense as I stayed for the whole month and with the large number and variety of cases. Since almost 50% radiographic requests comes from orthopedic cases, I experienced 'new' stuffs because I belong to laboratory of veterinary internal medicine in Hokkaido University where orthopedic is not part of our study field. In addition, there were numbers of radiographic examination performed in exotic pets such as turtle, crane, rabbit which were apparently new for me.

Not only radiography, I also observed ultrasound, CT and MRI. In this division, most ultrasound cases come for abdominal ultrasound but some cases for muscle and joint ultrasound also present. Abdominal ultrasound for internal medicine cases were almost similar as those I have been observing in Hokkaido University, but some cases came from division of theriogenology to evaluate the reproductive tract which I am not familiar with. Furthermore, I also had chance to observe ultrasound of guinea pig, rabbit, and chicken.

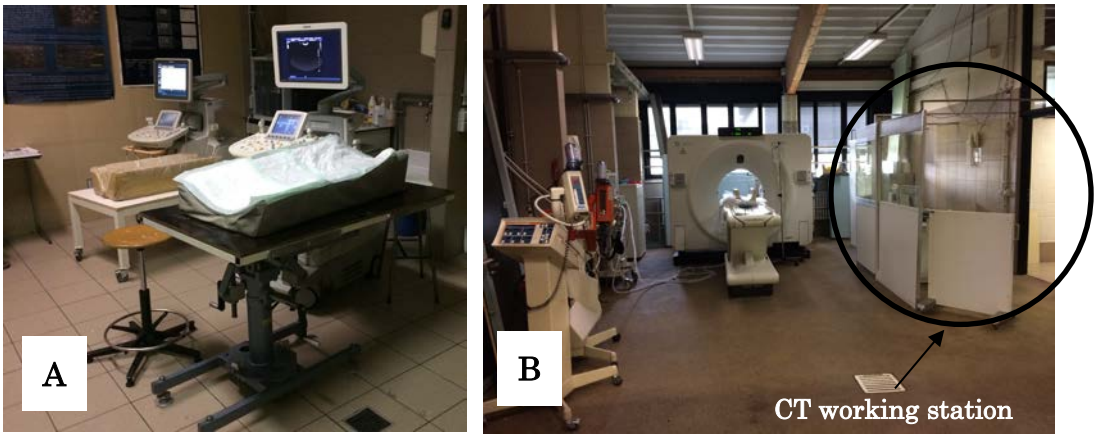

Figure 1. (A) Two ultrasound machine were utilized for ultrasound scanning in small animals. (B) The facility of CT scan was used both in small and large animal with a very large room.

2. Join case discussion with students and residents

Every Monday to Thursday 8-9 a.m., a resident hold discussion with students to train them interpreting radiograph by reading radiograph of previous cases. On Friday 8-9 a.m., all residents were challenged to interpret CT and/or MRI images and guided by a faculty staff. By joining these discussions, I learned a lot how to properly interpret radiographic, CT and MRI images. Other than this, I could also learn from resident's report as I got an access to the record of all cases submitted into this division.

3. Learning Scintigraphy

Scintigraphy is usually performed on Monday by Dr. Eva Vandermeulen. Scintigraphy is indicated for thyroid hyperfunction, portosystemic shunt (PSS), and bone disorders. There were only few cases during my stay. I only had chance to observe thyroid scintigraphy of five cats with thyroid hyperfunction. The thyroid scan was performed 20-30 min after intravenous injection of a radionuclide pertechnetate ion (Technecium suspended in saline, 1-2 MCi). The scan was conducted using gamma camera for 1 min without sedation except for debilitated animals. The image was subsequently analyzed by placing regions of interest (ROIs) on the thyroid gland and submandibular salivary gland to measure the intensity ratio of both organs. In normal cats, the ratio should not be more than 1. In this division, scintigraphy was performed in cats which have been diagnosed having thyroid hyperfunction. The scan aimed to measure the intensity ratio (as mentioned above) that will guide in determining the dose of radioiodine for therapy in addition to the

record of disease duration and progress.

Beside thyroid scintigraphy, Dr. Vandermeulen also introduced me the transplenic portal scintigraphy for PSS diagnosis. Different from thyroid scan, pertechnetate is injected via splenic parenchyma (1-2 mCi) and the scan is performed soon after injection. The scan is done for 1 min in a sedated animal positioned in right lateral recumbency. For the image analysis, three ROI are drawn in liver, heart, and background. Time-activity curve (TAC) is subsequently generated. From the TAC, we can measure shunt fraction (SF) that reflect the ratio of blood flow in liver and heart. SF should be not more than 2.4% in normal animal. Portal scintigraphy can confirm the presence of shunting, but it does not allow identification of shunt type.

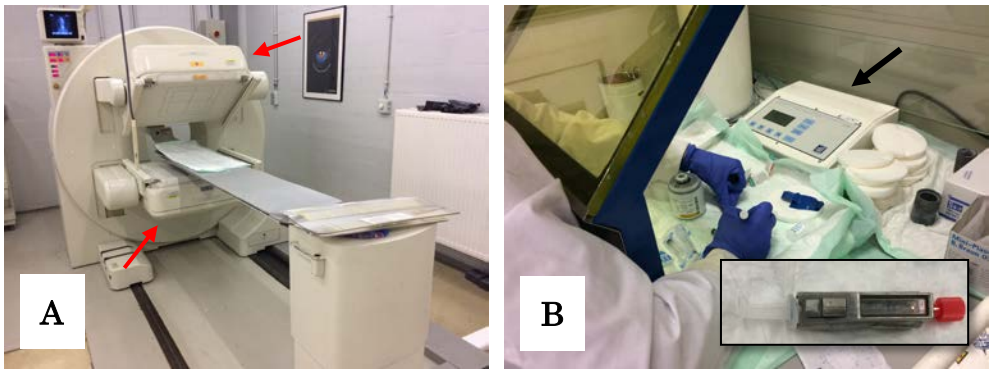

Figure 2. (A) Scintigraphy with two head of gamma camera (red arrows). For thyroid and portal scanning, only one head was used which was positioned under the patient. (B) Dr. Eva Vandermeulen was preparing the pertechnetate in a cleaning bench. Personnel must wear lab coat and gloves for protection during the preparation and scanning. Pertechnetate was aspirated into syringe and calibrated for Curie (Ci) or Becquerel (Bq) unit using calibrator (black arrow). Then the syringe containing pertechnetate was sealed in led case as it contain radioactive material (index).

4. Discussing about CEUS research

Unfortunately when I visited this division, there were no on-going CEUS study. Nevertheless, I had discussion with Prof. Katrien Vanderperren, and also Dr. Emmelie Stock which conducted CEUS study during her PhD and is currently a resident in the division of diagnostic imaging. She conducted a CEUS study on feline kidney. During my stay, they allowed me to try analyzing my data using an analytic software which they used to analyze CEUS images, VueBox®. This software has a feature of color parametric which I can use to evaluate the heterogeneity of post-contrast enhancement in the tissue. Unfortunately this software was installed only for one type of

ultrasound probe which was not be compatible for my data. As a consequence, even if it somehow could work with my CEUS data, I cannot use the result for official purpose.

Figure 3. The representative result of quantitative analysis of duodenal CEUS image using VueBox®. Four regions of interest (ROI) were drawn that include one ROI covering the whole upper mucosa of duodenum (green polygon), and three smaller ROIs within the same depth (yellow, pink, and white circle) (left upper). The time-intensity curve was generated from each ROI (left below). The color parametric image shows the heterogeneity of time to peak (TTP) within each ROI (right upper). The TTP values were listed in table (right below).
*the image is modified to hide the patient identity and replace the title of ROIs.

- What do you think the positive impact of the activity will have on your further career path?

For the first few years after graduation, my plan is working in an animal hospital back in my country. I got lots of benefits from joining activity in Hokkaido University Veterinary Teaching Hospital during my PhD, and this internship packed me with many valuable stuffs. To be honest, I did not imagine that I would join radiography most of the time during my internship. But this really kicked my motivation to study more about it. Furthermore, after the internship, I now have the image of how to be a specialist in veterinary diagnostic imaging. I used to have impression that diagnostic imaging is part of internal medicine, but now I understand that it embraces a lot more study fields which I have to study more from now on if I want to be a specialist in diagnostic imaging in the future.

As of Mar 19, 2015

- Advice for your junior fellows

- **Don't worry about the language barrier!** Before I went for the internship, one thing which I worried the most was the language because my English is poor. I have limited vocabulary, understand only few expressions, and have difficulty to catch words when the counterpart speaks too fast. But when I get there, I was surprised that this was not really a problem. It is indeed important to polish our English, but the communication should not be limited by verbal language.
- **Good preparation is the key.** I must confess that I missed an important thing. I brought all my research data because I wanted to try analyzing them with an analytic software VueBox®, but I forget to check which kind of data compatible with the software. Then I found out that the type of data I brought were not compatible for the software. So I ended up only analyzing two data which were later kindly sent by my colleague in Laboratory of Veterinary Internal Medicine, Hokkaido University.

Approval of supervisor	Institution・Official title・Name Department of Veterinary Medical Imaging and Small Animal Orthopedics, Faculty of Veterinary Medicine, Ghent University Prof. Jimmy Saunders

※1 Send the electronic file to the Leading School section, International Affairs Office, also submit the original print out with seal of supervisor to the Leading School section, International Affairs Office.
※2 Attach a copy certificate of the content of internship activity that is prepared by the counterpart at the internship institution (any form with a signature of the counterpart).
※3 The Steering Committee of the Leading Program will first confirm the content of this report and report will be forwarded to the Educational Affairs Committee for credits evaluation.

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