

What Does Modern Veterinary Pathology have to Offer?

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Abstract: *We reflect back upon our experiences and discuss the current state of veterinary pathology. At its heart, it is field centred on its role in diagnostics, however it also provides necessary information about the genesis and progression of various pathologies. It is an important tool for pathology stratification, informing prognostic outlook and appropriate therapeutic choice. Herein we briefly discuss the main pillars of veterinary pathology: necropsy, biopsy, cytology, molecular pathology, education and research. We will show that veterinary pathology has an irreplaceable role in veterinary practice and research.*

Keywords: *Biopsy, Cytology, Histopathology, Molecular pathology, Necropsy.*

1. INTRODUCTION

Based on our many years of experience in the field, we would like to postulate on the current situation of veterinary pathology, and through the pages of this journal will speak briefly to our colleagues from around the world. Veterinary pathology is one of the basic veterinary disciplines, with predominantly a diagnostic role and has an important role in routine practice as well as, in both basic and applied research (**Latimer et al., 2011; Zachary et al., 2012**). It is a field that primarily focuses on the recognition of diseases and their causes, and the assessment of diagnostics, treatments and preventive measures, both in veterinary medicine and the food industry. It is therefore a field with wide application and, according to us, is consistent with the national political agendas of each country. Veterinary pathology can be classified into several main pillars: necropsy, comprising biopsy, cytology and molecular pathology, the professional control of diagnostic and therapeutic care, and lastly vocational education.

2. CLASSIFICATION SYSTEMS

2.1 Necropsy

This is the oldest and historically most noted activity, connected with pathology. Necropsies allow one to obtain a wide spectrum of valuable information, which is used to reveal an immediate cause of death, including a summary of information, which is part of the development of knowledge of the essence and diagnosis of various diseases (**Innes, 1969; OToole, 2010**). A database summarizing this information has made it possible to determine, for example, the most common cause of death among different groups of animals or the breed predisposition to various diseases. It is possible to find out, which oncologic diseases dominate in different local environments and what is the average life expectancy of animals with specific disease. This information is valuable, for example, in order to address the needs of preventive medicine, and identify causative or preventative covariates. Autopsy based diagnoses should not be understood as a purely mechanical activity, but according to us, this activity effectively contributes to the expansion of differential diagnostic considerations of not only pathologists, but also clinical colleagues (Figures 1, A and 2, A).

2.2 Biopsy

This is a major part of the discipline and professional activity, which is based on the diagnostic evaluation of tissues or clumps of cells that were obtained by clinical process (Figure 1, B). During this examination, a tissue sample is processed in order to histological sections, which can be further

examined under the microscope. Excision of samples is usually performed by the pathologist (Figure 2, B). We also have good experience with clinicians consigning already selected, representative parts of the pathologically changed tissue and, as necessary, parts of the altered periphery. The sample is then processed according to the needs by a laboratory technician. It is not just one methodology, but a wide collection of methods, by which the sample can be processed and the section prepared (Campbell et al., 2007). In this sense, conventional methodology can be applied, using that mainly a clear staining or unconventional methodology, including a wide spectrum of histochemical and immunohistochemical methods to confirm or, alternatively, further specify the diagnosis. These also have a prognostic significance (Figures 3, B and 3, C). We group into this category also cytology, which is engaged in identifying pathological changes within isolated cells that were obtained by the sampling by thin needle aspiration of tissues or liquids, including also paracentesis of body cavities, smears, imprints, lavage, and examination of cerebrospinal fluid (Figure 1,C and 3,A). The end result of histological and cytological examination is diagnosis, which includes a description of findings and a final diagnosis or, alternatively, differential diagnosis. Comprising part of the description is information about a malignancy, the degree of differentiation of tumour growth, the presence of infiltration of organ walls and lymph nodes, including the assessment of excision borders, possibly typology and differentiation of tumour process. By wider use of histopathological methods, the diagnosis becomes more complete with added objective information that is of practical benefit to clinical colleagues.

2.3 Molecular pathology

Continuously improving possibilities for therapy are directly related to the increasingly expanding degree of histological classification together with a whole spectrum of other important information which inform therapeutic algorithms. Especially in the area of cancer diagnosis, there has been huge progress in recent years, especially in the perspective of a direct relationship between molecular genetics and therapeutic options. Importantly, this combination reveals new information about prognosis of future development, ability of metastasis and eventually the length of survival. All these procedures are now routinely used in our laboratories, as well as in various veterinary facilities worldwide. The quality of performed techniques is guaranteed by academically educated professionals in the field of molecular biology (Figure 3, D).

2.4 Professional inspection of diagnostic and therapeutic care

This is the activity that provides a summary of the objective materials in order to reach conclusions about the quality of provided medical activities. Here we include the so-called consultative biopsy and the second bioptic reading. Veterinary pathology is introduced here as one of the units, which performs independent inspection activity (Figure 1, D).

2.5 Professional education

This involves a set of activities that includes undergraduate preparation of specialists in the field of veterinary medicine, agriculture, and alternatively in natural science, and also include a postgraduate education (Figure 2, C).

2.6 Research

Veterinary pathology has routinely used a number of techniques, including electron microscopy, in order to assess the changes introduced through experimentation (Figure 2, D).

3. CONCLUSIONS

Veterinary pathology had undergone many changes in the past and today it represents a complex field that comprises a part of diagnostic medicine. It was not so long ago that we lagged behind other countries, who were already commonly using genetic and molecular techniques in the diagnosis of diseases. Today, we know that this information is very valuable for the effective treatment of animals. Perhaps the reader now asks himself how important is this text in fact? The contained information is general and very familiar with all veterinary pathologists. But it has occurred to us that our clinical colleagues even today ask the question highlighted in the title of our article “What does modern

What Does Modern Veterinary Pathology have to Offer?

veterinary pathology have to offer?” In this text we have tried within limited space to answer this question. Our activities are open to all who are interested in serious cooperation in the pursuit of the guiding principle “The right therapy depends on the correct diagnosis”. From outside, ours a dynamic field that is constantly evolving, always offering something new. We have tried to convince clinical fellows what should be obvious, to send material obtained through surgical removal to veterinary pathologists and not to simply throw them into the biological waste, with explanation that is not necessary. We note in this regard several cases, where a very serious diagnosis was reassessed based on the histopathological proving that the suspected malignancy was in fact a benign process. It is the shame that such procedural oversights should result in unnecessary euthanization. Conversely, we noted the cases where, according to a clinical fellow, what was considered a routine removal of a small seemingly innocent structure of the mammary gland, was later evaluated by us as a metastasis of lymphoma. We can also dutifully report that we noticed many similarities in cytological diagnosis, especially of skin processes, which were for reasons of low technical and procedural barriers to entry, routinely carried out by our clinical colleagues. However, our point of view is that even cytological specimens, or alternatively subsequent surgical resection of material, should be properly sent to pathology laboratories. This supports double-sided education. Seeing but also the fact that the material for histopathological examination is often sent to us as non-fixed or embedded in various unsuitable containers, with accompanying lists, that do not mention the anamnesis, type of surgery, animal type, description, localization of pathology, and sometimes, there is even nothing mentioned. But these biopsies we processed too, and we further worked with maximal effort to assess the sample so that the results were usable. It is frequently needed a shorter telephone consultation in these cases. Also by this way we make effort to participate in collaboration with clinical colleagues and emphasize an importance of our work, referred to their benefit. However, it is perhaps questionable, whether our activity will be appreciated, if they didn't find the time to fill out even basic information. We want to trust and believe that after all, yes, and eventually through our long lasted work we contribute to the natural elevation of the importance of veterinary pathology through our professional society.

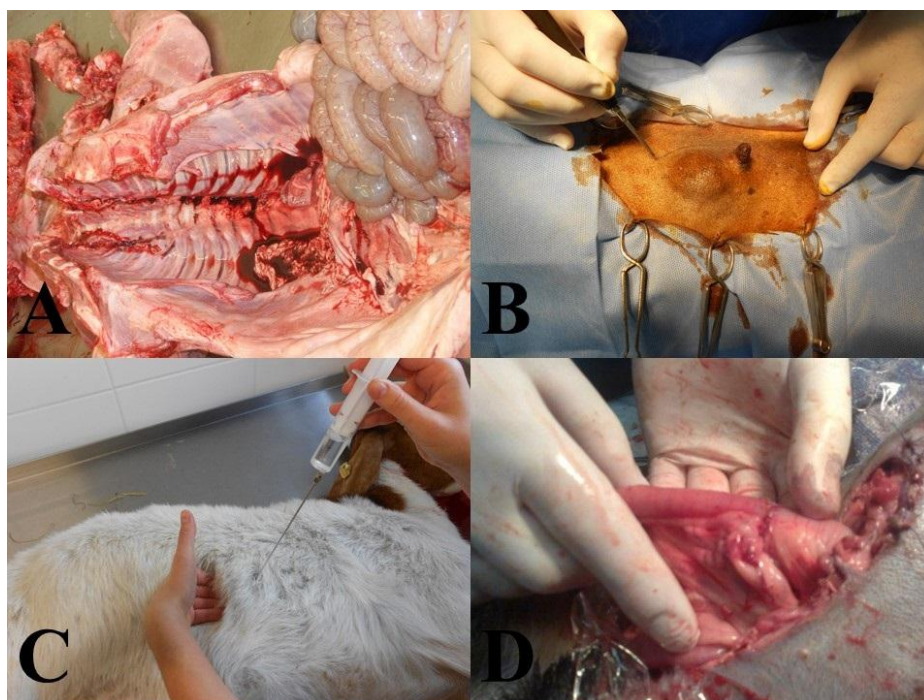


Figure 1

A: View at the chest and part of the abdomen cavity of the pig during the necropsy.

B: Cut by electrocautery with the definition of the borders around the dog's mammary gland tumour.

C: View at a thin needle technique surgery with aspiration of fluid on the goat model.

D: Assessment of the quality of medical intervention with the finding of loosening the stitches and falling out of the part of gut into the surgical dressing after surgery during recovery a dog.



Figure 2

A: External visual inspection before the autopsy. In the picture is visible several times enlarged dog's testicle.

B: Into the histopathological laboratory delivered tissue, including the edges of a resected tumour.

C: Undergraduate teaching of students with demonstration of material from reproductive pathology in models of pig and cow uterus.

D: Research activity mainly involves experiments primarily on small animals with a removal of pre-selected organs during autopsy.

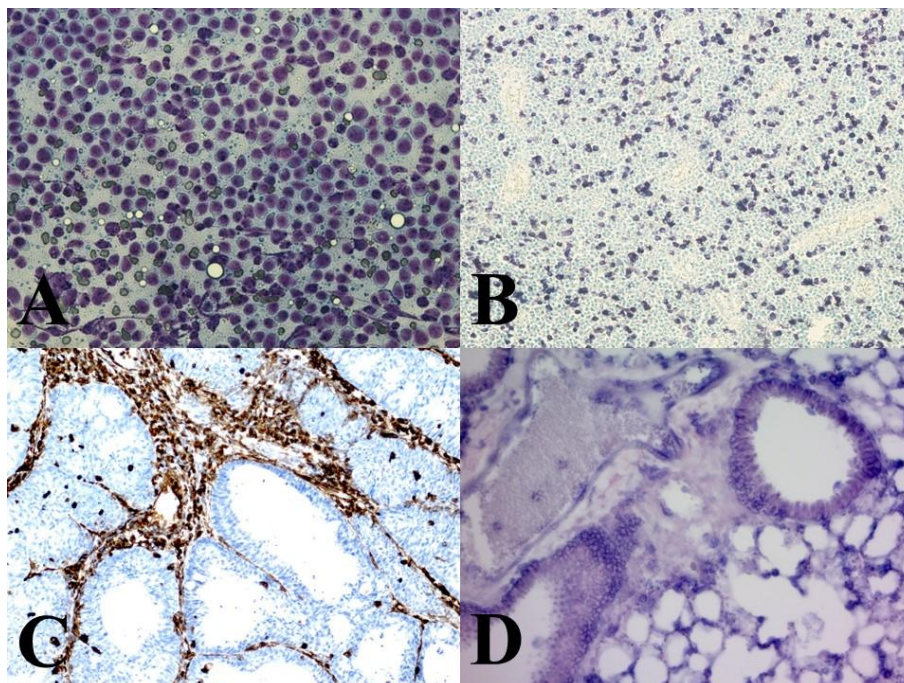


Figure 3

A: Thin needle aspiration of cells from dog's tumour with the presence of lymphocytes with minor disproportions in calibre and highly visible, numerical compact, nucleoli in character of well-differentiated dog's lymphoma. Legend: Giemsa-Romanowski, 400x.

B: This is the finding of well-differentiated dog's mastocytoma. Legend: Toluidine blue, 200x.

C: Immunohistochemical evidence of smooth muscle cells in the stroma of dog's adenocarcinoma of a colon. Legend: Smooth muscle actin, 200x

What Does Modern Veterinary Pathology have to Offer?

D:Detection of mRNA in lung tissue section by in situ hybridization using digoxigenin-labeled riboprobe (purple signal). Legend: Visualized by chromogenic alkaline phosphatase substrate, 200x.

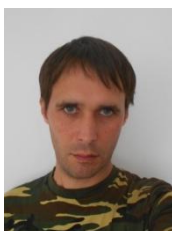
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