

# A SURVEY ON THE WORKING CONDITIONS FOR TOXICOLOGIC PATHOLOGISTS IN EUROPE

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*Throughout the last decade, the (bio)pharmaceutical and chemical industry has undergone major structural changes, which also affected toxicologic pathologists. To gain a better understanding of the current and future working conditions for toxicologic pathologists in Europe, the European Society of Toxicologic Pathologists (ESTP) and the French Society of Toxicologic Pathology (SFPT) conducted a survey in 2015. Data from this survey is presented in this article and shows that there is an almost equal distribution of male versus female toxicologic pathologists in Europe. The majority of them work for big pharmaceutical companies located in Western Europe and reads slides from GLP or non-GLP studies. About 60% of the toxicologic pathologists in Europe will retire within the next 15 years, and there appears to be an insufficient number of young people to fill the open positions that are forecasted for the next decade. Availability of qualified toxicologic pathologists appears to be an obstacle when filling open positions, although remuneration is rather competitive. The limited geographical flexibility of candidates may be a factor that could be overcome by developing new remote working models. The information in this survey is not easily available elsewhere and is expected to assist both pathologists in training, who intend to apply for a toxicologic pathology position in Europe, and established toxicologic pathologist and their employers, who need to adapt to an ever-changing working environment.*

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**T**hroughout the last decade, the (bio)pharmaceutical and chemical industry has undergone major structural changes, which also affected toxicologic pathologists. In 2012, the European Society of Toxicologic Pathologists (ESTP) at its annual congress in Stresa, Italy, hosted a round table about the current and future working conditions for toxicologic pathologists. One outcome of this discussion was that a more detailed understanding of such working conditions was needed. Consequently, the ESTP initiated a survey among its society members on this topic. The survey aimed at illustrating the current situation of toxicologic pathologists, and it specifically asked those who recruit pathologists, what their prediction for the near future was. It is anticipated that the results of this survey help in shaping the training and continuous education programs for

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veterinary/toxicologic pathologists in Europe, and that they also assist pathologists to adapt to an ever-changing working environment.

**T**he survey was initiated and financed by the European Society of Toxicologic Pathology (ESTP) and the French Society of Toxicologic Pathology (SFPT).

The authors (LM, EB) were assigned to coordinate the project by the ESTP executive committee (EC) and started generating survey questions. These were modified after review by the ESTP EC. The ESTP commissioned P.N. Lee Statistics and Computing Ltd. (PNLSC) to conduct an electronic survey based on the questions generated by the ESTP EC.

The survey consisted of 6 sections, referring to A. Personal information, B. Position and work content, C. Remuneration and gratuity, D. Continuing education, E. People management, and F. The experience with the survey itself. The personal information (name and email address) that was requested in section A was only visible to one person from PNLSC. This person permanently disconnected the personal information from the rest of the responses. The personal information was only used to monitor responses/double entries and was deleted after the survey closed.

PNLSC used the software platform QuestionPro to conduct the survey. For this purpose and under the umbrella of a strict confidentiality agreement, PNLSC was supplied with all email addresses of ESTP and SFPT members. The survey started in November 2015 with an initial mailshot to 308 members of the ESTP. 6 members were retired and therefore did not fill in the survey. A further 16 members had email addresses that did not manage to reach the member of interest. There were further requests to fill in the questionnaire on the beginning of January and the beginning of February, with the final date for the survey given as 19<sup>th</sup> February 2016. For the SFPT a further 49 invitations were sent out in early February to members of the SFPT who were not members of the ESTP. Two of these members were also retired and did not participate in this survey. A second invitation was sent out to the non-responders in the middle of February, with the last response coming on the 3<sup>rd</sup> March 2016.

The final set of data was downloaded from QuestionPro on 8<sup>th</sup> March 2016 and transferred to a software system (ROEELE) for listing and statistical analysis.

In all there have been 189 completed surveys and 39 incomplete surveys out of a possible 329, who received invitations and were not retired. This makes 57% completed responses with a further 12% partial responses. Complete and partial responses were combined where possible. The 228 individuals, who responded to this survey, represent about 2/3 of the membership of the ESTP and SFPT. When interpreting the results from this survey, it needs to be taken into account that there is no clear distinction made between anatomic and clinical pathologists in Europe like it is for North America. The vast majority of ESTP and SFPT members are anatomic pathologists.

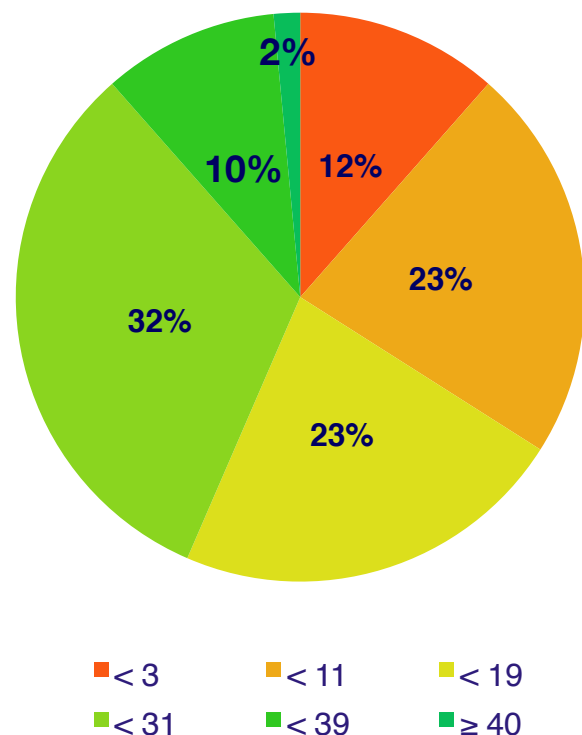
### Demographics

There was an almost equal distribution among male and female pathologists within Europe, with only a slight majority of males (54%). The number of females is significantly higher compared to a recent survey among toxicologists (mainly within North America), where the distribution between males and females was 61.5% versus 38.5% [1].

The distribution of age across the respondents is quite similar to the above survey among North American toxicologists [1]. Most respondents (60%) were in the age range of 45 to 65, compared to 32% in the age range of 25 to 44 (7% below the age of 35). 8% of respondents were above the age of 65. This age range of European pathologists is also reflected by the range of the individual year of graduation, which peaked at 1989-1992.

In accordance with the age distribution of respondents, 12% had less than 3 years of experience in toxicologic pathology. 23% had experience up to 11 years, and another 23% up to 19 years. 32% of respondents had experience of up to 32 years, and the experience of 12% exceeded 32 years, with 2% having more than 40 years of experience in this field (Figure 1).

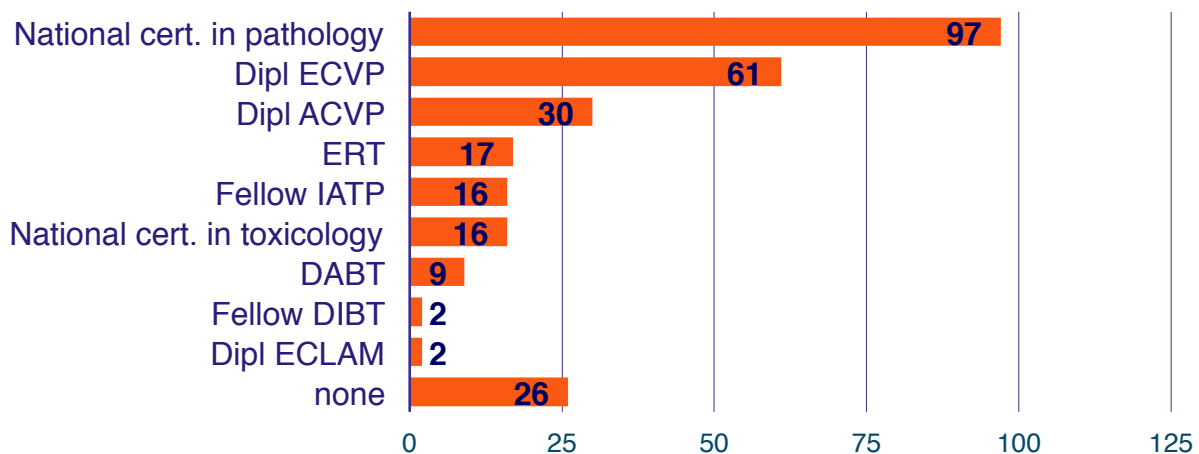
**Fig. 1. Years of experience (n=200)**



The great majority of the respondents (88%) were veterinarians, followed by biologists (8%), medical doctors (3%), and pharmacists (2%). 49% of all respondents hold a national certificate in pathology, 31% are Diplomate of the ECVP and 15% of the ACVP. This conforms to the general trend to require ECVP/ACVP certification or at least board eligibility from candidates, and it is expected that these diplomates are among the younger society members.

In total, 23% of respondents hold some kind of certificate in toxicology with the majority being recognized as ERT (9%) or as holders of a national certificate (8%). 6% were Diplomate of ABT or fellow DIBT. About 13% of all respondents do not hold any form of certificate in pathology or toxicology (**Figure 2**).

**Fig. 2. Certifications held  
(n=200, multiple responses)**

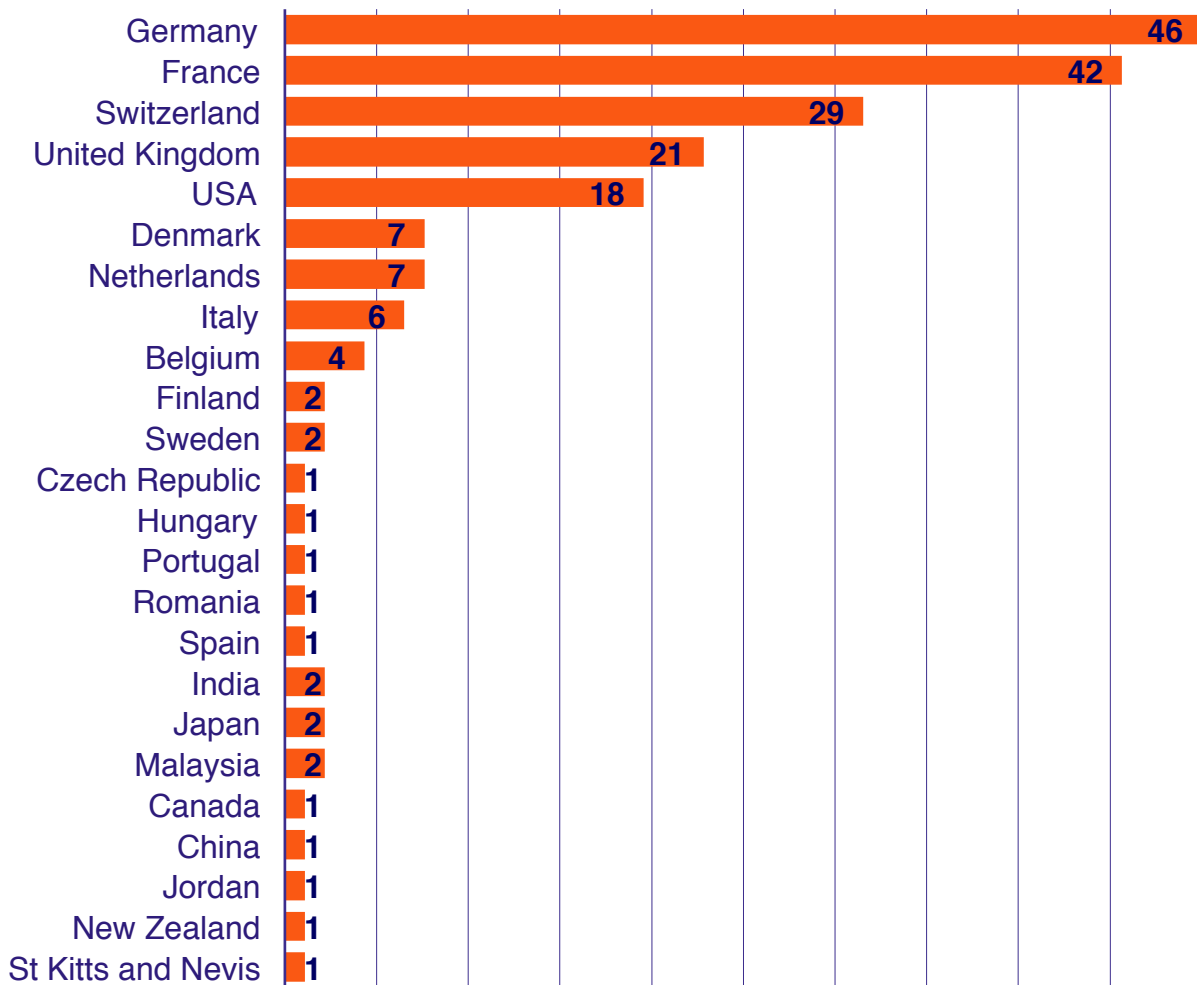


While the survey was sent out exclusively to members of ESTP and SFPT, only 88% disclosed themselves as member of ESTP (those who did not check this response probably considered this membership as given). 42% were also member of the North American STP, 36% were member of the BSTP, and 26% of the SFPT (the over-representation of the SFPT is due to the fact that it co-sponsored this survey and all its members were invited to participate in the survey). Memberships of other societies in toxicologic pathology were JSTP (4%), NVP (3%), Indian STP (2%), LA-STP (1%); and Chinese STP (1%).

The vast majority of respondents (82%) were born in Europe. 19 respondents came from North America, 12 from Asia, 3 from South America and 2 from Africa (Australia was erroneously not included in the answers).

Most respondents work in Germany (23%), France (21%), Switzerland (15%), or the United Kingdom (11%), followed by USA (9%), Denmark and Netherlands (each 4%), Italy (3%), and Belgium (2%) (Figure 3).

**Fig. 3. Country of work (n=200)**



### **Positions**

Data from this survey shows that the working conditions for toxicologic pathologists in Europe follow rather traditional concepts. The vast majority of respondents (90%) work as an employee. Only 9% are self-employed and very few are on temporary leave or retired (note that most retired members of ESTP/SFPT preferred not to participate in this survey). A similarly high majority (89%) works full time (5 days a week). 7% of respondents work 4 days a week and only 5% work less than this.

Over half of all respondents (55%) work in the pharmaceuticals/biotechnology sector (**Figure 4**). 7% are consultants and another 7% work in academia. Less common work sectors are public non-profit organizations (4%), diagnostic laboratories (3%), regulatory agencies (3%), and the chemical (3%) or agrochemical (2%) industry. Only one member works in the medical device industry. About 17% of all respondents work for contract research organizations, which reflects the trend to outsource many preclinical development activities.

A large proportion of respondents (40%) was employed in organizations with more than 20,000 employees. 21% work for organizations with 2,000-20,000 employees, and 22% for organizations with 11-500 employees. 10% of respondents are part of organizations with less than 10 employees, and 8% work for organizations of the size 500-2,000 employees.

**Fig. 4. Sector of work (n=200)**



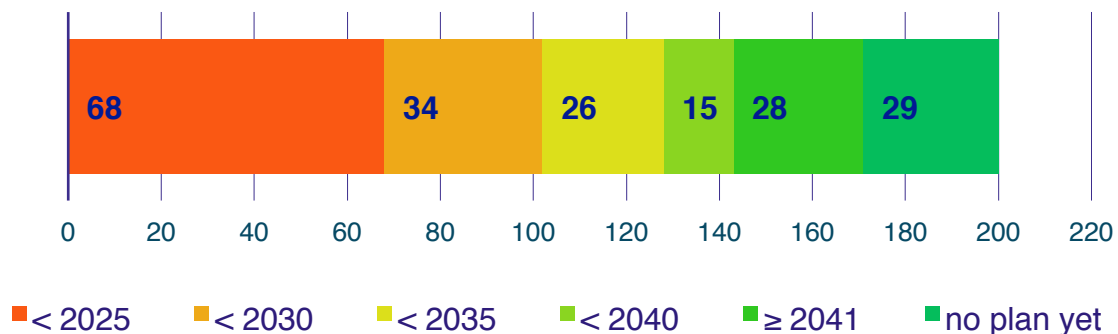
### Work stability

The working conditions appear to be rather stable for the majority of respondents. 51% of all respondents are employed in the same organization for 4 to 16 years, and another 24% work for the same employer even longer than that. However, this survey has not specifically addressed unemployment, and it may be speculated that among the 25% of respondents that are new in their current role (less than 2 years), many have experienced a loss of their previous position. Future surveys should include questions on unemployment and experience with managing and overcoming this situation.

### **Anticipated retirement and forecasted positions**

Consistent with the previous demographic information, 60% of the respondents are going to retire within the next 15 years (for 40% of respondents, retirement is planned within the next 10 years). Only 16% of respondents will work for more than 25 years until retirement (**Figure 5**).

**Fig. 5. Year of anticipated retirement (n=171)**



This implies a significant number of open positions over the next 2 decades and it triggers the question, whether enough younger pathologists can be found to fill these positions. Indeed 73% of those participants, who are responsible for managing pathology teams, predict a stable or even increasing number of open positions for toxicologic pathologists in the next years. The overall number of forecasted positions for toxicologic pathologists in the next 5 years is above 80 (16 per year). When asked about the number of available qualified pathologists to fill the above positions, 50% of participants responded the number was just right, but 47% said it was too low. This indicates difficulties in filling open positions and is in concordance with a survey conducted among veterinary pathologists in North America in 2008, where respondents stated that it takes more than 6 month to fill a position and that the number of candidates per position was between 1 and 3 only [2]. Limited availability of qualified candidates was also conceived the main obstacle in hiring for the majority of respondents in this survey. When looking into further details, it appears that there are qualified candidates available on a global scale, but that geographical flexibility of these candidates is limited (see below).

### **Finding employment**

29 participants in this survey (14.5%) responded that they were actively seeking for new employment (we did not specifically ask whether these people were unemployed). Finding a new position heavily relies on the networking and the personal contact between employers and candidates. 53% of respondents indicated that they had found their current position via direct contact to a



colleague. Involvement of professional recruiters and internet platforms (mainly LinkedIn) are far less important. The ESTP homepage facilitated career opportunities for 6% of respondents. Job advertisements in print media were still used by 9% of the responders.

Main obstacles in finding a new position were a limited availability of positions (27%) and limited geographical flexibility of the candidate (29%). Uncertainties around the security of the new position (17%) and insufficient career opportunities (14%) are additional obstacles. Both the managers and the employees recognize limited geographical flexibility as an issue; it implies that new concepts for working remotely are needed. This is a good opportunity to develop digital pathology and to influence IT providers to develop tools that are adapted to the current work processes in toxicologic pathology.

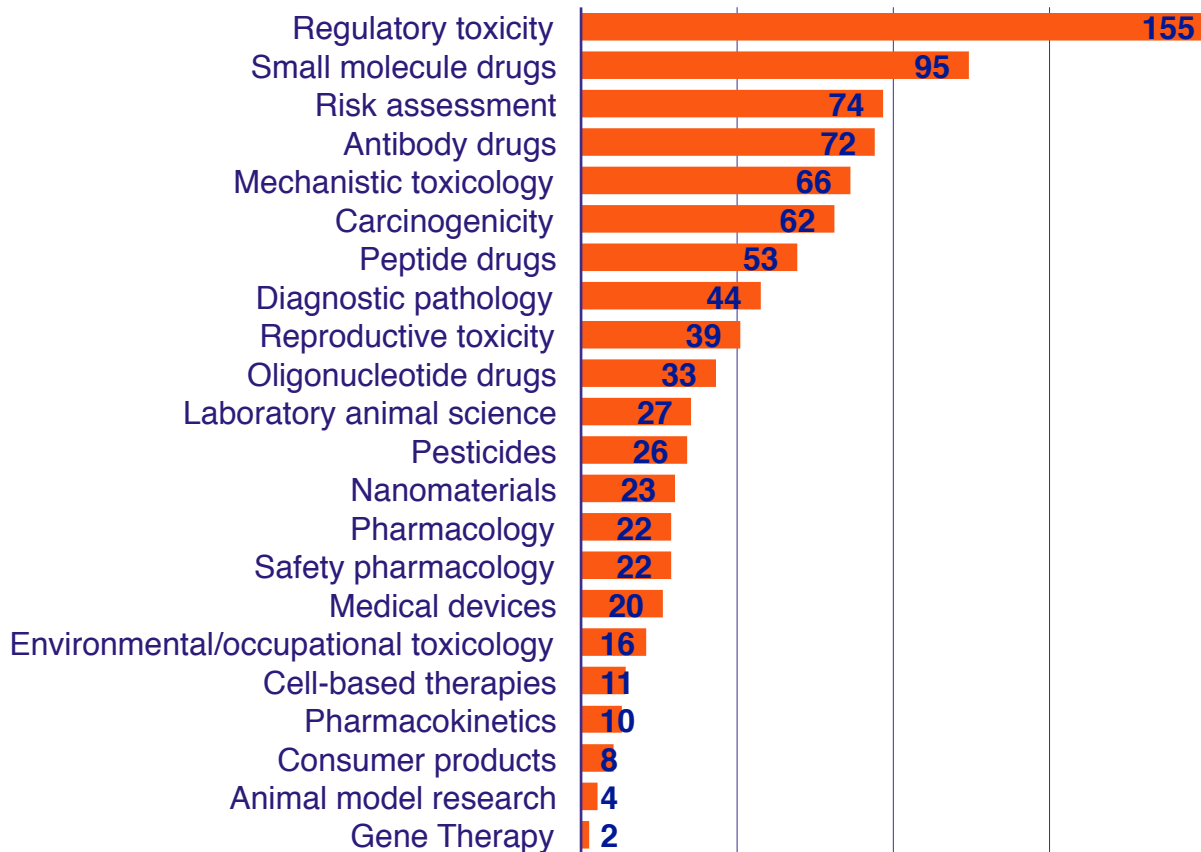
### **Work content**

The typical work content of toxicologic pathologists within Europe focusses on regulatory toxicity studies within drug development conducted with small molecules and antibody drugs. We asked respondents for their main fields of professional activity and allowed multiple answers. Regulatory toxicity studies were named most often (17%), followed by small molecule drugs (11%), risk assessment (8%), and antibody drugs (8%). Also commonly selected were mechanistic toxicity studies (7%), carcinogenicity studies (7%), and peptide drugs (6%) (**Figure 6**).

Experience to read slides is considered the most important skill of a toxicologic pathologist (**Figure 7**). These slides may come from GLP-compliant regulatory studies or from non-GLP studies with a more investigative character. Both aspects are considered important by the respondents of this survey, but under analysis of individual answers, it is either GLP or non-GLP studies that were mentioned as most important, indicating that there is a differentiation among pathologists into those that are involved in GLP work and those that are primarily working on investigative pharmacology studies. Interestingly, self-administration was mentioned as a task that consumes considerable working time of toxicologic pathologist throughout Europe. This reflects the general trend to downsize and outsource administrative functions and appears to be a global phenomenon of our times (although it is conceived as counter-productive to ask specialists to perform tasks not directly linked to their area of expertise). People management was not considered an important part of the work, which likely reflects the fact that only 24% of all respondents were actually managers of people.



**Fig. 6. Main fields of activity (multiple responses)**

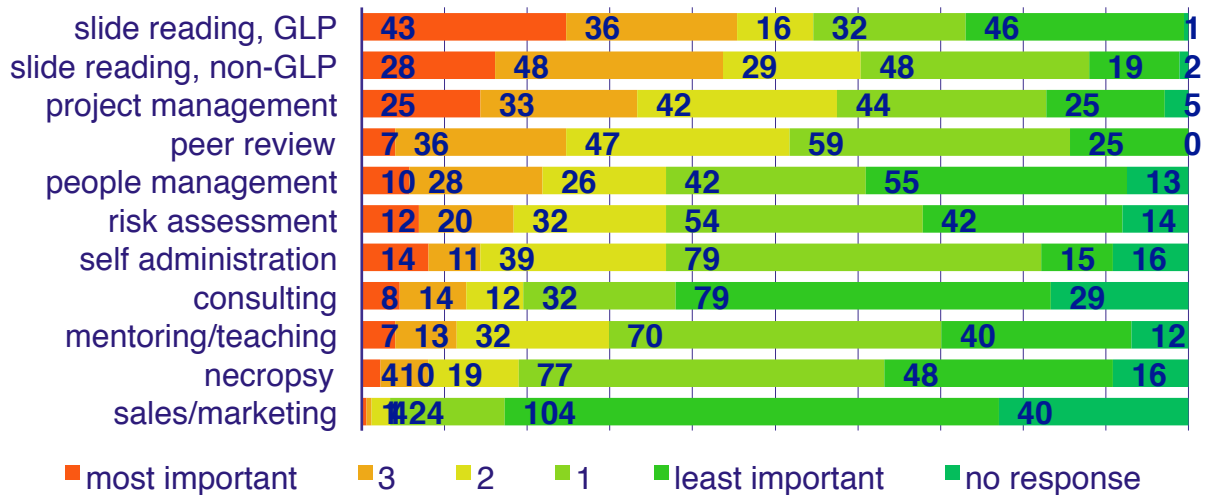


We specifically asked what skills were most important to succeed as a toxicologic pathologist. Not surprisingly, skills in anatomic pathology ranked by far highest, followed by toxicologic and pharmacologic pathology and toxicology. Knowledge in clinical pathology, in the general conduct of research, in laboratory animal medicine, and in molecular biology were also considered of high importance (Figure 7).

### **Remuneration and gratuities**

This survey was also designed to acquire data on remuneration of toxicologic pathologists. Considering the sensitivity of this data, we did not ask for actual salaries but provided salary ranges for selection. This certainly limits the value of this information and should be reconsidered for future surveys of this kind.

**Fig. 7. Main daily tasks (multiple responses)**

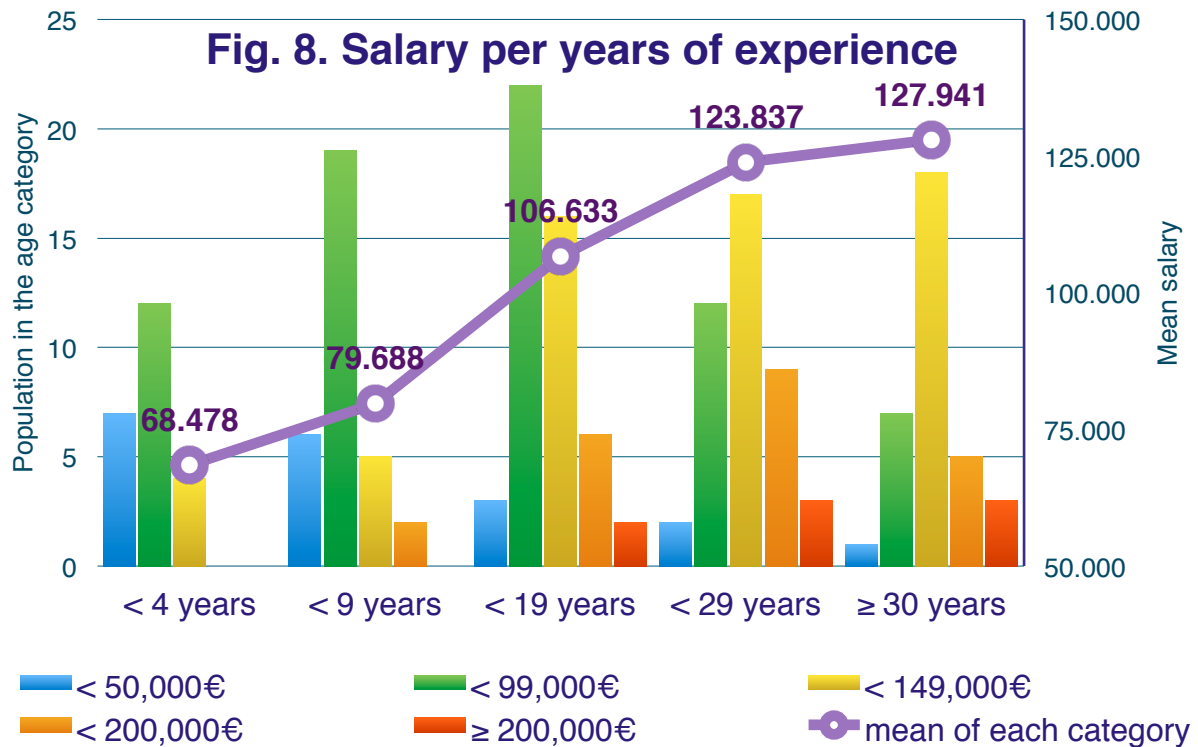


Half of the toxicologic pathologists in Europe earn more than 100 k€ per annum. This includes 12% with an annual salary of 150 k€ or above and 4% with a remuneration of greater than 200 k€. The largest group (40%) is in the range of 50-99 k€, while only 10% earn less than 50 k€. In comparison to a recent survey among North American toxicologists [1], salaries in Europe appear to be lower. However, many European countries offer substantial social benefits such as health insurance, unemployment insurance and pension plan, and the vast majority of respondents (75%) receives additional gratuities such as boni, stock options or a company car. Remuneration of toxicologic pathologists in Europe appears to be rather competitive when compared to another survey among scientists in Europe, where the average income was in the range of 55k€ [3].

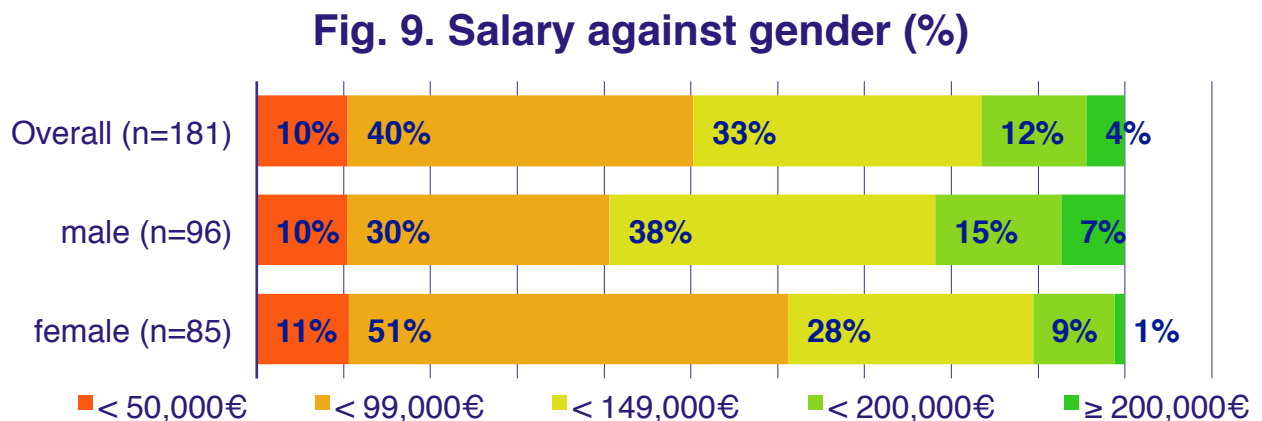
In order to better understand the remuneration situation of toxicologic pathologists, we analyzed the data with emphasis on gender, years of experience, employment sector and the size of the organization people are working for. In general, remuneration correlates with the years of experience that pathologists have (Figure 8)<sup>3</sup>. Interestingly, women receive less payment compared to male respondents, with a significant smaller number of female pathologists earning 100 k€ and above (Figure 9). It is also evident that pathologists working in the

<sup>3</sup> note that the mean was constructed for each age category by summing the multiplication of the mean of a salary interval with the population of this interval; for the interval “< 50,000 €”, the mean of the interval was fixed at 25,000 €, and for the interval “> 200,000 €”, it was fixed at 225,000 €.

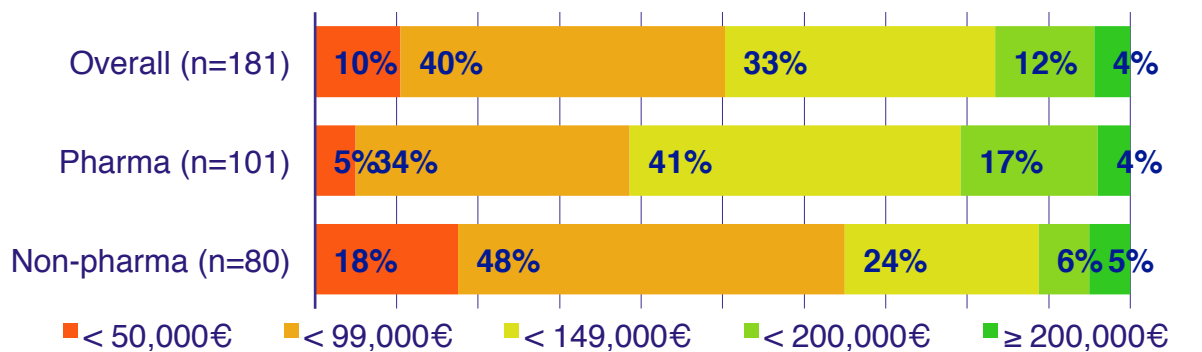
pharmaceutical industry receive higher payment compared to all other sectors of employment (Figure 10), and that the highest salaries are paid in organizations with more than 20,000 employees (except for a few people with very high salaries working for organizations with less than 10 people).



Vacation days are also an important factor in the overall working conditions. The majority of respondents in this survey (62%) was eligible to more than 25 days of paid vacation per annum. Only 15% of respondents had 20 days of annual vacation or less.



**Fig. 10. Salary in pharma versus other sectors (%)**



### Continuing education

Among the goals of the ESTP as stated by its constitution is the continuing education (CE) of toxicologic pathologists. Consequently, we wanted to know what style of CE programs participants would prefer and what topics they considered most important for CE programs. While the number of high quality webinars and self-study capabilities is increasing (paralleled by a declining financial support of congress attendance by employers), most pathologists still rank the value of conferences and seminars much higher. Reading scientific articles is considered of equally high importance by most respondents, and the journal *Toxicologic Pathology* is by far the most frequently cited source (52%). Respondents did not indicate a clear preference for printed versus online journals. A high number of respondents regularly referred to the journals *Veterinary Pathology* (28%), and *Journal of Toxicologic Pathology* (16%). There is a long list of further journals that respondents found useful for toxicologic pathologists (Table 1).

With regard to the content of CE programs, most participants favored topics around the core competencies of toxicologic pathologists, i.e. anatomic pathology, toxicologic and pharmacologic pathology, toxicology, research in general, clinical pathology and molecular pathology. Soft skills, medical writing, laboratory animal medicine and project management ranked medium only.

### Managing people

About a quarter of respondents (48 individuals, 24%) indicated that they were managing people. Around half of them (48%) managed up to 10 employees, a third of them (35%) had a group of 11 to 30 and the remainder (17%) had a group larger than 31 people. All of the above respondents had pathologists

reporting to them, 60% had additional technical or administrative staff, and 56% were also managing non-pathology scientists.

We aimed at getting a better understanding of the age composition of pathology teams and requested that managers indicate the age range of the youngest and oldest pathologist in their team. Only about a quarter (23%) had pathologists of less than 30 years of age in their team. 4% of respondents indicated that the youngest pathologist in their team was above 51. In 40% of cases, the oldest pathologist in the team was above 60, and in 10% of cases the oldest pathologist was below 50.

The survey asked managers how they predicted development of pathology positions in their teams. 45% expected an increase in pathologist positions, while only 28% predicted a decrease. The number of pathologist positions forecasted for the next 5 years was mostly 1 or 2 per organization, but 13% of respondents indicated they may have more than 3 positions to fill in the next 5 years.

We also asked people managers for their hiring experience. 32 respondents indicated that they had employed a pathologist during the last 3 years. 55% had recruited a junior/trainee level pathologist, and 45% an experienced pathologist. 42% of 31 respondents stated that direct contact was the main route of recruiting potential employees, followed by the internet (39%). Print media, the ESTP homepage and professional recruiters were considered less important.

The question whether there were enough applicants available for a pathologist position was answered with 'just right' by 50% of respondents. 47% responded that there were not enough applicants for a pathologist position, while only 3% indicated they had too many applicants. The main limitations in hiring a pathologist was the limited availability of trained/experienced pathologists (22%) followed by limited geographical flexibility of potential candidates (20%) and limitations in the qualification of candidates (20%).

### **Survey experience**

Since this is the first survey of its kind conducted by the ESTP, we wanted to know how respondents considered the time that was needed to fill in the questionnaire. The majority of respondents found that the time to fill in the survey was just right (48%) or that it actually took less time than they expected (47%); given the length and complexity of the survey, we consider it as another indication that this exercise was really needed and that the results are an asset for the members. This should encourage our profession to repeat investigations like this in regular terms, in order

to monitor any changes in the working conditions for toxicologic pathologists. Ideas on how to improve the questionnaire are highly welcome and should be addressed to the ESTP or SFPT administration. We received a long list of topics that could be considered for any subsequent survey of this kind (Table 2).

This survey is the first of its kind to provide comprehensive demographic data about toxicologic pathologists in Europe. It combines this with data on desired skill sets, preferred ways for continuing education and remuneration. While remuneration is a sensitive topic, this survey provides data that is well comparable to surveys among other life science professions or other geographical regions. Its value, however, could be increased by asking for precise data rather than ranges. The value of such data also increases as the survey is regularly repeated over time, allowing for comparison with previous responses. It would also benefit from a global harmonization of surveys across different STPs. Last but not least, there are several areas that have not been covered by this survey, such as the experience of unemployment and career paths beyond toxicologic pathology; this could be added in subsequent surveys.

It can be concluded from this survey that there remains a substantial demand for qualified toxicologic pathologists throughout Europe. This survey shall therefore encourage the veterinary schools to adapt and scale their curricula and post-graduate education programs accordingly.

## **ACKNOWLEDGEMENT**

We greatly appreciate the assistance of John Fry from PN Lee Statistics and Computing Ltd., who on behalf of the ESTP/SFTP conducted the survey and performed the statistical analysis.

## **REFERENCES**

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- [3] Zusi K, Keener AB. 2015 Life Sciences Salary Survey. *The Scientist Magazine*, November 1, 2015.

**Table 1: Journals that were reported as being of interest for toxicologic pathologists**

- American Journal of Pathology	- Journal of Veterinary Diagnostic Investigation
- Annual Review of Pharmacology and Toxicology	- Journal of Veterinary Internal Medicine
- Biomaterials	- Nature
- Blood	- Neurology
- Cancer Research	- New England Journal of Medicine
- Cytotherapy	- Pharmacology and Toxicology Methods
- Drug Discovery Today	- PLoS One
- Experimental and Toxicologic Pathology	- Point Vétérinaire
- Expert Opinion on Drug Discovery	- Regulatory Toxicology and Pharmacology
- Expert Opinion on Drug Metabolism & Toxicology	- Science
- Expert Opinion on Emerging Drugs	- Stem cells
- Expert Opinion on Investigational Drugs	- The Journal of Bone and Joint Surgery
- Human Gene Therapy	- The Lancet
- Immunology	- Toxicological Sciences
- International Journal of Toxicology	- Toxicology and Applied Pharmacology
- Journal of Bone and Mineral Research	- Veterinary Clinical Pathology
- Journal of Comparative Pathology	- Veterinary Dermatology
- Journal of Pharmacological Methods	- Veterinary medicine (Czech)
- Journal of the American Association for Laboratory Animal Science	



**Table 2: Topics that were suggested to be included in future surveys**

- Data on how pathologists are embedded within companies (line unit vs matrix organization); data on whether they deliver reports and/or participate in project teams
- Data on the activities that toxicologic pathologists conduct in project management, safety strategy and senior management
- Data who had experienced redundancy and/or site closure
- Data on who is on a temporary position versus a permanent position
- Data on the general job satisfaction
- More detailed data on salaries and correlation with regard to job level and country of work
- Data on how many pathologists an individual organization employs
- Data on the role of pathologists in evaluating animal models of disease (target selection and efficacy screening)
- Data on what training is offered by the employer
- Data on development opportunities within the current role/organization
- Data on how many hours people work per week (maximum was 5 days, but some people regularly work more than that)
- Data on what career paths are available for toxicologic pathologists outside of pathology
- Data on the role of toxicologic pathology in academia