



**Project Title: Telepathological ASsessment of
histopathological and cytological TEchniques**

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Executive Summary

Histological and cytological preparations are the basis for pathological diagnoses performed in daily practice throughout Europe in a number of several millions per year and correctness and reproducibility of such diagnoses is heavily dependent on the technical quality. Yet, quality is variable in different places and countries, related to school level, technicians' dedication, standard of apparatuses and reagents.

The present proposal tackles these problems by building-up an ICT environment **TASTE System** whereby pathologists, residents in Anatomic Pathology, technicians and students from different countries will submit via Web, using Tele-pathology procedures featuring "virtual slides", the microscopic images of their own preparations to a panel of internationally-recognized experts who will give comments and suggestions. Assessment with real users will be organized in order to smooth-down major problems encountered. Inter-laboratory transfer of sophisticated procedures will be favoured .

The Exchange of images will start with basic routine stains (Haematoxylin-Eosin stained slides, Papanicolaou-stained smears) in order to check quality and reproducibility of fixation, processing and staining procedures. The program will then proceed with more sophisticated techniques such as immunohistochemical and FISH preparations.

Ultimately, we expect that the present approach (unprecedented at world level) will fuel a Web-based community comprehensive of students and staff personnel, aimed to a levelling and improvement of histopathological and cytopathological preparations, thus leading to an innovative training and more reproducible diagnoses, a basic requisite for disease treatment.

During its first period of activity, the project has managed to:

- collect and tune the different **target needs**
- set up an **Alpha version of the system** (already available to the public)
- load a first set of **microscopic images**
- organize **several public workshops** to show the Taste system to real users.

The **project website**, www.tasteproject.eu, is available in EN, IT, PT, FR, RO, SV and contains information on the project, indications on events, TASTE preliminary results.

A preliminary version of the **TASTE system** is available at www.system.tasteproject.eu .

Interested parties (in trying the system or joining the TASTE Virtual Community) can write to infotaste@corep.it .

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1. Project Objectives

The TASTE (Telepathological ASsessment of histopathological and cytological TEchniques) project aims at developing a novel tele-pathology system by means of modern ICTs (**technological platform and repository of high quality images and slides**). The TASTE project is addressed to technicians working with histological and cytological preparations and doctors specialized in anatomic pathology, but also to residents, students as future professionals in these fields.

Histological and cytological preparations are the basis for pathological diagnosis performed in daily practice throughout Europe in a number of several millions per year and correctness and reproducibility of such diagnosis are heavily dependent on the technical quality. Yet, quality is variable in different places and countries, related to school level, technicians' dedication, standard of apparatuses and reagents. What is even more important, variation in technical quality of the preparations prevents their open circulation at European level.

The main objectives of the TASTE project are:

- the identification of **TASTE usage scenarios** for each kind of user (doctors, residents, technicians and students), both for training and VET (Vocational Education and Training) purposes then to join community where it will be feasible to compare preparations/diagnosis assessed by experts. These scenarios will be defined tailored to the needs of the end users, assessed with them;
- the realization of a **TASTE system** which will combine a fully sustainable system of e-learning and lifelong learning solutions with a microscopic images and slides repository (a sort of "virtual microscope") collected and continuously updated in different languages;
- the set up of a **TASTE virtual community** and network where students and experts in the field of histology, cytology and anatomy-pathology could compare preparations and diagnosis with a large number of already defined cases and in continuous update.

2. Project Approach

The TASTE system is based on the combination of two platforms: **Moodle**, a well know and diffused software for the management of courses and **Olympus dotSlide**, a digital virtual microscopy system.

The first important item of the project approach has been the **Refinement of Needs Analysis**, because it allowed a direct relation with all target groups (technicians, doctors, residents, and students), that, in an international dimension, have been part of a survey whose purpose was the analysis of the real needs-in terms of expectations and desired usage scenarios to be foreseen.

The survey has been led to the various typologies of participants, collecting the different points of view mainly of the professionals and of university students, obtaining important feedbacks for the **definition of the users scenarios and content organisation**, second important step of the project.

This approach has been interdisciplinary, because the points of view of the different categories are kept into account:

- from a *technical point of view*, where usability of the scenarios and related functionalities were investigated;
- from a *scientific point of view*, in terms of definition also of the best content organization matching expectations of the majority.
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A number of interesting suggestions have been risen during:

- the **First TASTE Workshop** organised in Falun, where 20 professionals (technicians and doctors) participated to a round table on TASTE topics
- **N. 5 local workshop** organized in each partner's country, during which focus groups and interviews were performed to a total of 169 people, participating to an interactive and stimulating discussion.

With specific regard to the content organization, this has been set up, according to user expectations, on the basis of the different **procedures** adopted in histopathology and cytopathology: users can in this way check best and worst cases of preparation related to a single procedure.

In relation to the pedagogical methodology to be applied, the TASTE Consortium decided:

- 1) to keep separate cytopathology and histopathology, as strictly related but separate areas, since the technical procedures involved are basically different, especially in the pre-staining steps. Smearing (and related artefacts) is for instance proper of the former, while sectioning is typical of the latter.
- 2) To present artefacts mainly as cases/exercises, to foster a pragmatic and constructivist approach. Questions could be open, but mostly closed, with more than one alternative. If the answer is not the correct one, the user will be sent back until completion.
- 3) Various degrees of severity of artefacts will be presented, some of them quite unacceptable, since might lead to wrong diagnoses, and which is mandatory to recognize and avoid. Others are instead more tolerable.

- 4) Different types of questions are going to be posed, some straight ("type of artefact") other in sequence. Finally, questions related to the correct procedure in order to avoid artefacts will be introduced.
- 5) It has been realized that neither fixed images (illustrating artefacts, as presented in textbooks) nor dynamic presentations as virtual slides would allow to reach the educational goal. In fact, the former represents a top-down didactic approach which does not mimic the real world, while the latter would have been too long and dispersive. Therefore it has been decided to set a combined approach, so that a given artefact affecting a slide will be presented as a fixed image, but users will be able to open the virtual vision of the same slide, at different magnifications, in order to go through and recognize the artefact.
- 6) Finally, when the number of artefacts will reach a critical point, accrued data will be exploited in order to build in sequence a Library and Encyclopaedia of cytopathological and histopathological artefacts.

In the following months, the main aim will be the completion of the development of the system and the wide collection of microscopic images and creation of cases/exercises.

One of the most important part, at the end of the year, will be the **design of the validation of the TASTE system**, conducted on different levels:

- Coherence of identified scenarios with the real user needs (extensive evaluation);
- Assessment of functionalities and usability of the whole system.

Moreover, by Spring 2014, an almost definitive version of the TASTE system and repository of microscopic images will be released. It is planned also for that and extended validation with external parties.

The Dissemination plan, that involves a promotion and diffusion of the project through different channels (Web sites, Mailing lists, Conferences/Events, Academic publications/journals, Network activities) has provided a useful outline for the first half period of the project and, with the ongoing elaboration of the Exploitation plan, will constitute a milestone of the next steps of the project. Dissemination and exploitation activities are fundamental to let the results of the project being adherent to the real world and therefore sustainable in terms of gathering interest from the different parties and be used/spread.

3. Project Outcomes & Results

The project in its first and a half year has achieved the following results (public results are available on the TASTE web site www.tasteproject.eu):

- **Definition of TASTE user scenarios:** for each kind of primary user (doctors, residents, technicians and students in Anatomic Pathology), different usage scenarios have been conceived, both for training and vocational education purposes then to join a community where they can compare preparations/diagnosis assessed by experts or ask for a feedback. These scenarios, tailored to each user category, have been presented and discussed during the investigation phase of the refinement of needs analysis. The result of this work is in the deliverable **D3.1 TASTE Users Scenarios**.
- **Refinement of needs analysis:** investigation made with 189 external users to refine expectations of the target groups and assess designed scenarios. Proper methodologies and tools have been tuned to run interviews and focus groups at partners' sites. The investigation has been performed on a international sample of users, belonging to different segments (primary target of the project - technicians, doctors, students) in all partners' countries. The result of this work is in the deliverable **D2.1 Refinement of Needs Analysis**
- **Definition of the TASTE system specification:** identification of all technical requirements and functionalities needed to realize the identified users scenario. The result of this work is in the deliverable **D3.2 Specifications for development of TASTE system**.
- **Development of a first Alfa version of the TASTE system**, available at www.syste.tasteproject.eu, presented in the needs analysis investigation to real users and during Falun public workshop. The TASTE system is based on the open source software Moodle linked to a virtual microscope system based on Olympus dotSlide system with NIS database. Actually the English version of the system has been developed.
- **Set up of the microscopic image repository**, a "living" archive of histological and cytological images and slides. Slides are scanned with virtual microscopic system at different resolution-10x or 40x depending on the width of the area to be scanned- and then the link to scanned images is inserted in the TASTE cases/exercises. The virtual microscope is accessible, via the TASTE system, through the Internet.
- A **Quality plan** (deliverable D6.1 and updated version D6.2) to ensure that project activities and results are made in the right schedule and with the required quality.
- Realization, as results (and goals) of the **Dissemination workpackage** of:
 - Realization of the **project web site** (www.tasteproject.eu), 2420 visits until 31/03/2013
 - Realization of the **project leaflet**, about 1400 leaflet distributed
 - Creation of an **interested parties mailing list**
 - Realization of the **First TASTE workshop** in Falun (Sweden) with production of the proceedings (deliverable **D7.4**)

- Realization of **local workshops** for the need analysis investigation in which 190 among professionals, workers and students have been directly involved in the project.
- Publication of some **papers** and abstracts in important Pathology Conferences
- A report documenting the **dissemination plan** (deliverable D7.1) and activities (dissemination table).

4. Partnerships

The partnership is composed by members coming from 5 European countries:

- **COREP - Consorzio per la Ricerca e l'Educazione Permanente (P1) , Italy**, a no profit consortium specialised in high level training and continuing education.
- **UNITO – Università degli Studi Torino (P2), Italy**, one of the leading Italian public Universities with an international reputation for high quality teaching and research.
- **IPATIMUP – Instituto de Patologia e Imunologia Molecular da Universidade do Porto (P3), Portugal**, a non-profit institution of public utility specialised in research in human pathology.
- **IJB - Institut Jules Bordet (P4), Belgium**, a multidisciplinary anticancer medical institution that develops diagnostic and therapeutic approaches based on active laboratory and clinical research.
- **IVB - "Victor Babes" National Institute of Pathology (P5), Romania**, is the leading research institute in Romania in the fields of pathology, immunology, genetics, cellular and molecular medicine.
- **FALUPAT - Central Hospital Falun (P6), Sweden**, is a large county hospital serving the entire population of 280.000 inhabitants in Dalarna County, central Sweden.

The added value represented by this multi-country partnership is:

- the different – and wide - expertises of the consortium members (two universities, an educational centre with deep connections with both the Academic and Industrial world, one research centre specialised in human pathology and two hospitals provide diagnostic pathological and cytological services;
- the several connections – at a national and international level – of the partners put in place a wide network in the pathological field; research institutions or university hospitals with a strong commitment to applied research, daily practice in hospitals and training sector in the field of Pathological Anatomy have been involved in the project.

The partnership has worked a lot both with *in praesentia* meetings (two coordination meetings have been organised until this moment and also with bilateral meeting), and with an electronic collaboration, realized through:

- a TASTE mailing list, created in order to manage communication between partners
- a Skype group for the virtual periodical meetings
- a virtual platform, to share documents and have a common virtual space to work.

The collaboration between partners has a strong component not only in writing the deliverables, but also in approving them.

5. Plans for the Future

It has already been explained that through improving the knowledge sharing and experience about histological and cytological preparations, the TASTE project will hopefully reach two main aims:

1. set up of an **innovative telepathology system** to improve training and VET in technicians, doctors, residents experts in the field of Anatomic Pathology
2. **quality improvement** (toward a possible standardization) of the histological and cytological preparations in Europe.

For this reason, TASTE partnership considers the exploitation of the results a crucial element of the project and then, in its plan for the future of the project, a lot of energies and activities will be spent in this direction.

An enhanced exploitation of the TASTE system will hopefully be reached by the adoption of the System as a test for competency exams for Technicians, Cyto-screener, Biologists, Residents and Pathologists. Competency exams are presently mandatory at national level, but European competency Test are also being conducted. The adoption of a common database and standard for such test, as represented by the TASTE system, would constitute an input towards the establishment of a uniform and improved level of cytological and histological preparations in Europe.

Therefore, even if the detailed Exploitation of the Results is foreseen in the second half of the project (months 15-36), a plan of future exploitation has been drafted and will be refined through next months and the partnership is working on how to route the exploitation according to the different target users.

Moreover, since the very first stages of the project, a large number of students, technicians and doctors have been involved, belonging to partners' countries hospitals, universities and other stakeholder (companies, professional associations) creating a quite good initial network. This network will have a central role in the dissemination activities, both in the short and in the long term.

For the valorisation activities, national/international networks will be contacted, from European Society of Pathology, to several local partner's countries associations and pathology departments.

In the next months of activities the work will focus on:

- Final development of the **TASTE system**, with the set up of all required functionalities according to identified user scenarios.
- Enrichment of the **TASTE microscopic images repository**, with the insertion of cases, exercises, and realization of the **Encyclopaedia of histological and cytological images**. The completion of the Project will require **collection of several examples** (slide/cases), recordings and presentations. Specifically, the focus shall be on Cytological samples of Exfoliative extra-gynecological cytology and of Fine Needle Aspiration cytology from breast and thyroid lesions. Moreover, we planned to collect and accordingly present examples of artefacts related to immunohistochemical techniques, an area where technical pitfalls can heavily affect pathological diagnoses.
- **Design of the assessment framework** for the validation of the TASTE system, with identification of specific evaluation goals, settings, experimental procedures
- **Validation of the TASTE system** through extensive pilot experiments with real users. Results will indicate eventual refinements to finalize the system.

- Organisation of the **Second TASTE workshop** in Belgium and publishing of related proceedings
- Organisation of the **Third TASTE workshop** in Portugal and publishing of related proceedings
- Organisation of the **Fourth TASTE workshop** in Romania and publishing of related proceedings
- Organisation of the **Final TASTE workshop** in Italy and publishing of related proceedings
- Enlargement of the **TASTE Virtual Community** as much as possible through all valorisation actions above mentioned.

The presence, in the TASTE consortium, of top level doctors highly recognized at International level, give prestige and authority to the **TASTE Panel of expert** and therefore to the TASTE Virtual Community.

6. Contribution to EU policies

The project is in line with the Priority 2 of the LLP Programme related to innovative pedagogy and assessment methods for diverse learning pathways.

Indeed TASTE is focusing on creating a technological platform based on the most advanced ICTs. A “virtual microscope” for diagnostic purposes and telepathology will be created. The collection of scanned preparations will allow circulation of a wide range of high quality images, accompanied by accurate diagnoses, from routinely to highly sophisticated ones, building a creative method of lifelong learning, based on Scenarios designed and tailored on the need of the different target groups.

TASTE project is developed in line with the goals of the European Research Programmes, as it aims at enhancing research and innovation capacity throughout Europe. TASTE system can contribute to the restructuring of the European Research Area, thanks to the Virtual Community exchanging best practices required in histological and cytological preparations - basic elements for pathological diagnoses.

The most important contribution that TASTE can bring to EU policies, is the possibility of exploiting the results in all European countries, meeting the need for harmonisation and improvements in field of histological and cytological techniques, preparations and diagnoses, thanks to an easy to use tool and the chance for final users to exchange best practices in a virtual community of professionals and students.