

ICS 11.100.10

English Version

**Molecular in vitro diagnostic examinations - Specifications for
pre-examination processes for FFPE tissue - Part 2: Isolated
proteins**

Tests de diagnostic moléculaire in vitro - Spécifications pour
les processus préanalytiques pour tissu FFPE - Partie 2:
Protéines extraites

Molekularanalytische in-vitro-diagnostische Verfahren -
Spezifikationen für präanalytische Prozesse für FFPE-
Gewebeproben - Teil 2: Isolierte Proteine

This Technical Specification (CEN/TS) was approved by CEN on 6 July 2015 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

European foreword	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 General considerations	7
5 Outside the laboratory	8
5.1 Primary tissue collection manual	8
5.1.1 Information about the primary sample donor	8
5.1.2 Information on the primary tissue sample	8
5.1.3 Information on the primary tissue sample processing	9
5.2 Transport requirements	9
6 Inside the laboratory	9
6.1 Information on the primary tissue sample receipt	9
6.2 Formalin fixation of the specimen	10
6.3 Evaluation of the pathology of the specimen and selection of the sample	11
6.4 Post-fixation of frozen samples	11
6.5 Processing and paraffin embedding	12
6.6 Storage requirements	12
6.7 Isolation of the total protein	13
6.7.1 General	13
6.7.2 General information for protein isolation procedures	13
6.7.3 Using commercial kits	13
6.7.4 Using the laboratories' own protocols	13
6.8 Quantity and quality assessment of isolated RNA	14
6.9 Storage of isolated RNA	14
Annex A (informative) Quantitative protein analysis demonstrates changes of protein amounts during cold ischemia	15
A.1 Introduction	15
A.2 Example	15
A.2.1 General	15
A.2.2 Experimental procedures	15
A.2.2.1 General	15
A.2.2.2 Tissues	16
A.2.2.3 Protein analysis	16
A.2.3 Results	17
A.2.4 Further reading	18
Bibliography	19

European foreword

This document (CEN/TS 16827-2:2015) has been prepared by Technical Committee CEN/TC 140 “*In vitro* diagnostic medical devices”, the secretariat of which is held by DIN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Molecular in vitro diagnostics has enabled a significant progress in medicine. Further progress is expected by new technologies analysing signatures of nucleic acids, proteins, and metabolites in human tissues and body fluids. However, the profiles and/or integrity of these molecules can change drastically during primary sample collection, transport, storage, and processing thus making the outcome from diagnostics or research unreliable or even impossible because the subsequent analytical assay will not determine the situation in the patient but an artificial molecular pattern generated during the pre-examination process.

Although originally thought as being impossible due to the crosslinking activities of formaldehyde, protein extraction techniques from formalin formalin fixed and paraffin embedded (FFPE) tissues have been much improved in recent years. Heat-induced reversal of formaldehyde-induced crosslinks has been demonstrated as an essential step in the protein extraction procedures [1], [2]. Currently, most investigators accept that proteins extracted from FFPE tissue are suitable for downstream proteomic analysis [3].

However, a standardization of the entire process from primary sample collection to protein analysis is needed. Studies have been undertaken to determine the important influencing factors. This Technical Specification draws upon such work to codify and standardise the steps for FFPE tissue with regard to protein analysis in what is referred to as the preanalytical phase.

1 Scope

This Technical Specification gives recommendations for the handling, documentation and processing of FFPE tissue specimens intended for the analysis of extracted proteins during the preanalytical phase before a molecular assay is performed. This Technical Specification is applicable to molecular *in vitro* diagnostic examinations (e.g., *in vitro* diagnostic laboratories, laboratory customers, developers and manufacturers of *in vitro* diagnostics, institutions and commercial organizations performing biomedical research, biobanks, and regulatory authorities).

Protein profiles and protein-protein interactions in tissues can change drastically before and after collection (due to e.g., gene induction, gene down regulation, protein degradation). Protein species amounts can change differently in tissues from different donors / patients. The expression of genes can be influenced by the given treatment or intervention (surgery, biopsy), or drugs administered for anaesthesia or even treatment of concomitant disease as well as by the different environment conditions after the tissue removal from the body.

Furthermore, the formalin fixation and paraffin embedding process leads to modifications of the protein molecules, which can impact the validity and reliability of the analytical test results.

Therefore, it is essential to take special measures to minimize the described profile changes and modifications within the tissue for subsequent protein analysis.

This document is not applicable for protein analysis by immunohistochemistry.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 15189:2012, *Medical laboratories — Requirements for quality and competence (ISO 15189:2012, Corrected version 2014-08-15)*

ISO 15190, *Medical laboratories — Requirements for safety*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 15189:2012 and the following apply.

3.1

ambient temperature

unregulated temperature of the surrounding air

3.2

analytical phase

processes that start with the isolated analyte and include all kinds of parameter testing or chemical manipulation for quantitative or qualitative analysis

3.3

cold ischemia

condition after removal of the tissue from the body until its stabilization or fixation

3.4

FFPE

formalin fixation and paraffin embedding