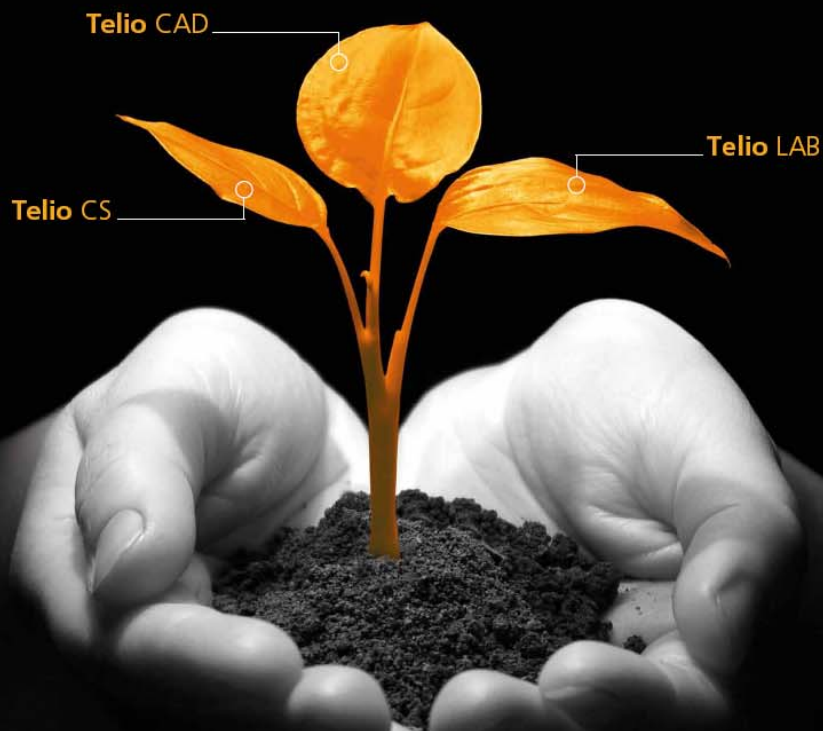


Telio[®]

Everything (for) provisionals



Scientific Documentation

Telio Lab

ivoclar
vivadent:
passion vision innovation

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1. Introduction

1.1 *Temporization*

The temporization of teeth is considered to be an important intermediate step in the provision of permanent tooth replacement [1; 2]. Temporary restorations are provisional solutions which ensure masticatory functionality and phonetics until the permanent restoration is placed. The temporary restoration serves the purpose of protecting the prepared teeth from mechanical, chemical and thermal influences.

The periods of time which need to be bridged might be very short in some cases; in others, however, this time may be several months or even more than one year.

Temporary restorations which are supposed to be worn for several months are generally referred to as long-term temporaries. However, there is no universally accepted definition as to the maximum wearing time for which the use of the term short-term temporary is still acceptable and when long-term temporary is the more appropriate term.

Lab-fabricated reconstructions are generally required in complex clinical situation or when certain biological processes have to be accomplished first, e.g. periodontal treatment.

Due to the continued growth of the implant market, the demand for temporary crown and bridge restorations on implant abutments [3] has been constantly rising. This applies mainly to materials suitable for the fabrication of long-term temporaries.

In addition, the patient demands regarding accuracy of fit, functional aspects and esthetics are increasing also with regard to temporization. These aspects become even more important the longer a temporary restoration is intended to remain in the mouth. Long-term temporaries in particular are increasingly viewed from this perspective.

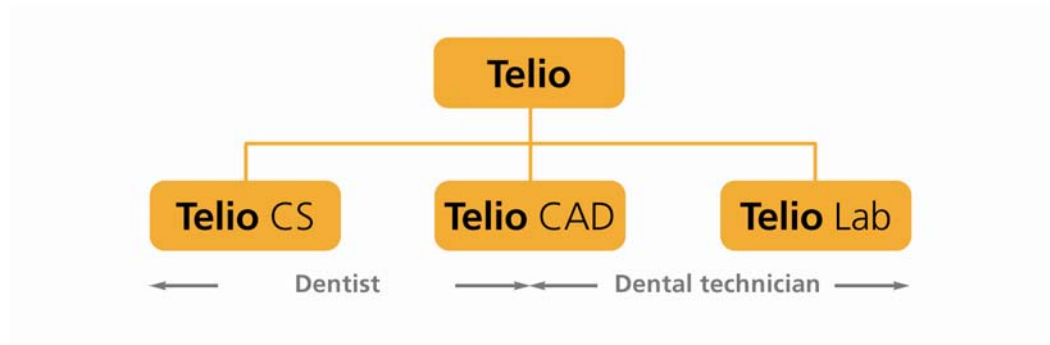
1.2 *Requirements on long-term temporaries*

Given the in most cases considerably longer wearing time of long-term temporaries as compared with short-term temporaries, the materials used for the fabrication of the restorations must meet higher requirements. They should exhibit a sound intraoral stability, sufficient mechanical properties and low susceptibility to discolouration. Furthermore, the materials should be sufficiently resistant to wear and offer the possibility to conduct repairs and supplement existing restorations [4].

Suitable materials include, for instance, tooth-shaded polymethacrylate (PMMA) resins which can be processed using various techniques.

1.3 *Telio Lab*

Telio Lab forms part of the Telio System, which comprises products for the fabrication of conventional and implant-supported temporaries to dental technicians, CAD/CAM users and dentists.



The Telio CS products are used chairside, Telio CAD blocks are milled in CAD/CAM machines and Telio Lab is processed in the dental laboratory.

Telio Lab is a PMMA-based two-component powder/liquid system for the cold polymerization and is available in A-D shades.

The Telio Lab product line is ideal for lab-fabricated temporary crowns and bridges on both natural tooth preparations and implant abutments. Furthermore, the materials allow the fabrication of temporary veneers and lining of temporary restorations.

Telio Lab offers flexibility in processing techniques, allowing for both pouring and injection technique options.

2. Technical data

Standard composition (in wt%)

Telio Lab Powder

Dentin, Bleach, Incisal, Neck, Gingiva and Intensive

Polymethyl methacrylate	> 98.0
Benzol peroxide and pigments	< 2.0

Telio Lab Liquid

Methyl methacrylate	86.5
Dimethacrylate	13.0
Amine	0.5

Telio Lab Opaquer Powder

Copolymer	> 28
Aluminium oxide	30
Barium sulfate	40
Catalysts and pigments	< 2

Telio Lab Opaquer Liquid

Methyl methacrylate	99.5
Catalyst	0.5

Physical properties

Flexural strength	90 ± 10	MPa
Modulus of elasticity	3000 ± 100	MPa
Ball hardness	165 ± 5	MPa
Vickers hardness	160 ± 10	MPa
Water absorption	25 ± 1	µg/mm ³
Water solubility	0.8 ± 0.3	µg/mm ³

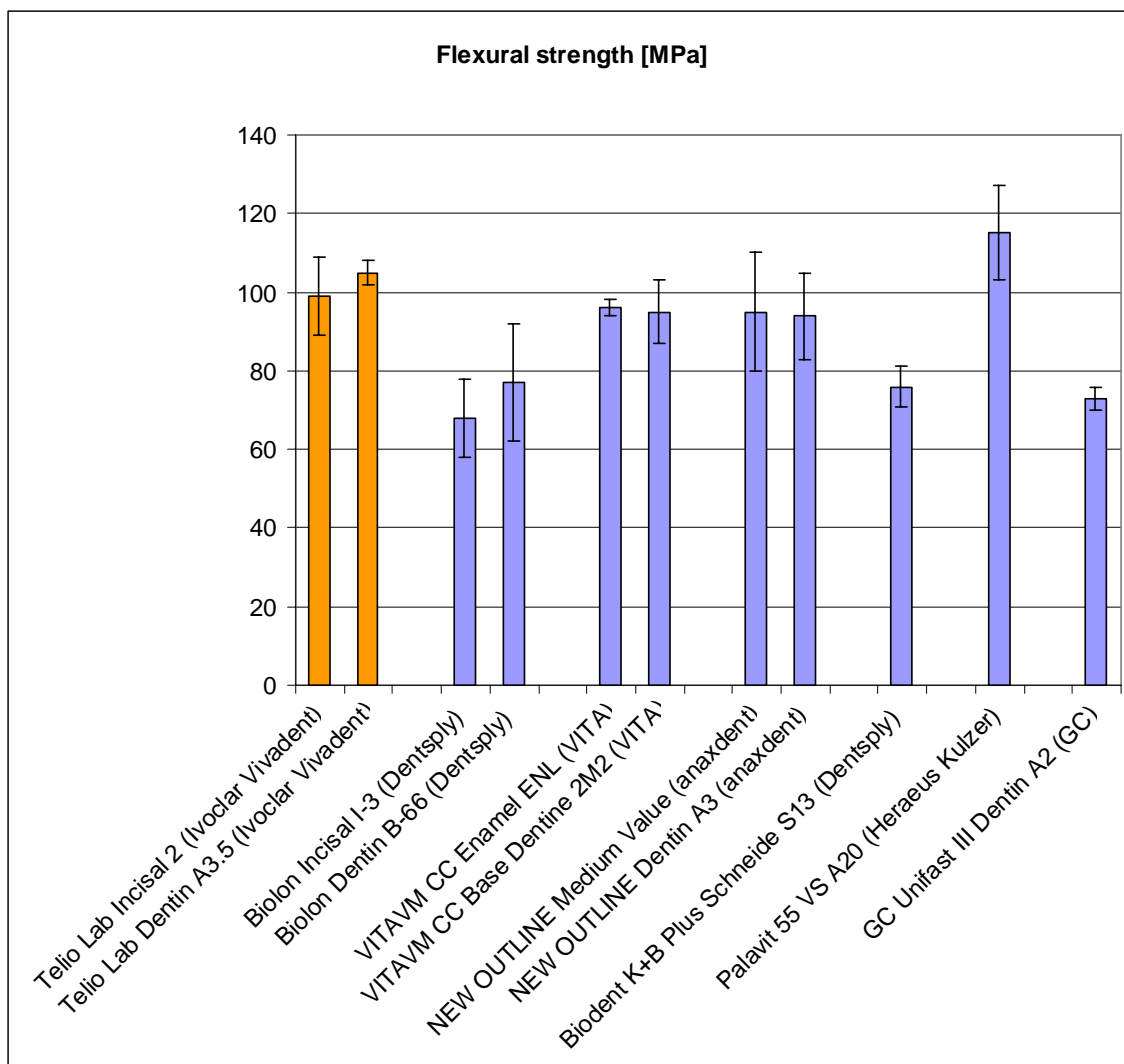
3. In vitro investigations with Telio Lab

Various internal tests were conducted at the Research and Development Department of Ivoclar Vivadent to evaluate the material's physical and mechanical properties. As there are no definitive standards for temporary materials, the results obtained were compared to those of other materials currently on the market. Although there are no product-specific norms for temporary materials which stipulate limiting values for specific parameters, certain measurements can nevertheless be conducted in accordance with norms which are applicable to similar products. For instance, it is advisable to refer to the ISO 10477 norm, which applies to resin materials used for permanent crown and bridge restorations, to determine the flexural strength and the modulus of elasticity. This procedure allows the values obtained in these tests to be compared more easily with other values obtained according to the same norm.

3.1 Flexural strength

Temporary materials also need to provide sufficient mechanical strength in order to withstand the force exerted during chewing. A measure for this strength is the flexural strength of a material, which is expressed as the stress that is exerted on the bent test specimen at the instant of failure.

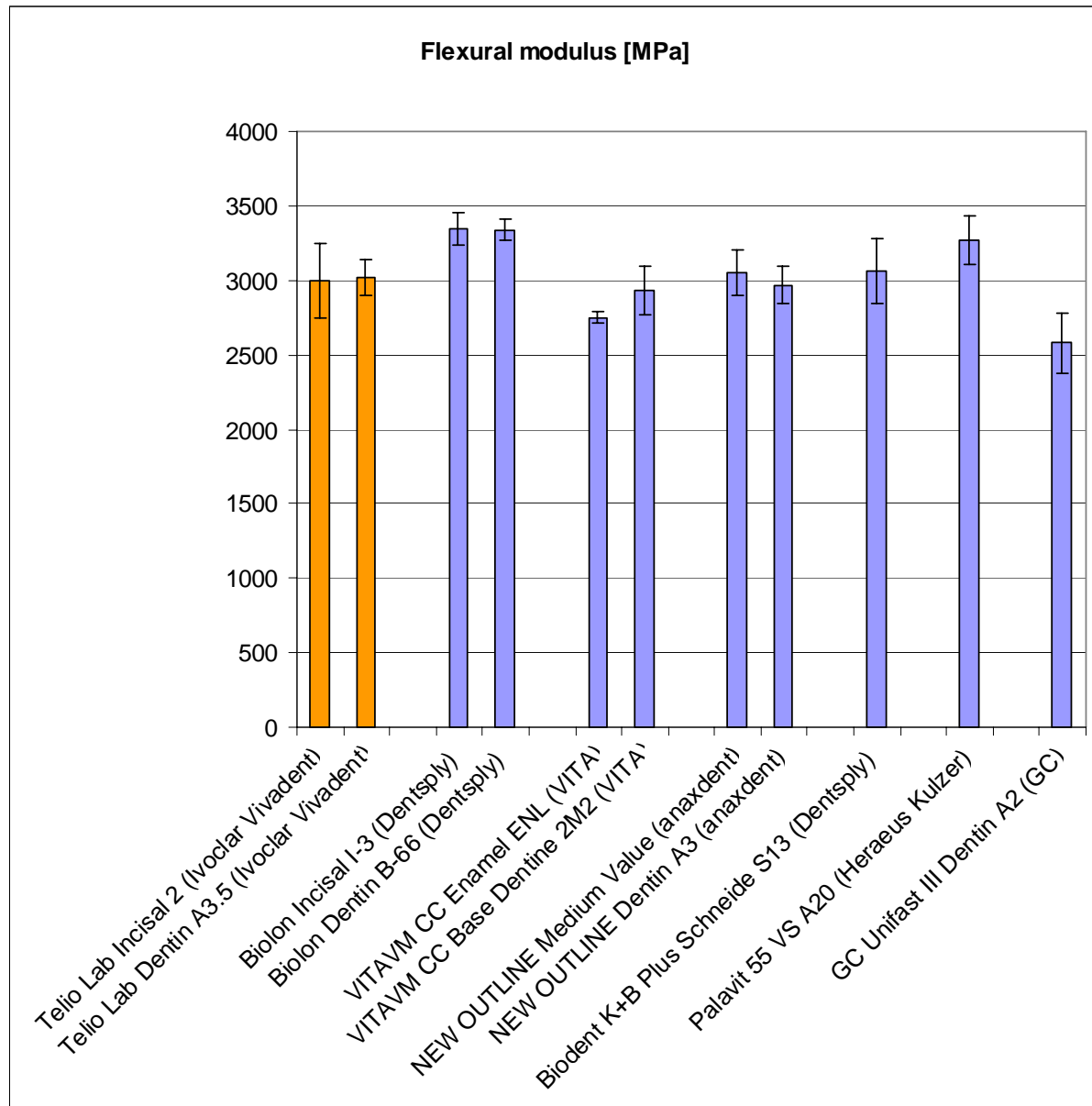
The test specimens were fabricated and the measurements conducted according to ISO 10477 guidelines. The flexural strength measured for Telio Lab shows that the material provides appropriate stability.



Source: R&D Ivoclar Vivadent, Liechtenstein (2009)

3.2 Flexural modulus

The flexural modulus, which is often also referred to as modulus of elasticity, is determined by means of the same trials as those indicated in section 3.1. The modulus of elasticity describes the gradient of the linear section of the stress-strain curve. Therefore, it describes the relationship between stress and strain in the elastic deformation of a solid body and thus refers to the stiffness of a material.



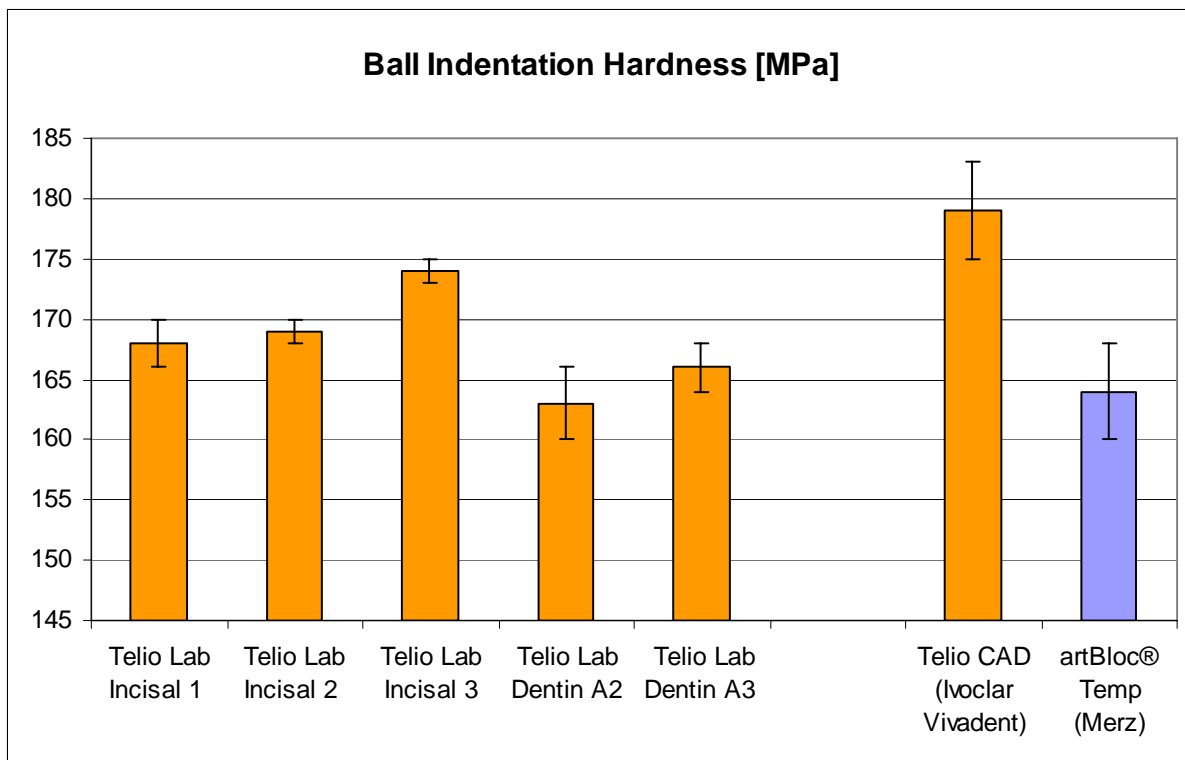
Source: R&D Ivoclar Vivadent, Liechtenstein (2009)

The flexural modulus of Telio Lab is comparable to that of competitor products. No significant differences can be identified.

3.3 Ball indentation hardness

When it comes to acrylics or composites, the determination of ball indentation hardness is a preferred method of describing their hardness. In this test, a ball is dropped on a composite surface measuring 50 x 50 mm. The value determined is the quotient of the applied load and the surface area of the impression underneath the ball.

The hardness of a material is the resistance of a material to the penetration by another body. This parameter influences the resistance of a restorative material to wear by itself. Particularly when used for occlusal restorations, the material requires a certain degree of hardness. However, there is no clear correlation between hardness and wear resistance. As far as wear of the antagonist is concerned, the surface roughness is much more important than the degree of hardness.



Source: R&D Ivoclar Vivadent, Liechtenstein (2009)

The ball indentation hardness of Telio Lab Incisal and Telio Lab Dentin is in a similar range as the values obtained for competitive products.

3.4 Wear

In order to assess the clinical behaviour of a dental material, chewing conditions are simulated in the laboratory.

At Ivoclar Vivadent, the Willytec chewing simulator is used for wear measurements. In order to obtain comparable results, a more or less standardized procedure is chosen. For this purpose, standardized ceramic antagonists made of Empress material are used and planar test specimens are subjected to 120,000 chewing cycles at a load of 50 N and a horizontal movement of 0.7 mm. Vertical wear is measured by means of the 3D laser scanner. Vertical wear of less than 200 μm is considered to be low wear, while wear in the region of 200 – 300 μm is classified as medium wear. Values above 300 μm are classified as high wear.

Telio Lab was compared with the tried-and-tested SR Ivocron material in the laboratory wear measurement. The Dentin version was used for both materials. Both in terms of material and antagonist wear, no statistically significant difference was found between the two materials.

	<i>Vertical wear (μm)</i>	
	<i>Material wear</i>	<i>Antagonist wear</i>
Telio Lab Dentin	175 \pm 22	73 \pm 11
SR Ivocron Dentin	179 \pm 26	77 \pm 11

Source: R&D Ivoclar Vivadent, Liechtenstein (2009)

4. Biocompatibility

Test specimens made of Telio Lab were subjected to cytotoxicity and mutagenicity tests. In XTT assays conducted to assess the cytotoxicity of the material, no cytotoxic potential was found [5]. The AMES did not reveal a mutagenic effect [6]. The results of both tests show that Telio Lab is neither cytotoxic nor mutagenic and that its use does not pose a toxicological risk if used as indicated in the respective instructions for use.

5. Literature

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Ivoclar Vivadent AG
Research and Development
Scientific Services
Bendererstrasse 2
FL - 9494 Schaan
Liechtenstein

Contents: Dr Marion Wanner
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