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*Research Article*

# Study of the "One Day Biotech" Implant Prosthetic System

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## ABSTRACT

**Background:** Implant prostheses have evolved with aesthetics, occlusion and peri-implantitis. Initially only the duration of oral rehabilitation was considered. The consolidation of the concept of osseointegration and titanium implant led to an increase in the importance of aesthetics, peri-implant concepts and the definition of occlusal protocols. Today implant rehabilitation is predictable, improves patient's quality of life and has a high success rate.

Initially it was used only for completely edentulous patients. The breakthrough came with the UCLA abutment.

Today protheses can be cemented when the aesthetics are paramount or not cemented (screwed) when ease of removal is paramount.

The main goal of this article is to analyze One Day Biotech implants in terms of cost, aesthetic, occlusion, ease of removal, screw or porcelain fractures and periodontal health.

**Material and Methods:** After reviewing the diagram of the prosthetic components in the One Day Biotech System, this article discusses cement-Screw retained protheses (the main advantage of screw-retained protheses, whether immediate or delayed, is their ease removal).

One Day Biotech components are approximately 20% cheaper and are available for any type of prosthesis, whether analog or digital.

Cemented protheses can be made with standard abutment or customized posts (Ti-Bank).

**Discussion:** One Day Biotech in a 11º convergence morse cone implant with screw tightening at 30Nw, which loosens 60% less than external hexagon and 50% less than the internal hexagon implant over time.

Screw retained protheses are preferable whenever removal is prioritized over aesthetics and occlusion.
On the other hand, the discussion focuses on the type of connection, prosthetic retention, intermediate abutment and CAD/CAM technology.

**Conclusion:** The One Day Biotech implant adapts to any clinical situation.
It has analogs for both: plaster casting and digital applications.
It doesn´t have a Ti-Bank in Cr/Co.
It doesn´t have zirconium and Cr/Co abutments.
It preserves periodontal health.

## KEYWORDS

Dental Implant, Cemented &Screwed prosthesis, Unitary prosthesis, Total prosthesis, Hybrid prosthesis, Occlusion with implants.

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## Introduction

Implant rehabilitation is predictable, as demostrated in the study by Lini F [1] Moraschini V [2] Ekehund J A [3], implant rehabilitation significantly improves patient quality of life, as stated by Clancy JM [4] and Manzano A [5], presenting a high success rate since 1981, when the article by Adell R [6] was published.

At the beginning of implantology, in the 1970´s it was only allowed to make prostheses on completely edentulous people, as we can read in the articles of Schnitman PA [7] and Adell R [8], which were made of resin and implant longevity was more valued than prosthodontic aesthetics (Figure 1) so the prosthetic system was limited to intermediaries between the prosthesis and the implant, as described by Bränemark [9].

**Figure 1:** Total mandible rehabilitation with resin tooth.

The introduction of new manufacturers expanded the field of rehabilitation, Alf Eliasson [10] introduced the ceramic prosthesis, the great revolution being the UCLA attachment, presented to the scientific community by Lewis S [11], basically a plastic attachment , on which it could be waxed and finished by casting with Cr/Co, on which the screwed or cemented ceramic prosthesis was built (Figure 2 a), as described by Holm C [12] in his review article at 10, 20 and 30 years. The UCLA attachment presented two major problems: shear effect between the Cr/Co post and the titanium of the implant and the inaccuracy of the connection. Rieder CE [13] proposed a UCLA with a mechanized base and plastic tube as a solution for the second problem (Figure 2 b). The issue of the stack effect remained until recent advancement when the UCLA has been replaced by the titanium Ti Blank type, assuming that porcelain cannot be adhered to titanium, nor can a zirconia prosthesis be made without increasing its diameter to the point of interfering with occlusion. In the cuspids, it is possible to cement a zirconia crown on a base of titanium and eliminate the shearing effect.

**Figure 2a:** UCLA without mechanical base.

**Figure: 2b:** UCLA with mechanized base.

The Corevent Company was the first to present an extensive library of abutments (Figure 3), whose objective was to adapt to any type of prothesis as described Zobler MN [14].

**Figure 3:** Prostodontic Core vent System.

Today the prosthodontic dentist only has to select which prosthetic abutment is adequate to achieve a satisfactory aesthetic rehabilitation, as proposed Tiziano T [15] as well as Buser D [16], Romanos GE [17] and Laleman I [18].

Attachments can be classified according to: type of connection, prosthesis retention, implant-prosthesis axial relationship, manufacturing material, manufacturing method, intermediaries between prosthesis and implant.

There are three basic types of connection: external, internal, well defined by Gracis S [19] and Morse taper, as defined from the article by Merz BR [20] (Figure 4).

**Figure 4:** Implant connection: external hex, internal hex, morse taper.

Initially it was a 0.7mm external connection, the aim was to prevent lateral forces affecting the screw, while its low height avoided parallelism problems. As the importance of esthetics in single teeth increased, the importance of the anti-rotation effect increases, which led the development of the internal connection by increasing its depth. The Morse taper is a type of internal connection that offers a cold weld, friction stability and better distribution of the load received by the prosthesis, distributing it along the entire length of the implant, reducing micro movements of the abutment interface implant, as reported by Meng JC [21]. Very interesting in unitary prosthesis, but in a prosthesis with two or more implants, the position that each attachment can adopt tends to infinity and in the case of a screwed prosthesis it is impossible to position it due to the slightest non-parallelism of the implants. This is the reason why Multiunit (Figure 5) should be used on conical implants, as stated by Ashurko I [22], which converts the Morse cone into an external connection and places the abutment gap 1mm below the gum, but away from the bone.

**Figure 5:** Complet jaw edentulous with multiunits, titanium bar and zirconium rehabilitation.

The prosthesis can be cemented or screwed, as described by Shadid R [23]. The cemented prosthesis is difficult to remove, but it has the following advantages: better aesthetics, greater passivity, as stated by Guichet [24], better occlusal stability, less food retention. On the other hand, the screw-retained prosthesis is very easy and simple to removal, in exchange of less aesthetics, greater food retention and a need for total accuracy in taking impressions. The widespread use of screw-retained prostheses is the greatest evidence that the problems of implant-supported prostheses are far superior to those commonly accepted.

The axial relationship between prosthesis and implant does not present any difficulty. In cemented prosthesis, straight, angled and custom-made components are available from a Ti Bank Type (Figure 6). In screw-retained prostheses, straight or angled multi-units are available, as well as screws with a straight or angled head. According to Huang Y [25] the angulation of the prosthetic component is a factor in loosening of the implant abutment.

In 1988, Nordin T [26] published the use of the conical connection in partially edentulous patients.

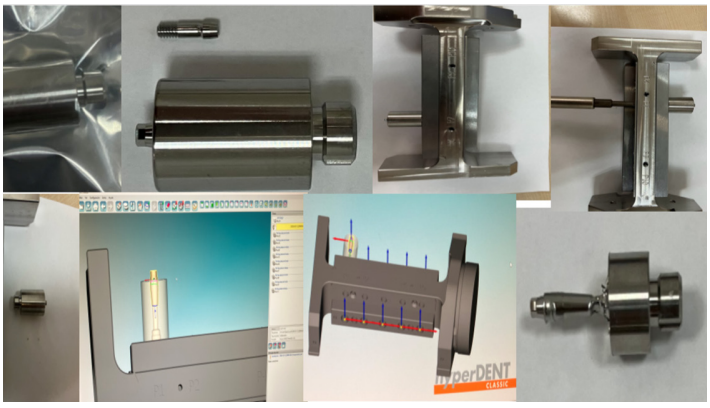

**Figure 6:** Ti Bank type abutment.

All prosthetic components are made of titanium, in order to reduce the stack effect. Zirconia components are prone to fatigue fractures due to their fragility, as Sailer I [27] and Nakamura K [28] refer in their articles. According to Slanting HJ [29], Peek is exclusively used in provisional prostheses, as Kwan J C [30] refers in his article.

Currently, all components are manufactured using Cad Cam technology. They can be "original": when the same manufacturer manufactures the implant and the prosthetic components, or "clones", in other words, the manufacturer of the prosthetic phase does not manufacture the implant, so its accuracy is lower.

The Intermediaries or Multiunit, act as substitutes for the polished collar in the implants, have various heights and angles and only make sense in multiple screw-retained prostheses. Its interest is Biological (the prosthetic Gap is placed 1mm below the upper limit of the gum) and mechanical (in case of screw breakage, the multiunit is changed and the risk of loss of the implant is eliminated due to the impossibility of removing the piece of broken screw located inside the implant).

There are components for very precise situations. Temporary Abutment for provisional prosthesis. UCLA CCM with machined Cr/Co base for analogue techniques, ONEDAYcator as a removable prosthesis retainer.

## Primary and Secondary Objectives

The article will study cost, aesthetics, occlusion, loss of retention in the removable prosthesis, ease of disassembly of the prosthesis, fracture of the prosthesis (porcelain, screw) and periodontal health.

## Material and Methods

A.-General diagram of the prosthetic components in the One Day Biotech system (Figure 7).

The One Day Biotech system offers a full range of prosthetic components that allows all types of prostheses to be made, both analogically and digitally, whether cemented or screwed.

The One Day Biotech system is ergonomic and simple, so that, regardless of the One Day Biotech implant model used, we will always use the same connection for either, cemented or screwed prosthesis and in both cases we can opt for an immediate or delayed prosthesis and take impressions with silicone or digitally since analog or digital duplicates are available. Long-term prostheses can be made analog or digital, with free libraries for exocad, 3 Shape, etc.

The prosthetic connection is compatible with: Osstem, Dio Implant, Dentium, NeoBiotech, Dentis Implant and MegaGen (Figure 8), It does not have Ti Bank Type in Cr/Co, nor screws for angled chimneys.

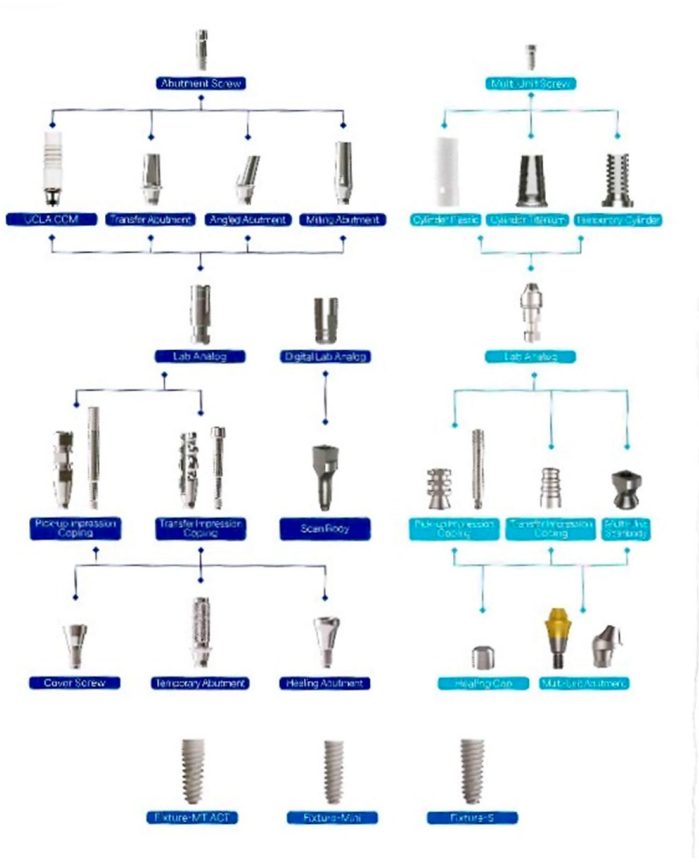


**Figure 7:** Diagram of prosthetic components.


**Figure 8:** Diagram pf compatibility.

## Cemented prosthesis

The cemented prosthesis (Table 1a) can be made in two ways: when the implant is uncovered, we directly position the abutment, and the same dentist parallelizes it, or we insert the healing abutment, taking impressions once the gum has healed. The impression can be done analogically or digitally with the Scan-body. Depending on whether the model is made analogically or printed digitally, we will use analog or digital analogs. Whether it is an analog or digital prosthesis, the laboratory will provide the individualized posts, the positioning key and the provisional prosthesis. From this stage onwards, the cemented prosthesis follows the same steps as a prosthesis on teeth (Figure 9).

**Figure 9:** Crown cemented versus crown screwed.

Advantages and disadvantages of the cemented restorations

| Advantages | Disadvantages |
|---|---|
| • Flexible implant positioning | • Retrieval is unpredictable |
| • Occlusion controlled in a precise way | • Minimum hole of 4mm to retrieve the screw |
| • Easy provisional teeth | • Excess cement leads to periimplantitis |
| | • Minimum 4mm abutment height required |

**Table 1a:** Advantages and disadvantages of the cemented restorations.

## Screwed prosthesis

The screw-retained prosthesis can be performed immediately or delayed (Table 1b).

Advantages and disadvantages of screwed restorations

| Advantages | Disadvantages |
|---|---|
| • Easy retrieval | • Porcelain fractures |
| • Possible even if les tan 4mm of height | • The composite material covering the screw looks bad |
| | • The temporal teeth are very difficult to make |

**Table 1b:** Advantages and disadvantages of screwed restorations.

## Delayed screw-retained prosthesis

Once the implant is Osseo-integrated, the cover screw is replaced by the healing abutment, and we wait for the gum to heal. The steps would be replacement of the cover screw with the healing abutment, taking impressions with pick up for the analog technique and scan body for the digital technique. The choice of the multiunit is made based on the height of the gum and the angulation of the implant. If we perform the prosthesis by analog methods, using plastic cylinders, if digitally with Cad Cam techniques. (All One Day Biotech libraries are public and free).

## Immediate screw-retained prosthesis

The One Day Biotech system allows immediate loading. If the dentist wishes to carry out an immediate loading, we will begin by making the prosthesis in an analog or digital way and we will use its duplicate as a surgical guide. Once the implants have been inserted, we will proceed to place the multi-unit abutments, so that they protrude 2mm from the gingiva. We take pick-up impressions for the analog technique and multi-unit scan body for the digital technique. Once the provisional prosthesis is finished, we will screw it into the mouth.

After 3 months we unscrew the provisional prosthesis, replace the multi-units with others of a height adapted to the height of the gum and proceed to take impressions. From these impressions we will proceed to make the long-term prosthesis and finish with its insertion in the mouth (Figure 10).

**Figure 10:** Rehabilitation screwed on the edentulous maxilla.

The Unitary Prosthesis can be cemented or screwed, digital or analog, immediate or delayed.

In the case of making a cemented prosthesis, we will use a straight, angled or milling abutment, depending on the angulation of the case. Its main advantage is aesthetics and occlusal stability, and its main disadvantage is the difficulty of disassembly, eventually leading to the need to break the prosthesis due to the impossibility of disassembly.

Clinical cases (Table 2)

| | | |
|---|---|---|
| Implant abutments | Type of connection | Connection with anti-rotational element |
| | | Connection without anti-rotational element |
| | Abutment material | Titanium |
| | | Zirconium |
| | | Peek |
| | | Cr/Co |
| | Type of retention between prosthesis and implant | Screw retained |
| | | Cement retained |
| | | Magnetic |
| | | Abutment locator type |
| | Method of fabrication | Prefabricated |
| | | Custom-made abutment |

**Table 2:** Types of implant abutments.

Unitary prosthesis (Figure 11).

**Figure 11:** Unitary crowns cemented.

If the prosthesis is screwed, we will use the UCLA CCM, in case of analog protocol, or a milling abutment for digital protocols. Its advantages are the disadvantages of the cemented one, being able to dismantle the prosthesis easily and its disadvantages. aesthetics, occlusal instability, loss of the composite plug and food retention. Another drawback is the absence of TI BANK Type of Cr/Co, so the crown cannot be made of porcelain, and must be made of zirconia.

## Partial prosthesis

The One Day Biotech system offers solutions for any clinical situation.

In the case of a cemented prosthesis, parallelism can be obtained in the clinic or in the laboratory. Once the abutments are in the mouth, the following phases will be identical to those we carry out in fixed prosthesis on teeth.

In the case of a screw-retained prosthesis we will face two problems: aesthetics and non-parallelism.

Regarding non-parallelism, a prosthesis with a chimney for access to the cover screw is inevitable. Even if angled screws are available, they can only be screwed at 10Nw, so loosening is frequent.

The chimney is closed with composite, so we will have color changes and de cementation, with consequent food retention and occlusal and aesthetic penalties.

If two or more implants are not perfectly parallel, the positioning of the prosthesis will be impossible, so we will have to cut the Morse cone, increasing the transmission of the masticatory forces to the closure screw, thereby increasing its breakage percentages, or use multi -units, with which we can correct non-parallelisms up to 30º in exchange for losing the Morse cone effect between the implant and the prosthesis, reducing the diameter of the closure screw and increasing the price of the rehabilitation.

Total prosthesis (Figure 12).

**Figure 12:** Total rehabilitation over unimetric screwed.

If we are faced with the rehabilitation of an edentulous jaw, we can opt for a removable prosthesis, a hybrid or a conventional fixed one.

## Removable prosthesis

The system has ONEDAYcator, it comes in varying heights to accommodates gingiva levels and in its straight version or angled at 15º.

The prosthesis will be made following the usual procedure and once finished the females will be fixed to the resin of the base.

## Hybrid Prosthesis

It will always be a screw-retained prosthesis, on the multi-unit abutment. The procedure does not differ in any way from a conventional procedure, except that the impressions must be taken with the transfers and prior to manufacturing the master model, the duplicates must be added to the transfers. We can do it analogically

or digitally (taking impressions and making the master model. Making an aesthetic prosthesis, in RC and correct DV. choosing the multi-units and making the bar passivity test. Testing the bar with the teeth mounted for its aesthetic and functional assessment: occlusion and vertical dimension, ending with the delivery of the prosthesis.

In the case of an immediate hybrid prosthesis, the multi-units will be 2 mm higher than the gum and once the gum has healed, they will be replaced by multi-units of the height of the keratinized gingiva.

### Conventional fixed prosthesis

This prosthesis can be cemented (it cannot be dismantled if necessary) or screwed directly on the implant or through the muti-unit abutment. If screw-retained prothesis is chosen, the great advantage will be being able to dismantle it easily and the disadvantages will be the aesthetic problems, occlusal stability and food retention due to losing the composite plugs that close the chimneys and the increased cost in case of using multi-units.

### Differences between cemented and screwed prosthesis

### Cost

Screw-retained prosthesis are the most costly, with costs increasing significantly when muti-units are used.

### Aesthetics

The cemented prosthesis shows identical aesthetics to the prosthesis on teeth. In the screw-retained prosthesis, the chimney closure composites will always be visible.

### Occlusion

Composite chimney closures always mean less occlusal stability.

### Loss of retention in the removable prosthesis

The loss of retention is not due to the wear of the silicone, but rather the metal component.

### Ease of disassembly of the prosthesis

Here the screw-retained prosthesis is far superior to the cemented one. The screw-retained prosthesis is easy and quick to disassemble, while the cemented prosthesis can be impossible to disassemble. That is the main reason why the screw-retained prosthesis is, by far, the most used.

### Prosthesis fracture

It depends on the material, rather than the type of prosthesis. Those that break most frequently are the resin followed by zirconium ones and finally porcelain ones. We can differentiate the breakage of the prosthesis, in which the metal structure never breaks, but rather the ceramic coating, and the abutment screw.

Zirconium abutments break very easily [27] and Titanium abutments never. Peeck's are only used for provisional prostheses [30].

The screw that joins the abutment to the implant is the one with the highest failure rate, being able to differentiate between loosening and breakage of the screw.

### Periodontal health

The machining factor and the type of implant-abutment connection influence more than the fact whether the prosthesis is screwed or cemented.

## Discussion

The type of connection of the One Day Biotech implant is the "Morse cone" type, with a taper of 11º. In our study, the loosening of the screws was lower than that observed in implants with external or internal hexagons, not exceeding 6%. coinciding with what was stated by Cavazos E [31] in his study, while in the external and internal hexagons it varies from 6% to 48%, as already confirmed by Y. Huang [32] in his article, keeping the type of connection constant, the torque, as emphasized by Walid Al-Zordk [33] and Honorio BS [34] and the length of the cantilever as pointed out by Horsh L [35] and Schmid [36]. Khraisat M [37] did not find significant differences between internal and external connections. Coinciding with Rieder CE [38] and Bruna M [39], in our study the Morse cone increases the mechanical resistance to the masticatory force and decreases the Gap between the connection of the implant and the prosthetic component, reducing bone loss due to bacterial penetration.

Regarding prosthesis retention, the best system would be one that increased implant-prosthesis passivity, improved aesthetics, allowed easy removal of the prosthesis, required less manufacturing time, and was less expensive. In our study, as in the article by Wittneben JG [40], there is no statistically significant difference between cemented or screw-retained prosthesis with respect to the percentage of success or failure, biological complications, type of abutment material (Titanium, Gold or Zirconium); nor cement used, If there is a difference regarding the disassembly time, if necessary.

The Morse cone distributes the masticatory forces throughout the body of the implant, which allows greater stability and less bone loss, as Pessoa RS [41] wrote.

When making screw-retained prostheses we favor retention (it can be manufactured from a 4mm interocclusal space), no cement is required and it uses multi-units, which will protect the peri-implant tissues, in exchange for increasing the cost, correcting large divergences of the implants and working through the gingiva of the bone level. In many articles, for example that of A Theoharidou [42], the specific torque setting are not provided and it does not differentiate between loosening and breakage.

The cemented prosthesis will follow the clinical and laboratory prosthodontic techniques identical to the prosthesis on teeth, it will keep the occlusal surfaces intact, thereby improving aesthetics, as stated by ST Chen [43], and occlusal stability, obtaining a

passive prosthesis more easily. according to Jemt T [44], being their learning curve faster in exchange for giving up to its easy removal and accept the problems derived from cement not removed.

The screw-retained prosthesis will be preferable as long as there are overhangs, as stated by Horsh L [35] and Schmid E [36] in the prosthesis (hybrid prosthesis), the emergence of the implant is lingual or palatal and we prioritize reversibility over aesthetics, not fixing them with screws at a torque less than 20 Nw nor more than 30Nw.

Cemented prosthesis will be the first option when maximum aesthetics and better control of occlusion and screw-retained prothesis when disassembly is prioritized, according to the Hebel KS [45].

The One Day Biotech system allows to make complete stabilized prosthesis, as the study of Smedberg J [46]. For these cases we will use the ONEDAYcator.The ONEDAYcator comes in varying heights and angulation to accommodate gingival levels. It does not have ONEDAYcator for bar, only the direct-to-implant version is available. As studied Borges GA [47], the force exerted depends on the color of the chosen female, and the loss of retention is more due to the wear of the metal of the male than to the wear of silicone female.

All OneDayBiotech intermediate pillars are made of titanium, to avoid the stack effect, reduce the risk of peri-implantitis, as indicated by Bruna M [38], except for the UCLA CCM, whose connection is made of Cr/co. This attachment was widely used in the 90s, due to its easy casting, mechanical resistance and price. Currently, it is exclusively used in analog laboratories, having been replaced by the Cad/Cam technique. Regardless of the type of prosthesis, the implant-prosthesis relationship is always of the Platform Switching type, in accordance with the article by Casetta M [48], with the purpose of minimizing the cortical loss of bone, as demonstrated by Pessoa RS [41], Sasada Y [49] and Sanz-Esporrin J [50].

Regarding the axial implant-prosthesis relationship, the system has straight and angled abutments, both with different cuffs, and Ti Bank Type, for cemented prostheses and multiunit straight and angled for screw-retained prostheses and the ONADAYcator to stabilize removable prostheses.

According on the type of manufacturing, they can be classified as originals and clones, the originals being: analog, prefabricated, manufactured by Cad Cam (digital) techniques and the ONEDAYcator for removable total prosthesis.

In contrast to Long et al. study [51], which found differences between abutment intermediaries and those made with Cad Cam technology (digital), in our study there were no significant differences.

## Conclusions

The One Day Biotech system is a complete system that adapts to any clinical situation.
The One Day Biotech system allows for cemented and screwed prostheses.
The One Day Biotech system can be used in analog or digital laboratories.
The One Day Biotech system lacks angled chimney cap screws.
The One Day Biotech system lacks zirconium abutments
One Day Biotech system lacks Ti Bank in Cr/Coç
Regarding cost, the cemented prosthesis is less expensive.
Aesthetics and occlusal stability are better in cemented prosthesis.
The ease of disassembly is much greater in the screw-retained prosthesis.
Prosthesis fractures depend on the material used.
Periodontal health does not depend on the type of prosthesis, but on how we have made the prosthesis.

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