

# Fibrinolytic system

This article has been translated from WikiSkripta; ready for the **editor's review**.

**Fibrinolytics**<sup>[1]</sup>, also thrombolytics, are drugs used to dissolve already formed thrombi. They work by activating the **fibrinolytic system**, which is the functional opposite of the coagulation system.

## Fibrinolytic System

First, the proenzyme **plasminogen** (*present in the clot and in plasma*) is converted to **plasmin**. The **plasminogen activators** (*tissue plasminogen activator t-PA and urokinase-type plasminogen activator u-PA*) are responsible for this, whose functional antagonist is **plasminogen activator inhibitor 1 (PAI-1)**. **Plasmin acts as a protease that cleaves fibrin into degradation products (but it acts with little substrate specificity and can also cleave fibrinogen). So fibrinolytics work as plasminogen activators.**

Under normal circumstances, fibrinolysis is limited to thrombus, free plasmin is rapidly neutralized by  $\alpha_2$ -antiplasmin. If the fibrinolytic system were to be systemically activated, imbalance and bleeding would occur. The success of fibrinolysis depends on the age of the thrombus - the older it is, the more difficult it is to lyse.

 For more information see *Fibrinolysis*.

## Ideal Fibrinolytic

- It is administered **intravenously**.
- It acts **selectively** on the thrombus.
- **Does not activate** plasminogen to plasmin **in plasma**.

## Indication

Thrombolytics are used to dissolve an already formed clot (venous and arterial) - in *'acute conditions*:

- extensive pulmonary embolism,
- thrombosis of large venous systems,
- arterial occlusion, embolism in the systemic circulation,
- Worldwide, thrombolysis is also used in acute heart attacks<sup>[2]</sup>, but coronary angiography with angioplasty is mainly used in the Czech Republic.

## Contraindications

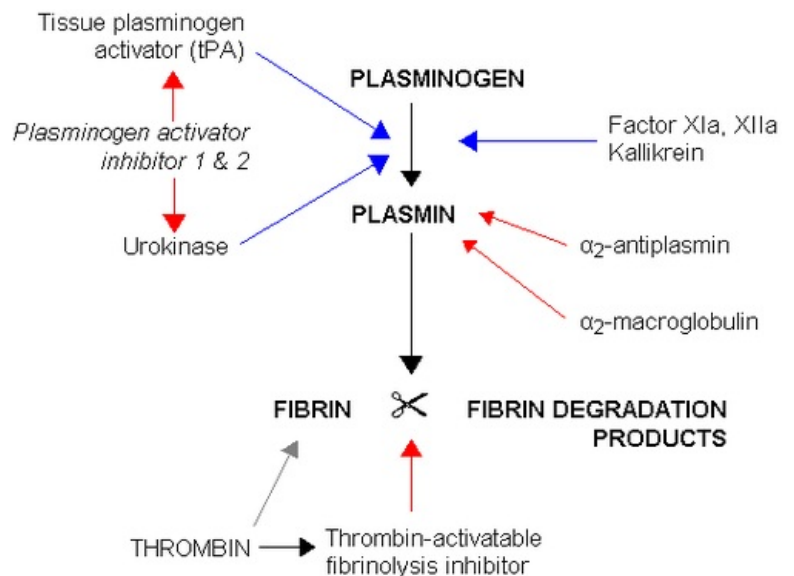
- Bleeding condition or risk of bleeding
- Recent surgery, puncture of the artery or trauma
- Ulcer disease
- Recent stroke / TIA (<2 months; not but acute)
- Cancer. <sup>[2]</sup>

## Side effects

- Bleeding

## Medicines used

Basic groups of fibrinolytics



Fibrinolysis diagram

<b>first generation fibrinolytics</b>	streptokinase, urokinase	non-selective, induces systemic fibrinolysis
<b>fibrinolytics II. generation</b>	t-PA, anistreplase, alteplase	selective binding to fibrin, not systemic fibrinolysis
<b>fibrinolytics III. generation</b>	reteplase, tenecteplase	selective binding to fibrin, no systemic fibrinolysis, faster onset than II. generation

## Streptokinase

 For more information see *Streptokinase*.

is a non-enzymatic protein from  $\beta$ -hemolytic streptococci, acting as an indirect activator of plasminogen (forms a complex with plasminogen converting free plasminogen to plasmin). The plasma half-life is 20 minutes. It is very effective, cheap, but it is antigenic and has a hypotensive effect<sup>[2]</sup>. Adverse effects may include bleeding, allergy, fever, or even anaphylactic shock.

## Urokinase

 For more information see *Urokinase*.

is a human protease synthesized in the kidneys, it directly activates plasminogen. Due to its origin in the kidneys, it is not antigenic, but it is less effective.

## Tissue plasminogen activator (t-PA)

it acts selectively on thrombus but has a shorter half-life than streptokinase (5–10 min), which is associated with a higher incidence of reocclusion. It is highly effective. It is used as recombinant rt-PA or **alteplase**.

## Anistreplase (ASPAC - acetylated streptokinase-plasminogen activator complex)

it has a long half-life (90 min), so it is administered as a bolus intravenously. Acts more selectively on fibrin than on fibrinogen, unbound anistreplase is inactivated in plasma by  $\alpha_2$ -antiplasmin. It is antigenic. It is mainly used in acute myocardial infarction.

## Links

### Related Articles

- Hemocoagulation
- Hemocoagulation versus anticoagulation
- Anticoagulants

### Source

- LINCOVÁ, Dagmar – FARGHALI, Hassan, et al. *Basic and applied pharmacology*. 2. edition. Prague : Galen, 2007. pp. 277–279. ISBN 978-80-7262-373-0.

### External Resources

- SOME ASPECTS OF ACUTE PULMONARY EMBOLISM TREATMENT (<https://www.internimedicina.cz/pdfs/int/2001/10/07.pdf>) prof. MD Jiří Widimský, DrSc., FESC, Internal medicine for practice 2001/10
- Recommended procedures of the European Society of Cardiology for the diagnosis and treatment of acute pulmonary embolism, version 2014 ([http://www.kardio-cz.cz/data/upload/Doporucene\\_postupy\\_ESC\\_pro\\_diagnostiku\\_a\\_lecbu\\_akutni\\_plicni\\_embolie\\_verze\\_2014.pdf](http://www.kardio-cz.cz/data/upload/Doporucene_postupy_ESC_pro_diagnostiku_a_lecbu_akutni_plicni_embolie_verze_2014.pdf)). Summary document prepared by the Czech Society of Cardiology (2014 ESC Guidelines on the diagnosis and management of acute pulmonary embolism. Summary document prepared by the Czech Society of Cardiology) Richard Rokyta, Martin Hutyrab, Pavel Jansac

### References

1. LINCOVÁ, Dagmar – FARGHALI, Hassan, et al. *Basic and applied pharmacology*. 2. edition. Prague : Galen, 2007. pp. 277–279. ISBN 978-80-7262-373-0.
2. BULTAS, Jan. "Pharmacotherapy of cardiovascular diseases" course. 3. LF UK, 2010.