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## An elegant gene regulation network for hyperuricemia therapy

### Keywords

Hyperuricemia, Gout, Urate oxidase, Uric acid, Biosensor, Gene network, Synthetic circuit, Implant

### Summary

A new method has been devised to reduce and permanently control the metabolite that causes hyperuricemic diseases, such as gout. It involves implanting a biological network that self-sufficiently regulates endogenous uric acid levels.

### Invention

A biological network of genes, called UREX, was developed to sense and self-sufficiently control levels of uric acid in blood. The individual components consist of a uric acid biosensor, which constantly captures the concentration in blood. In case the uric acid level reaches an alarming concentration, the sensor starts the production of a secreted urate oxidase and reduces the uric acid levels to a healthy concentration. The three components of the network thus communicate with each other and work independently and automatically – without any external assistance. The uric acid level can therefore be controlled permanently using UREX. Experiments in mice have shown the proof of concept *in vivo* (Fig. 1).

### Patent Status

- Patent pending PCT

### Features & Benefits

- Permanent and autonomous control of elevated uric acid levels *in vivo*
- The encapsulated synthetic gene network is protected from immune responses
- The UREX regulation mechanism can be implanted in humans without genetic modification of the host
- Long term control in hyperuricemic diseases, such as gout and tumor lysis syndrome

### Field of Application

- Gout therapy
- Preventing the tumor lysis syndrome after chemotherapy
- Control and prevention of metabolic pathway diseases

### References

- Kemmer, C., et al. Self-sufficient control of urate homeostasis in mice by a synthetic circuit. *Nature Biotechnology* (2010) 28(4):355-60

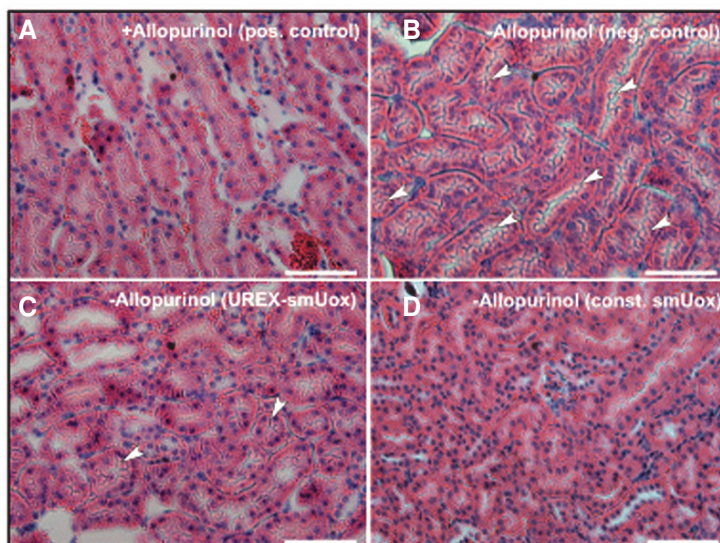


Fig. 1. Transections of mouse kidneys, showing healthy tissue (A) and tissue where white urate crystals have formed (white arrows) (B). After UREX was implanted, the number of crystals was reduced significantly (C). Complete depletion of urate crystals after injection of urate oxidase (D).

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