



Preliminary study on the efficiency of vitamin K on hypocoagulable rats. Introduction

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► To cite this version:

Sébastien Lefebvre, Benoit Rannou, Stéphane Besse, Marlène Damin-Pernik, Etienne Benoit, et al.. Preliminary study on the efficiency of vitamin K on hypocoagulable rats. Introduction. 20th EUROPEAN SOCIETY OF VETERINARY AND COMPARATIVE NUTRITION CONGRESS, Apr 2016, Berlin, Germany. hal-01504509

HAL Id: hal-01504509

<https://hal.science/hal-01504509>

Submitted on 10 Apr 2017

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Introduction:

Vitamin K are essential molecules involved in the **post-translational activation** of some proteins called protein vitamin K dependent (PVKD). The best know PVKD are the four involved in the coagulation cascade: **factor II, VII, IX and X**. In mammals, vitamin K has two origins: foods and a recycling system led by an enzyme called Vitamin K epoxide reductase complex subunit 1 (VKORC1). The vitamin K requirement is dependent of the efficiency of this enzyme [1]. The aim of our work is to **block the recycling mechanism** in order to evaluate the **efficiency of vitamin K₁** to balance the recycle system and so to better understand the vitamin K₁ action.

Material and methods: Obtention of hypocoagulable rats then administration of vitamin K to regenerate their coagulability

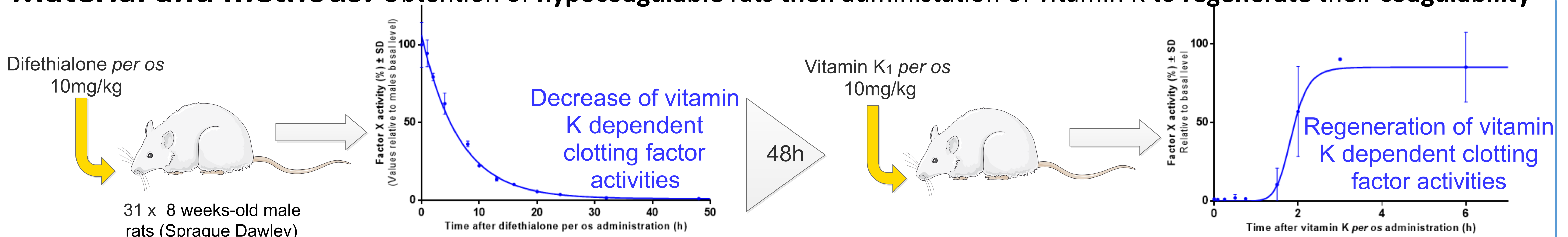


Figure 1: Experimental protocol used to explore the regeneration of vitamin K dependent clotting factors

Results:

The **delay between difethialone and vitamin K₁ administration** have been chosen to **maximize the diminution** of the vitamin K dependent **clotting factor activities** without involving death [2]. The results of the regeneration of vitamin K dependent clotting factor activities are presented on the figure 2. Regeneration evolutions fitted with a **sigmoidal model** (Factor II $R^2=0.88$; VII $R^2=0.84$; IX $R^2=0.78$; X $R^2=0.93$). After 360 minutes, **factor II and factor IX were significantly lower** ($P<0.05$) than their **basal activity** level before difethialone administration (set at 100%). For all factors, a lag time was observed during the first hour after the vitamin K administration. Then, **activities increased** during about **one hour** before to stagnate. The **prothrombin time** was within the **normal range from 120 minutes** (figure 3). The lag time was expected but not the different levels of factor activities. The difference between factors might be explained by different affinities in the post-transcriptional modification. The stop of increasing might be explained by lack of vitamin K. This arrest of regeneration was not described in the case of regeneration by recovery of recycling mechanism [3]. So, unrecycled vitamin K might have a different activity or affinity which leads to a new equilibrium.

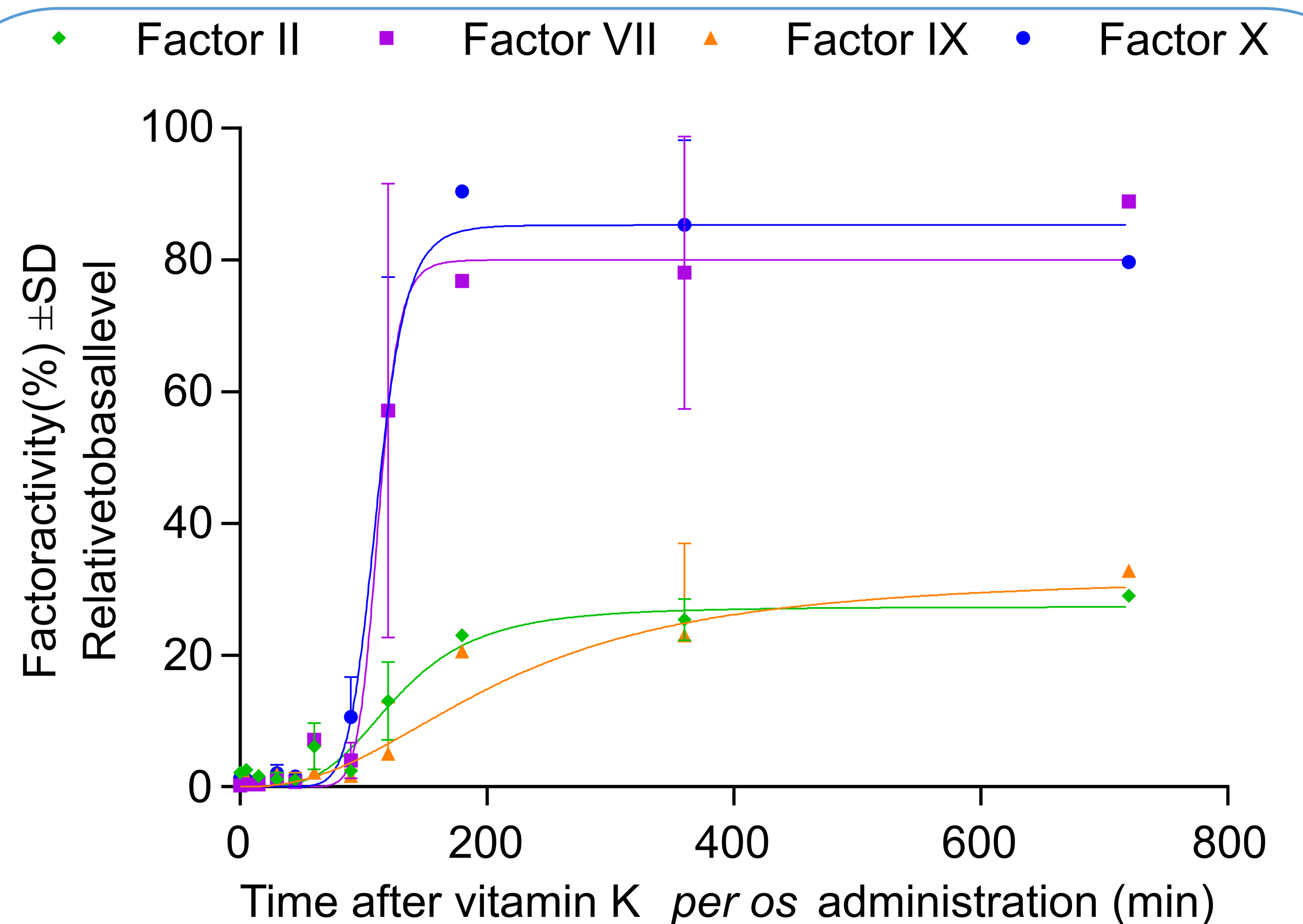


Figure 2: Evolution of factor II, VII, IX and X after administration of difethialone then, 48h after, administration of Vitamin K

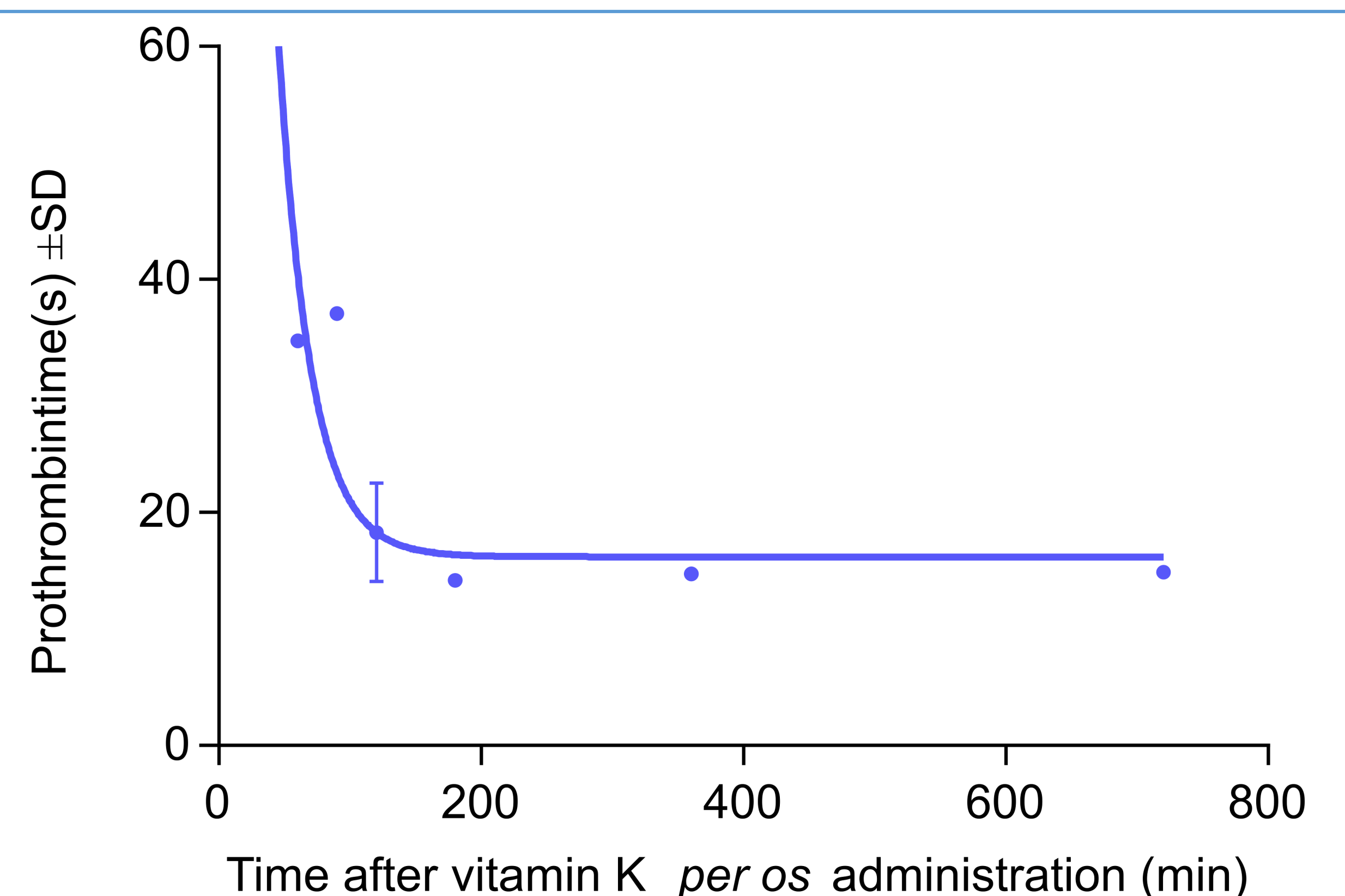


Figure 3: Evolution prothrombin time after administration of Difethialone then, 48h after, administration of Vitamin K

Conclusion:

Our experiment pinpoints that the regeneration of clotting factor activities is more **complex to understand than expected**. The study of the clotting factors' regeneration might disclose some new regulation mechanisms. By means of data provided by this study we are able to **design new experiments**, in order to **describe properly the regeneration mechanisms**.

References: 1. Markussen MD, Heiberg A-C, Nielsen R, Leirs H. Vitamin K requirement in Danish anticoagulant-resistant Norway rats (*Rattus norvegicus*). *Pest Manag Sci*. 2003;59(8):913-20.
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