Abstract
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Effect of a ketogenic diet on the clear cell renal cell carcinoma cell growth

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Objectives

Clear cell renal cell carcinoma (ccRCC) is characterized by a metabolic feature : an energy production by aerobic glycolysis at the expense of oxydative phosphorylation, which is called “Warburg effect”. Ketogneic diet (KD), which consists of high fat and low carbohydrate intakes, could bring required energy substrates to healthy cells while depriving tumor cells of glucose.

Methods

We studied the effect of ketogenic diet on a ccRCC cell line : ACHN.

Twenty CD-1 nude mice received a sub-cutaneous xenograft of ACHN cells, and were then split into 2 feeding groups and fed either a standard diet (Control group, n=10), or a 2:1 ketogneic diet (Ketogenic group, n=10) *ad libitum*.

Tumor growth was weekly monitored by ultrasound measurements for 8 weeks. Blood glucose and blood ketone levels were also measured weekly.

At the end of the 8 weeks, mice were sacrificed, and the tumors were frozen.

Results & Conclusions

Ketosis was quickly reached. There was no difference in weight increase between the 2 groups.

The mean blood ketone level was **0,78 (±0,16) mmol/L** in the Control group, and **1,12 (±0,16) mmol/L** in the Ketogenic group (***p<0,001***).

The mean 8-week tumor growth was **930 %** in the Control group, and **190 %** in the Ketogenic group (***p<0,001***).

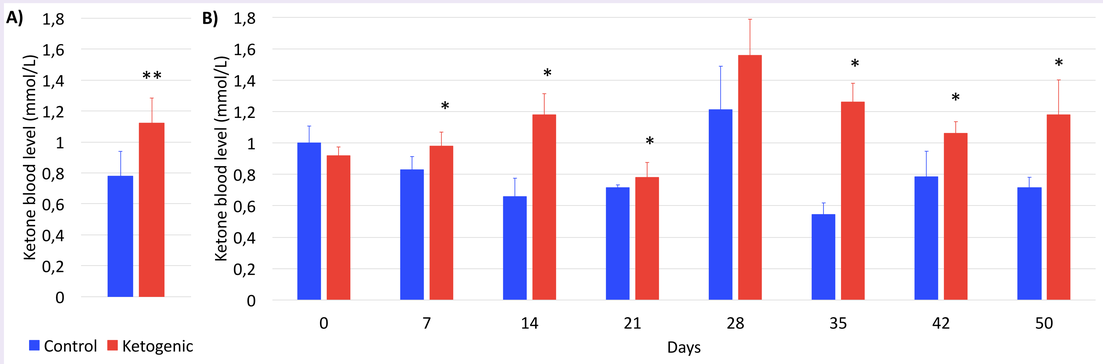

Fig 1 : *Comparison of ketone blood levels between the 2 groups.* ***A)*** *Overall average.* ***B)*** *Evolution over time.*
** p<0,05 ** p<0,001*

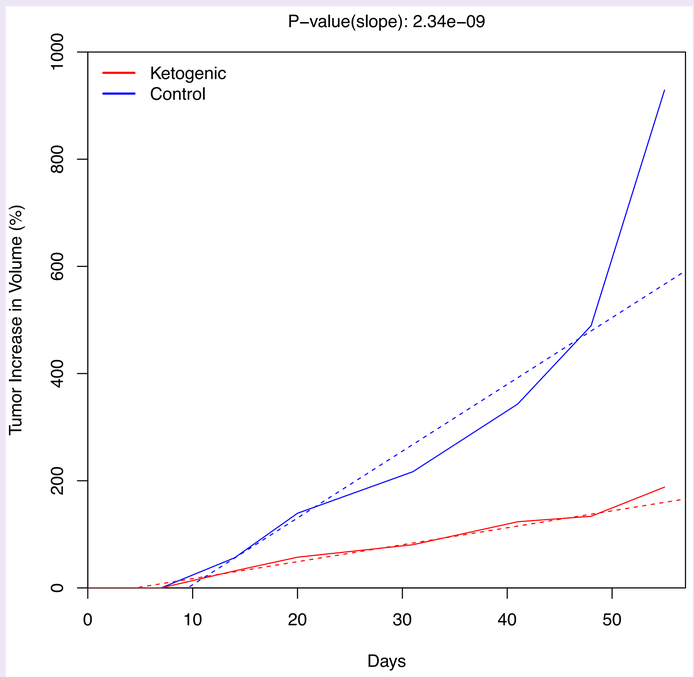

Fig 2 : *Comparison of tumor increase in volume between the 2 groups.*

This study showed that a 2:1 ketogenic diet can slow ccRCC tumor growth in a mouse model. These outcomes have to be verified in other cell lines, and signalling pathways need to be understood by transcriptomic and metabolomic analyses, before starting clinical trials.

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