

# p38 Mitogen Activated Kinases (p38MAPK) Activation & Skeletal Muscle Function

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## Introduction

Type 2 diabetes (T2D) patients have decreased skeletal muscle function when compared with age-matched non-diabetics<sup>1</sup>. p38MAPK is a protein involved in cell differentiation. Interestingly, a previous study found increased p38MAPK activation in cultured skeletal muscle cells from insulin resistant T2D patients with a strong diabetes family history<sup>2</sup>. When p38MAPK is deactivated in aged mice, it was found that their skeletal muscle functions could be improved<sup>3</sup>.

## Aim

To answer the question “Is p38MAPK activation increased in myoblasts (undifferentiated muscle cells) and myotubes (differentiated muscle cells) from an unselected group of T2D patients?”

## Methods

Muscle cultures were established from 11 T2D patients and 12 age-matched controls. Protein was then extracted from myoblasts and day 7 differentiated myotubes for each culture.

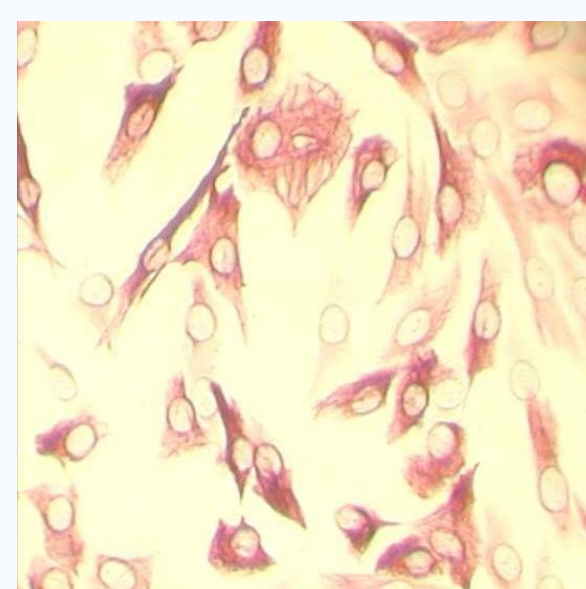


Figure 1: Myoblasts

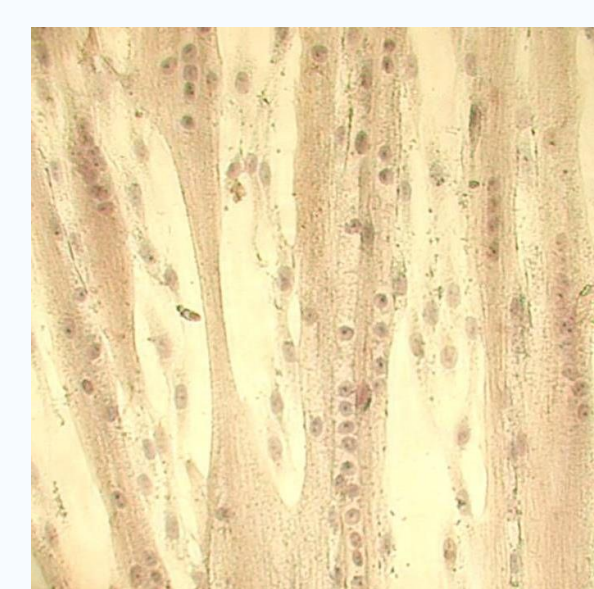


Figure 2: Myotubes

Western blotting (procedure to detect proteins) was employed to detect phosphorylated and total p38MAPK as well as  $\beta$ -actin. Detection of  $\beta$ -actin was done as a control measure. Densitometry (measurement of the intensity of the bands obtained from western blots) was performed using Quantity One software.



Figure 3: SDS-PAGE for western blots

## Results

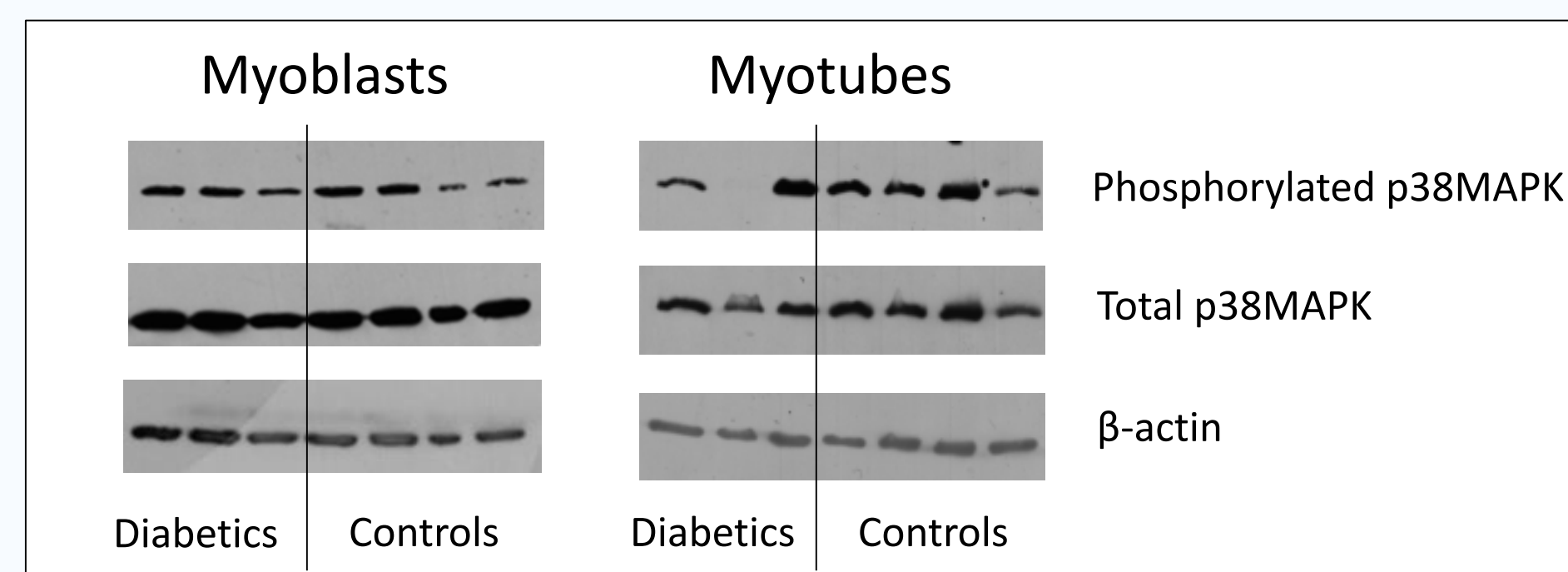
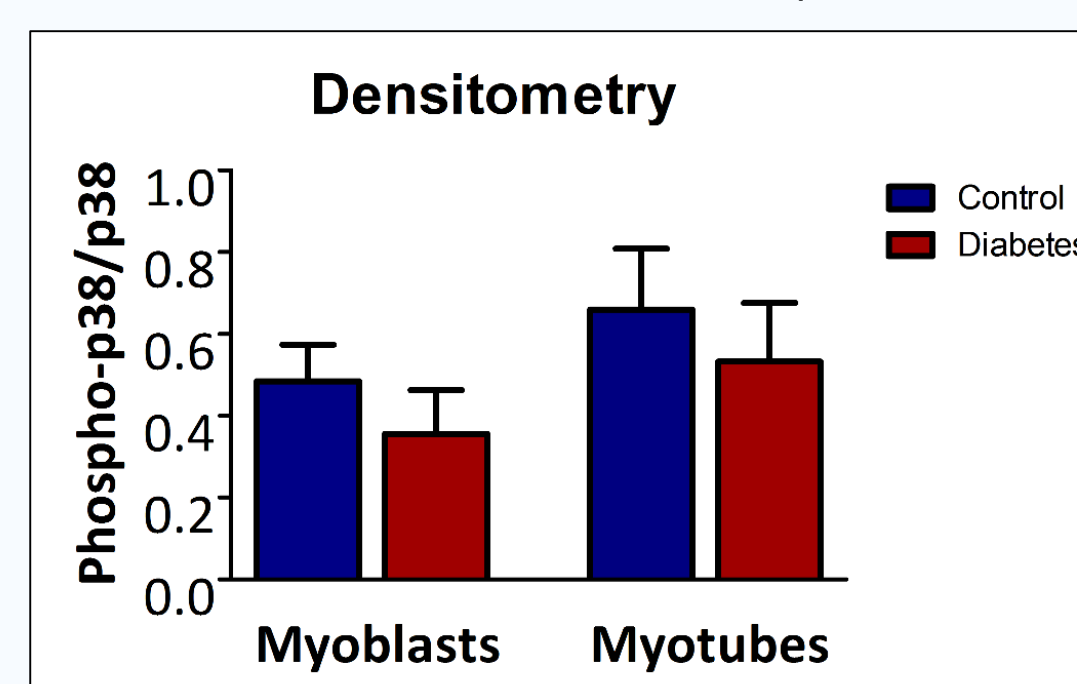
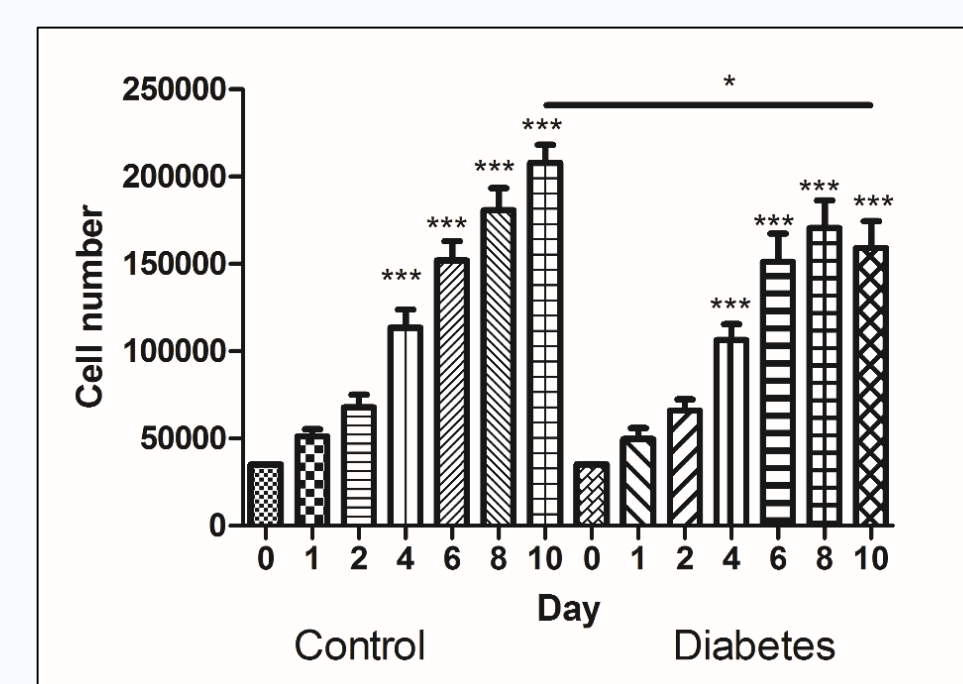


Figure 4: Western blots detecting phosphorylated p38MAPK (activated p38MAPK), total p38MAPK and  $\beta$ -actin.



Graph 1: Densitometry presented as the mean  $\pm$  standard error from 6 diabetic and 10 control samples for myoblasts; 10 diabetic and 9 control samples for myotubes.

Upon performing a Mann-Whitney test, it was found that there was no significant difference in the degree of p38MAPK activation between the diabetic and non-diabetic samples.



Graph 2: Cell number against days of cell proliferation for control and diabetic myoblasts.

This data was obtained from Dr. Brown's experiment which used the same muscle cultures as this study.

According to **Graph 2**, there was no significant difference in the proliferation of myoblasts between the control and diabetic samples during the initial stages of proliferation. However, during the late stages, there was a significant difference between them.

## Discussion

As this study showed that there was no significant difference in the degree of p38MAPK activation between diabetic and non-diabetic myoblasts and myotubes, the results from this study differed from those obtained from the previous study<sup>2</sup>. This might be because the T2D cohort in this study consisted of subjects with different family history, diabetes durations, treatment periods, as well as treatment types. These factors might affect p38MAPK activation, suggesting that increased p38MAPK activation is restricted to a subgroup of T2D patients.

However, taking the results from Dr. Brown's experiment as shown in **Graph 2** into consideration, it is worth noting that despite having a difference in the rate of proliferation of myoblasts in the late stages between control and diabetic samples, the degree of p38MAPK activation is still similar. Therefore, the late decreased proliferation in the diabetic myoblasts does not appear to be related to altered p38MAPK activation.

## Conclusion

p38MAPK activation is not increased in myoblasts and myotubes from an unselected group of T2D patients when compared with age-matched non-diabetics.

## Future Work

Since there is a possibility that various factors such as family history, diabetes durations, treatment periods and treatment types, affect p38MAPK activation, it is crucial to determine which factors are directly associated with it.

## Acknowledgements

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## References

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