

Reduced serum vitamin D levels are associated with type 1 diabetes in Queensland children

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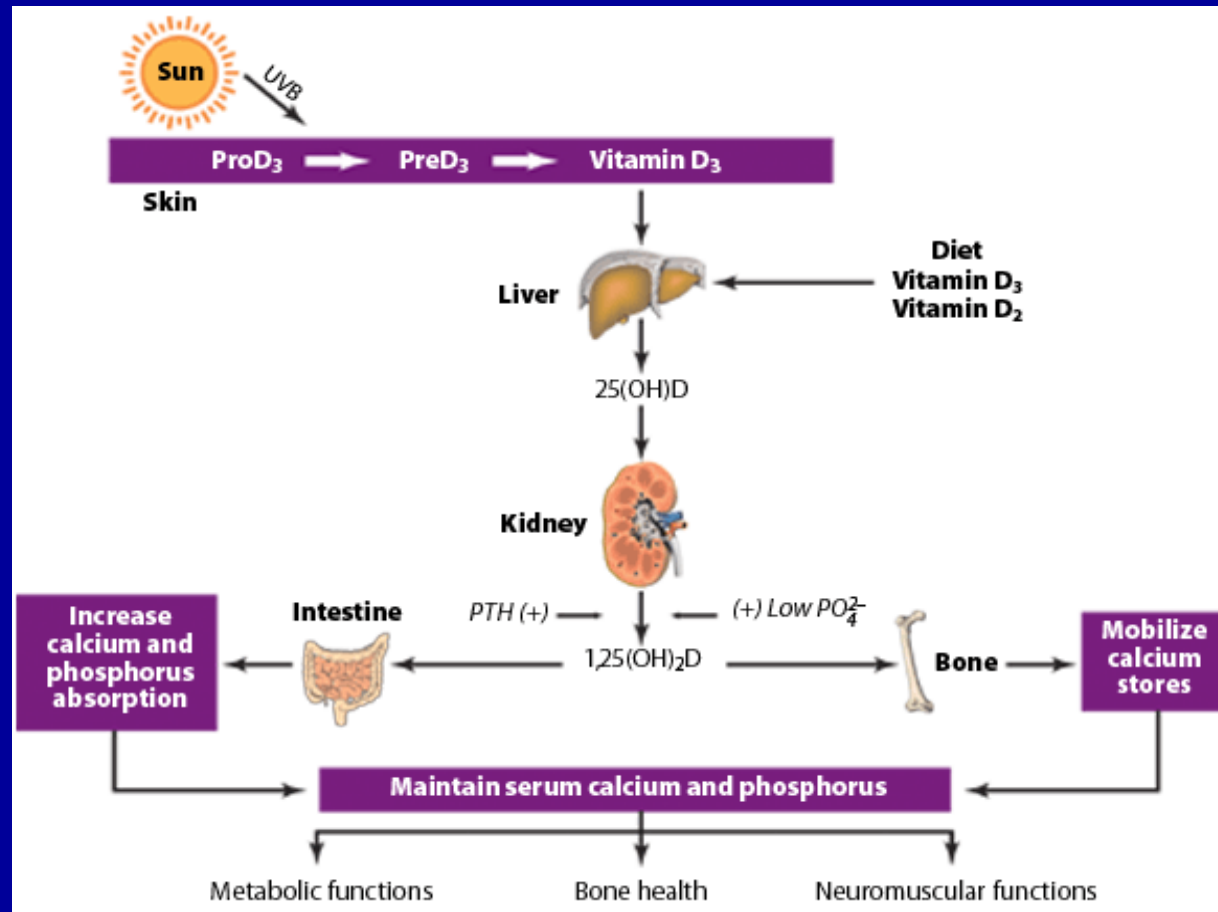
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Type 1 diabetes - immunomodulatory effects of vitamin D

- autoimmune disease
- **T-cell mediated** destruction of the β -cells in pancreatic Islets of Langerhans
- hormonal vitamin D ($1,25(\text{OH})_2\text{D}$) stimulates **tolerogenic T-cells**
- mouse models - vitamin D administration results in prevention or cure

Background: biochemistry of vitamin D



+ immunosuppressant and immune tolerance promoting functions

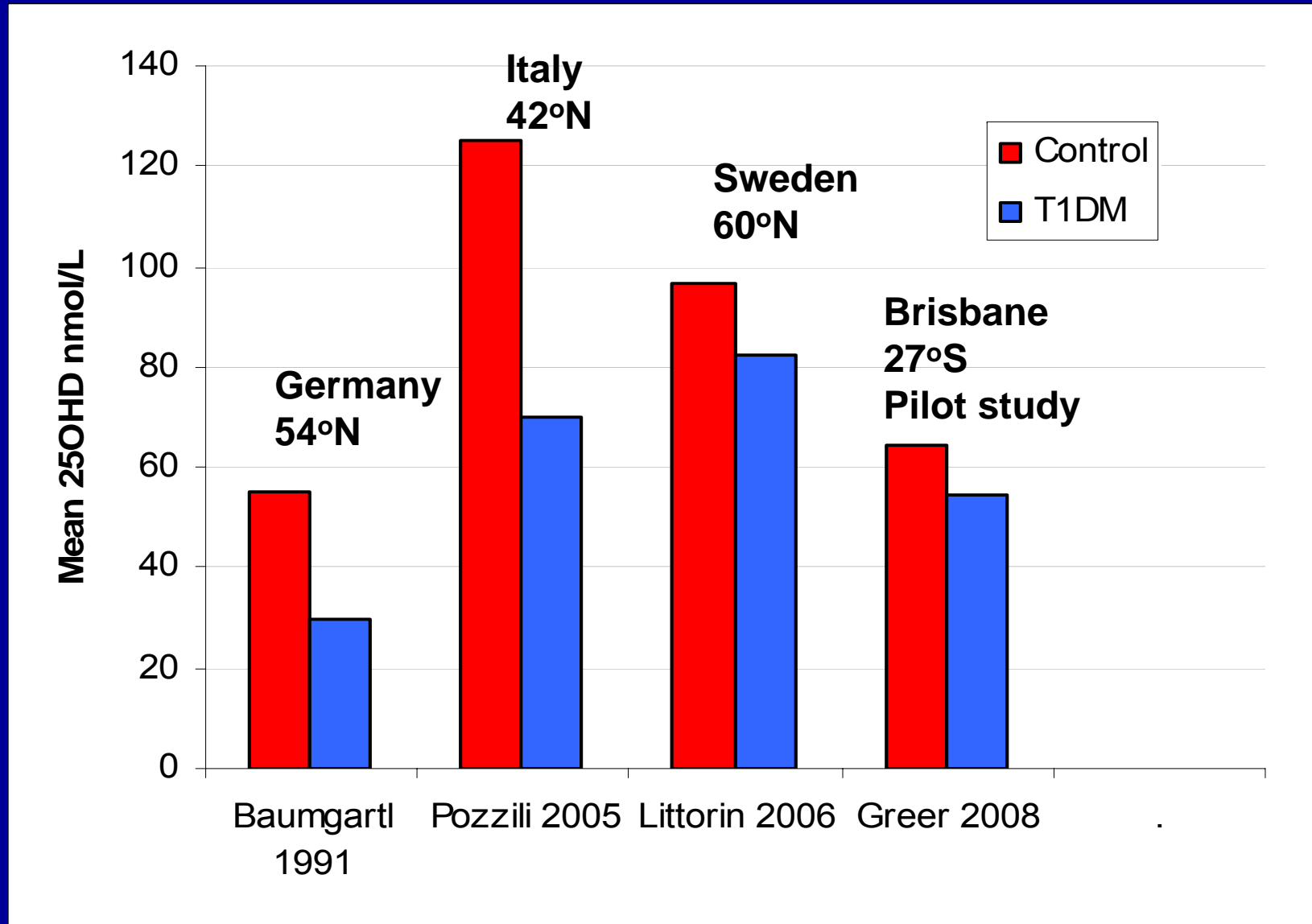
Background: type 1 diabetes

- Estimated 160,000 Australians have type 1 diabetes
- Most cases diagnosed in childhood
- Only treatment - injected insulin

Ecological studies

- Further away from the equator – higher incidence of diabetes
- Northern Europe – low vitamin D associated with diabetes
- Similar observations for other autoimmune / immune mediated conditions - cancer, multiple sclerosis, rheumatoid arthritis

Previous data



Research question

Do children with type 1 diabetes in an environment of abundant UV radiation have lower vitamin D than children without diabetes?



Graphic: Google Earth

Why is this research question important?

'Cure' of diabetes

- Transplantation (whole pancreas, islet cell, bone marrow)
- All these procedures require lifelong **immunosuppression**
- Increased risk of cancers, infection
- **RISK OUTWEIGHS THE BENEFIT IN CHILDREN**

Why is this research question important?

Non-hypercalcaemic analogues of Vitamin D may be:

- suitable for children
- Delay or prevent insulin dependence
- **Caveat** – low vitamin D relationship may not hold for high UV areas

Comparison groups

Control

hospital based
(Ear Nose and
Throat Clinic)

Diabetes

established
>30 days

Diabetes

newly diagnosed
<30 days

Ethics approved RCH & District Ethics
Committee, written parent/guardian consent
and, where applicable, child assent

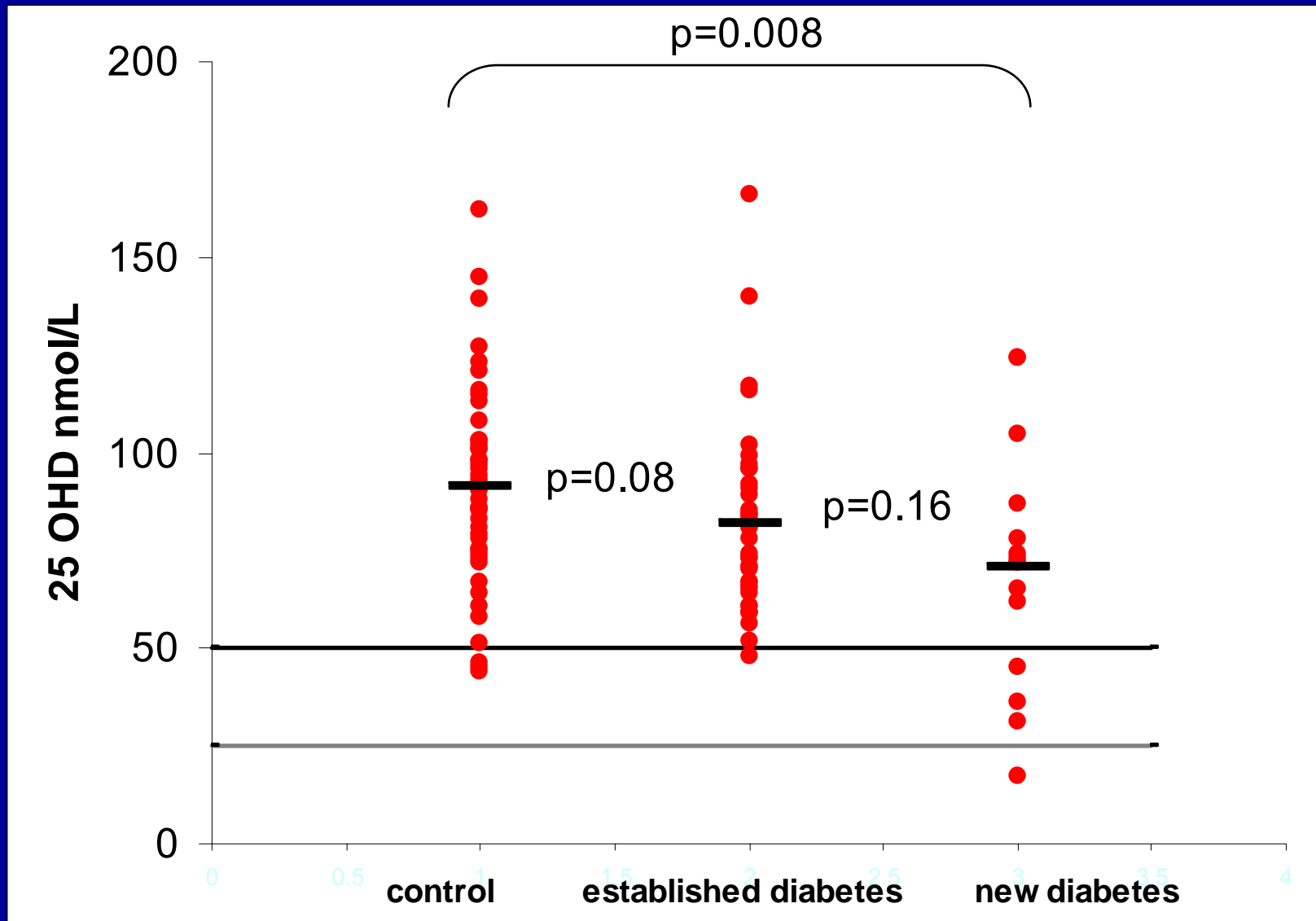
Methods

- 25 OHD, 1,25(OH)₂D, calcium metabolism (PTH, Ca⁺⁺), standard biochemistry panel, glycosylated haemoglobin (HbA1c)
- Skin colour (Fitzpatrick scale I – VI)
- Mean ambient UV index (www.arpana.gov.au) previous 14 days

Results

- 112 participants
- 47 control (26 M, 5.2-15.8 yrs)
- 41 established diabetes (21 M, 4.0 - 17.6 yrs)
- 15 new diabetes (7 M)

Controls vs Established vs Newly diagnosed diabetes

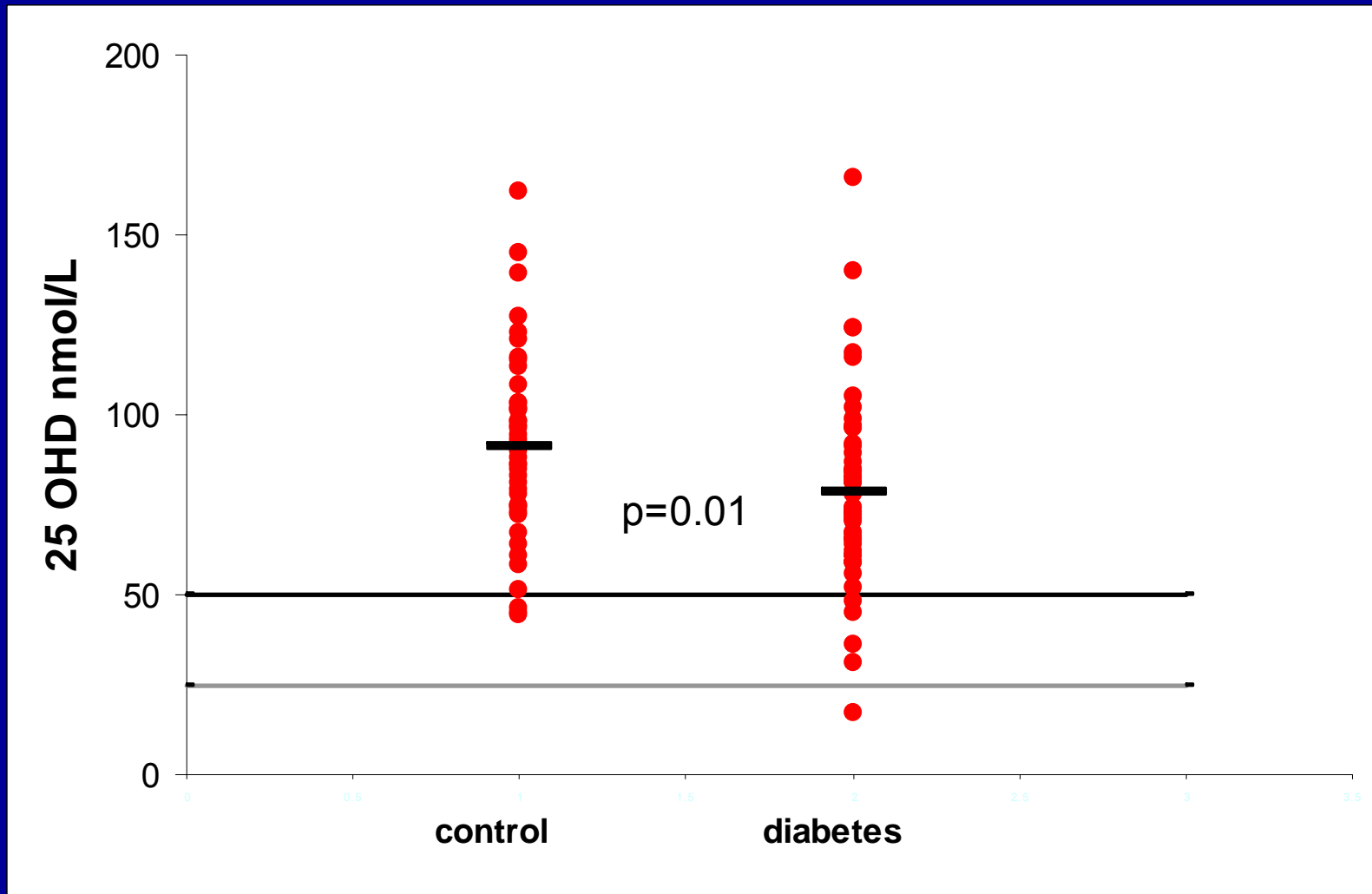


Mean±SD (nmol/L): 91.4±25.4

81.9±23.2

71.0±31.2

Controls vs children with diabetes



Mean±SD (nmol/L): 91.4±25.4

78.7±25.7

Results

Multiple regression model showed a highly significant association of 25 OHD with:

- Diabetes

no association with

- UV over last 14 days
- Age
- Skin colour
- Any biochemical variable
- HbA1c
- Duration of diabetes

Conclusions

- Vitamin D levels lower in newly diagnosed children even in high UV environment
- Consistent with observations from northern hemisphere locations
- Can't evaluate cause (risk factor) or effect
- Larger study required to determine - estimate n~100 in each group

Conclusion

- Further research is required to investigate causal relationship between low 25 OHD and diabetes
- Appropriate to extend immunology studies investigating biology of immune cells (T- and dendritic cells) and vitamin D related to onset of diabetes



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