

# How you can achieve normal blood sugars with diet and insulin

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**IDDT**

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# Me and my boys



# Dr Richard Bernstein

- People do not get complications and die from having diabetes. They have these adverse effects from not having consistently normal blood sugars.
- Diabetics have the same right to normal blood sugars as non diabetics.



# Diabetics deserve choice over:

- Dietary education
- Insulin regime
- Blood sugar monitoring regime
- Complications monitoring regime
- Treatment options of complications



# What level of blood sugar control is right for you?

- What are your personal circumstances?
- What degree of blood sugar control do you have now?
- What degree of blood sugar control do you want to have?



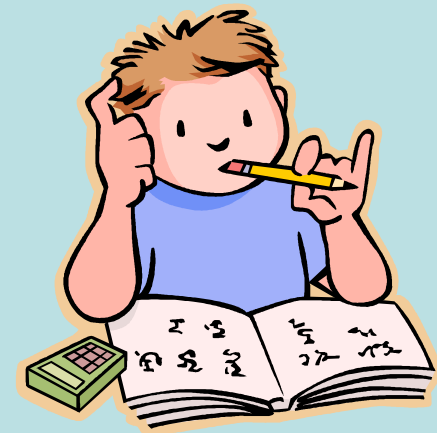
# Eat to Meter

- Fasting and pre meal blood sugar target
- One hour after finishing meal target
- Two hour after finishing meal target
- Look after the small stuff and let the hbaic look after itself



# Depends on what meter !

- Reference values are for plasma and mmol/l
- For US mg/dl multiply by 18
- Whole blood meter values show 12% lower on the screen than plasma tested values
- For plasma equivalent multiply whole blood reading by 1.12 eg normal bs 4.7 p = 4.2 wb and bs 10p = 9 wb



# Optimal targets

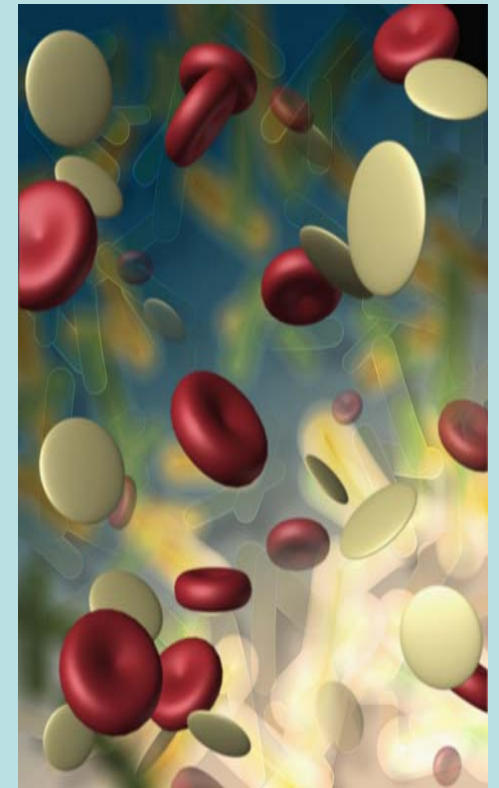
- Fasting and pre meal 4.7 – 5.6
- One hour post meal maximum 7.8
- Two hour post meal maximum 6.5
- The aim is to completely avoid diabetic complications from high and swinging blood sugars.





# Cellular damage from high blood sugars

- Aldose reductase pathway – swells and bursts cells
- Glycation of proteins – makes them sticky and malfunction
- Protein kinase – alters intracellular enzymes and causes malfunction
- Oxidative stress – ages cells, causes arteriosclerosis, new vessel proliferation



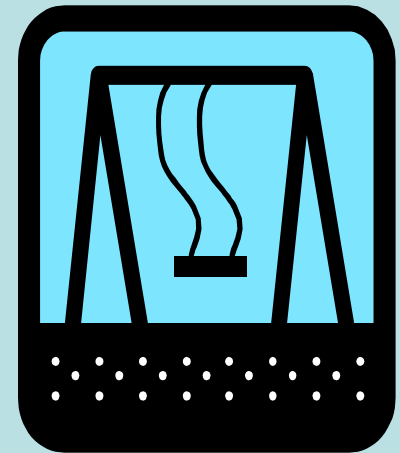
# Low blood sugars

- Accidents from inattention
- Family and personal stress
- Brain cell damage
- Death
- Problems from overcorrection
- Pure glucose is best



# Swinging blood sugars

- More oxidative stress !
- Mood changes
- Loss of predictability of blood sugars
- Loss of confidence and apathy



# Insulin effects

- 30 – 50 % variation on effect on blood sugars
- If high amounts of carb is eaten more insulin is needed to cover it
- Inconsistent effect means that the dangerous triad of high, swinging and low sugars is inevitable.



# For normal blood sugars

- Low carb / low glycaemic diet
- Avoid snacks if possible
- 7 units of insulin maximum for each insulin shot
- Careful matching of insulin type to food type
- Good carb counting skills
- Consistent exercise regime



# Different circumstances

- Pregnancy and planning, reversal of complications hbaic below 5%
- Older children, honeymoon, pumpers, low carbers hbaic 5-6%
- Drivers, older adults, new pumpers, change in insulin delivery method 6-7%
- Babies, toddlers, teenagers, elderly, living alone 7-8%



# To absolutely minimise complication risk consider

- Very strict level of eat to meter
- Fasting and pre meal targets 4.7-5.2
- One hour post meal target below 7.2
- Two hour post meal target below 6.0
- Resistance training exercises
- Strict end of low carb / glycaemic dietary scale



# Personal choice

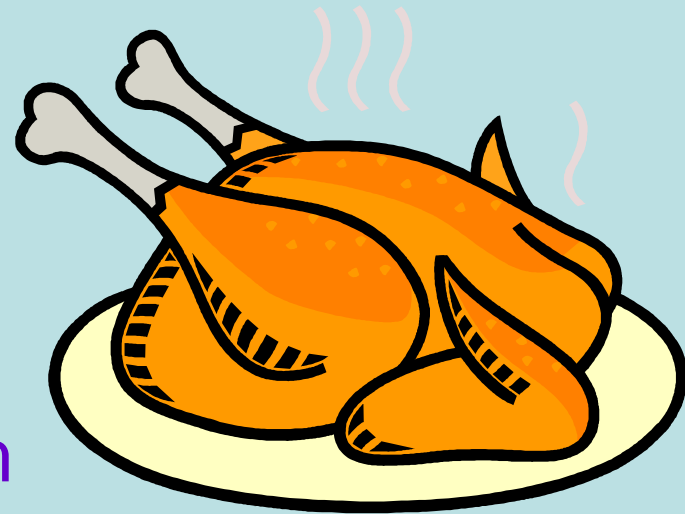
- Permissive 90-130g
- Typical low carb 50-90g
- Strict low carb 0-50g
- It all depends on your own goals, circumstances and preferences.
- For insulin users it is best to go down the carb scale gradually.





# Insulin for protein cover

- Protein needs 2 units of regular insulin for each 3 oz portion of lean protein
  - Eg 3 medium sized eggs, steak the size of a pack of cards
- Available in the UK in pen form as Pork Hypurin from Wockhardt
- Available in vial / syringe Actrapid from Novonordisk



# Insulin for low glycaemic vegetables

- Regular insulin works well
- Lasts 5 hours
- One unit covers 8g of carb
- All insulin calculations are based on averages and your insulin sensitivity may vary



# Insulin for higher glycaemic carbs

- Rapid acting insulin analogues
- Last 3.5 hours
- One unit covers 12g carb
- OR
- Regular insulin 8g carb
- Be sure to inject 45 mins before eating



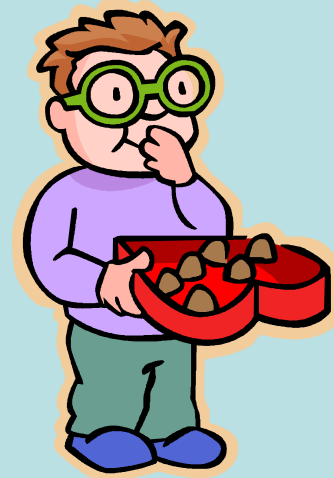
# Timing of injections

- Regular insulins 30-45 mins before meal for carb cover.
- Regular insulins 15-45 mins before meal for protein cover.
- Rapid acting insulins 0-15 mins before meal for carb cover.
- Time can be varied for higher or lower pre-meal sugars.



# Why avoid snacks?

- Snacks that need insulin cause confusion when it comes to figuring out how much insulin is still active when it comes to your next pre-meal dose.
- Can you do without?
- Can you eat low glycaemic veg/protein instead?
- Exercise carbs or hypo carbs don't count!



# Why restrict meals to 30g carb or less?

- After 30g of carb the insulin needed to cover it can no longer be predicted in a linear way.
- You will need a different technique to get better control of your sugars between 30-90g of carb.



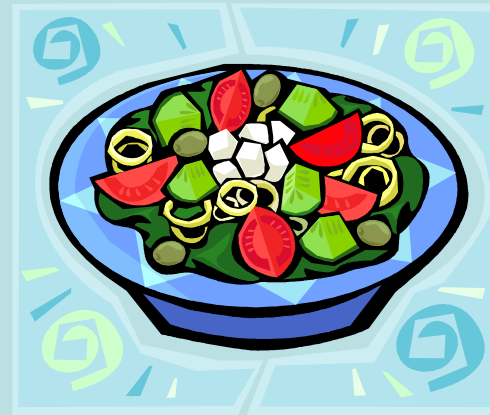
# My carb weighting technique

- Give an extra 0.5 units of rapid acting insulin for each 10g increase in carb over 30g to a limit of 90g.
- Needs to be adjusted for the individual.
- Best used at lunch.



# Why the emphasis on low glycaemic vegetables?

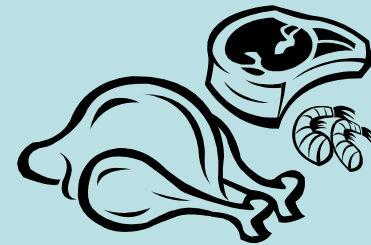
- These have high amounts of fibre and relatively little sugar
- Injected insulin works at the same rate that these foods digest
- High blood sugar spikes are minimised
- Vitamin rich





# How much protein?

- What is your ideal weight in kilograms?
- Divide by 6 = amount of lean protein in ounces to eat as a minimum a day
- People on dialysis and those who want to put on weight may need more
- People who have very poor renal function and those who are low carb and still not losing weight may need less
- If you are hungry between meals you probably need more



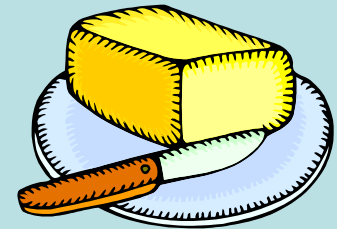
# Why eat fat?

- Improves vitamin absorption from vegetables
- Improves taste
- Provides ADEK vitamins
- Fills you up
- Adds calories
- Slows down carbohydrate absorption
- Does not need insulin cover



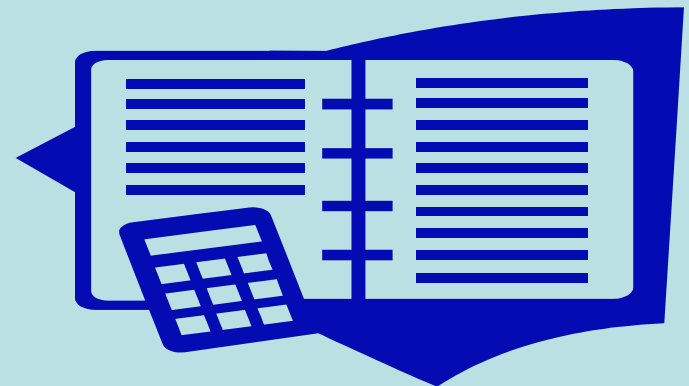
# What sort of fat?

- Avoid deep fried foods
- Avoid processed foods
- Avoid trans, hydrogenated, partially hydrogenated fats, refined vegetable oil.
- Yes to natural animal fats eg butter, cream, lard
- Yes to cold pressed polyunsaturates and monounsaturates
- Be careful about heating polys – superoxides and free radical damage !



# How do you adjust your diet?

- Learn to carb count
- Learn about the glycaemic index
- Learn to cook and bake the low carb way
- Replace high glycaemic carb items with low glycaemic vegetables and other substitutes
- Increase protein at each meal
- Add fat for additional calories as needed



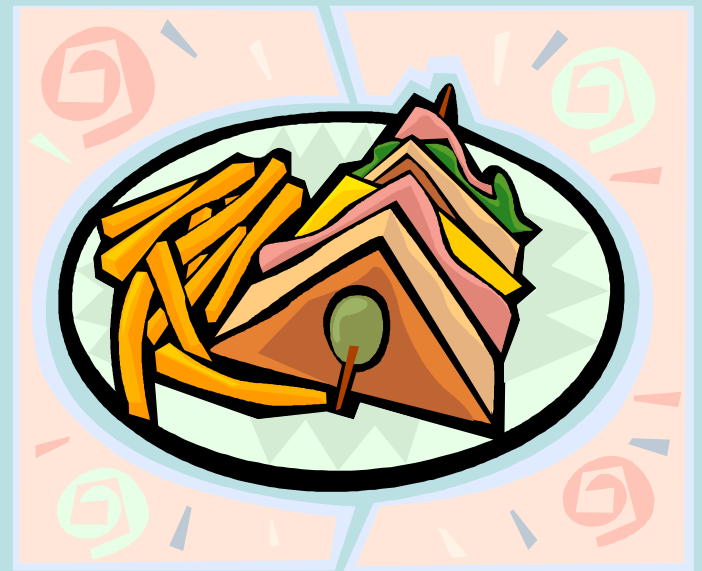
# How do I vary carb and protein intake throughout the day?

- Breakfast is best to be the lowest carb meal of the day.
- The Dawn Phenomenon tends to give many people high insulin resistance in the mornings so sugars tend to be high.
- A high protein breakfast delays hunger pangs and sets you up for a snack free day.



# Lunch

- Your insulin sensitivity tends to be best at this time of day.
- If you are going to have a high amount of carbohydrate this is the best meal for it.
- Exercise post lunch works well. No need for extra carbs and less insulin resistance that can otherwise cause a rise in blood sugars with exercise in eg the mornings.



# Evening meal

- Some people have a dusk phenomenon so can't tolerate higher carbs at this meal.
- Some people have delayed stomach emptying so need to have lower protein meals at this meal.
- Experiment so that your blood sugars are normal before you go to bed, you don't have much meal insulin still active and you don't have a very heavy meal to raise your sugars overnight.



# Bedtime snack

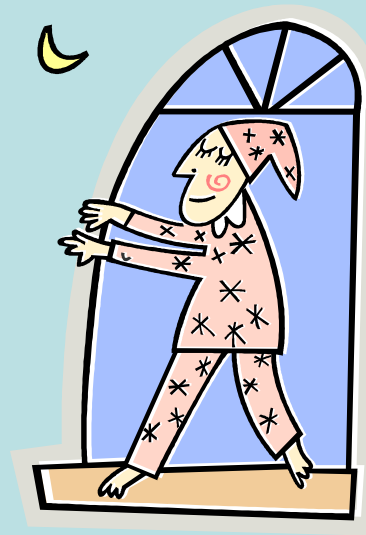
- Keep meal or correction insulin minimal at this time to prevent lows in the night.
- Snacks are best high fat/moderate protein and low glycaemic carb at this time.
- Consider a small amount of alcohol along with the snack if you have a marked dawn phenomenon eg cheese and wine.





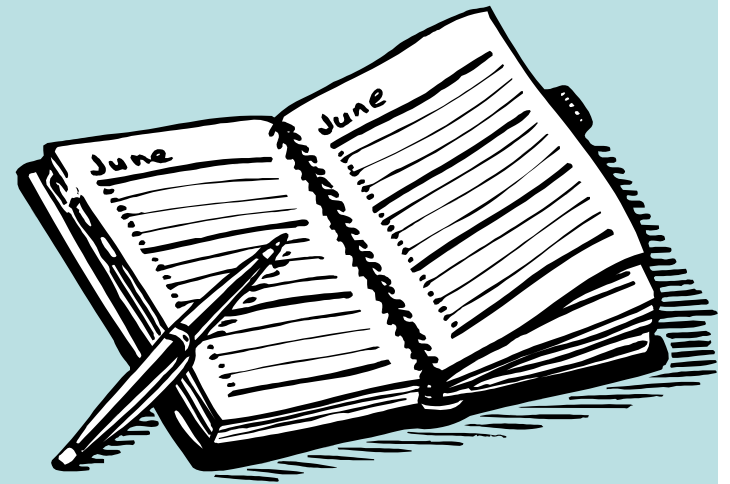
# Through the night

- Blood sugars between 2-4am are best for finding out how well you are handling your basal insulin.
- Use your night time bathroom excursions to your advantage!



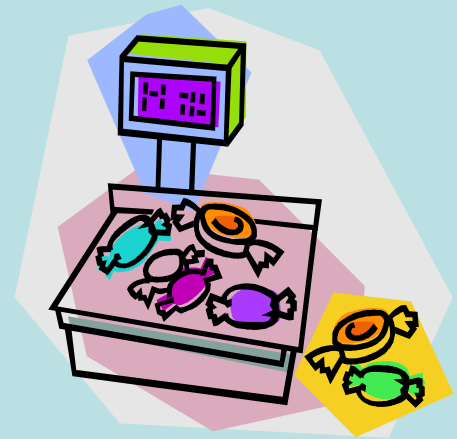
# How do you adjust your insulin?

- Learn your carbohydrate sensitivity for different times of day and night
- Test frequently
- Keep notes of your experiments and results
- Do meal profiles for all your regular meals
- Change what you do according to the results you get



# What supplies may I need?

- Lots and lots of testing strips
- A good meter or two
- Glucograph charts or a big notebook
- Half unit pens for novorapid and humalog
- Owen mumford pen for pork hypurin regular insulin
- Nutritional scale
- Carb counting aids



# What other aids are available?

- Online course at [www.dsolve.com](http://www.dsolve.com)
- Join a low carb diabetes forum.
- Go on DAFNE course.
- Insulin calculator for your personal programming available to download from [www.dsolve.com](http://www.dsolve.com)
- Palm version possible



# Insulin calculator

The screenshot shows a window titled "Insulin Calculator" with a menu bar containing "Configuration" and "Help". The main area is divided into two sections: "Input Data" and "Corrections".

**Input Data**

Mealtime:

Blood Sugar:

Carbohydrate:

1 Unit Insulin per 12 grms Carbohydrate

**Corrections**

Blood sugar correction dose	0.5
Dose for carbohydrate @ 1 unit	4.58
Weighting if over 40 grams	1
<b>Total</b>	<b>6.08</b>

EXIT

# What could cause difficulty?

- Do you have the time to learn the information and skills involved?
- Do you have the time for food planning and preparation?
- Are you motivated?
- How will the rest of the family react?
- How will your doctor and other health care professionals react?



# Does your diabetes team drive you crazy?

- Who does your bodywork belong to?
- Are you in the driving seat?
- How far and how fast do you want to travel?
- Are the health professionals doing their pit stop duties appropriately?



# Thank you!

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