

# DIAGNOSIS OF DIABETES NOW WHAT?

DISCUSS GOALS FOR DIABETES CARE  
IDENTIFY COMMON COMPLIANCE-  
ADHERENCE ISSUES  
DESCRIBE TECHNOLOGY TO ASSIST  
AND / OR IMPROVE DIABETES CARE

# WHAT DO WE WANT OUR PATIENTS TO ACHIEVE?

- ADA guidelines for type 1
  - April 2014 – first position statement for Diabetes Through the Life Span for type 1
    - Age appropriate care
    - Understanding of specific needs and limitations
- Individualized care plan with ongoing education and support
- Ongoing assessment for acute and chronic complications
- Access to medical providers with type 1 diabetes expertise
- Evaluate therapeutic approach at each visit and modify as needed

# Achieving Diabetes Goals

HOW?



# Achieving Diabetes Goals

- Initial education at diagnosis
- Daily phone calls for first 5-7 days
- Two week follow-up
- Group class at eight weeks
- Three month follow-up
- Every three months until 18, then transition to adult care

# AADE 7-AMERICAN ASSN OF DIABETES EDUCATORS

- Healthy Eating
- Being Active
- Monitoring
- Taking Medication
- Problem Solving
- Reducing Risks
- Healthy Coping

# Blood glucose targets

- **SHOULD BE INDIVIDUALIZED!**
- **ACHIEVE BEST POSSIBLE CONTROL WHILE MINIMIZING THE RISK OF SEVERE HYPOGLYCEMIA AND HYPOGLYCEMIA**
- Previously guidelines for pediatric patients were based on professional, expert advice
- DCCT only included pediatric patients aged 13-17 – a total of 195 patients!

# Currently - in addition

- Lower blood glucose levels and lower A1C targets as long as:
  - Patients can avoid severe, recurrent hypoglycemia
  - Achieve as close to normal blood glucose and A1C levels as possible without severe, recurrent hypoglycemia

# Previous ADA recommendations

- < 8.5% under 6 years of age
- <8% ages 6 – 12 years of age
- < 7.5 ages 13 -19 years of age



# GOALS

- International Society for Pediatric and Adolescent Diabetes – single goal of  $<7.5\%$
- Pediatric Endocrine Society -  $< 7.5\%$
- International Diabetes Federation -  $< 7.5\%$

# A1C Recommendations

## Current CCMC guidelines

Age	Bedtime/overnight	Daytime A1C (%)
0-4 years old	80-200 7.5% to 8.5%	100-200
5-11 years old	80-180 less than 8%	100-180
12-19 years old	80-150 less than 7.5%	100-150

**Lower goals are okay if there is no excessive low blood sugar**

**Higher goals are needed if there are frequent low blood sugars**

# THE LAST WORD

- EMPHASIS IS ON INDIVIDUALIZATION WITH A GOAL OF ACHIEVING BEST POSSIBLE CONTROL WHILE MINIMIZING THE RISK OF HYPOGLYCEMIA AND MAINTAINING NORMAL GROWTH AND DEVELOPMENT

# MONITORING GOALS

- Before meals, bedtime
- Middle of the night
- Prior to/during/after exercise
- When suspect low blood glucose
- Prior to driving
- More frequently during illness

# INSULIN MULTIPLE DAILY INJECTIONS

- Meal insulin – Insulin to Carbohydrate Ratio
- Correction Factor / Insulin Sensitivity Factor – additional insulin given based on blood sugar
  - Insulin analogs – Humalog/Novolog/Apidra
- Basal insulin – one or two injections per day
  - Lantus/Levemir

# Meeting the goals

So how do we/they do?

# Compliance vs Adherence

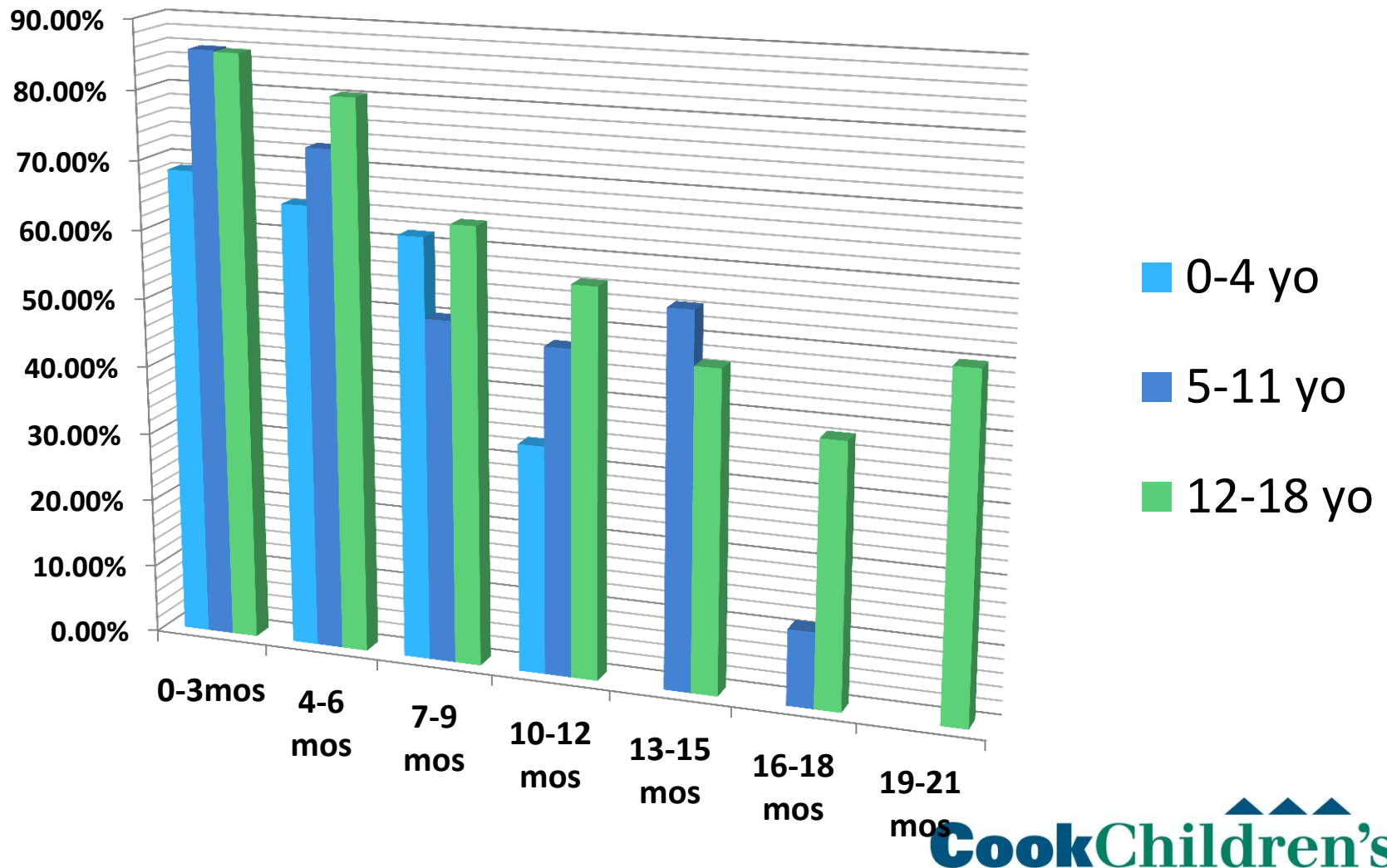
- Compliance – physician/clinician directed
- Adherence – patient and family centered

# CCMC DIAGNOSIS 2013 MET A1C GOALS

	<b>0-3 mos.</b>	<b>4-6 mos.</b>	<b>7-9 mos.</b>	<b>10-12 mos.</b>	<b>13-15 mos.</b>	<b>16-18 mos.</b>	<b>19-21 mos.</b>
<b>0-4 yo</b>	<b>68.4%</b>	<b>64.7%</b>	<b>61.5%</b>	<b>33.3%</b>			
<b>5-11 yo</b>	<b>85.7%</b>	<b>72.9%</b>	<b>50.0%</b>	<b>47.6%</b>	<b>54.5%</b>	<b>11.1%</b>	
<b>12-18 yo</b>	<b>85.5%</b>	<b>80.3%</b>	<b>63.6%</b>	<b>56.6%</b>	<b>46.8%</b>	<b>38.5%</b>	<b>50.0%</b>



# Diagnosed 2013 – met A1C targets



# 2013 – readmissions for DKA

## What happened?

- 18 patients
- Ages 10 – 18
  - 10 – 1
  - 11 – 3
  - 12 – 1
  - 13 – 2
  - 14 – 5
  - 15 – 2
  - 17 – 2
  - 18 – 2

# What happened?

- Missed appointments
- No blood sugar logs
- Anger – trigger events
- **Depression**
- Suicide attempt-bullied at school
- **In custody of someone other than birth parents**
  - Jail
  - Death
  - CPS removal
- Sneaking food
- Lack of supervision
  - Parent’s work schedule
  - “I’m 18”
  - He is old enough to care for himself
- “Just got sick”
  - Did not treat ketones
  - Overnight with friends

# Improving adherence

## Not reaching goals

- Education and functional literacy
- The clinic/office visit
- Parental influence
  - Lack of supervision
  - Not reinforcing plan
- Socioeconomic factors
- Peer or society influence

## Improving adherence

Nurse educators

Case managers

Tele-Health/phone calls

Motivational  
interviewing

# What Next?

Steps to more  
advanced care plans

# CASE STUDY – SARAH

**Sarah returns to the clinic 3 months later and seems to be doing much better with her glycemic control. Her HgbA1c is 8.5%. She inquires about insulin pump therapy**

*Which of the following is the MOST appropriate response to her questions about insulin pumps?*

- 1. Insulin pump therapy is seldom successful in children with diabetes mellitus.**
- 2. Insulin pump therapy is seldom indicated in children who have had diabetes mellitus <2 years.**
- 3. Insulin pump therapy is not covered by most insurance companies.**
- 4. Insulin pump therapy may be helpful if the child and family are committed to training, CHO counting and frequent blood glucose monitoring**

*Which of the following is the MOST appropriate response to her questions about insulin pumps?*

- 1. Insulin pump therapy is seldom successful in children with diabetes mellitus. 8%
- 2. Insulin pump therapy is seldom indicated in children who have had diabetes mellitus <2 years. 11%
- 3. Insulin pump therapy is not covered by most insurance companies. 3%
- 4. Insulin pump therapy may be helpful if the child and family are committed to training, CHO counting and frequent blood glucose monitoring 79%



# To Pump or Not To Pump

- American Association of Clinical Endocrinologists/American College of Endocrinology
- Consensus statement from the Insulin Pump Management Task Force (May 2014)

# Insulin Pump Therapy – Continuous Subcutaneous Insulin Injection (CSII)

- **Ideal candidate**

- A patient with T1DM or intensely managed insulin-dependent T2DM
- Currently giving 4 or more injections per day
- Currently testing blood glucose 4 or more times per day
- Motivated to get best control
- Willing and able to carry out complex and time-consuming tasks associated with CSII
- Willing to maintain frequent contact with health care team

# Pediatric patients for CSII

- Elevated A1C levels on injection therapy
- Frequent severe hypoglycemia
- Widely fluctuating glucose levels
- A treatment regimen that compromises lifestyle
- Microvascular complications and/or risk factors for

- MOTIVATED FAMILIES
- AGE AND DURATION OF DIABETES SHOULD NOT BE FACTORS IN DECISION
  
- Only providers whose practice can assume full responsibility for a comprehensive pump management program should offer this technology

# Sarah

- After attending an insulin pump workshop, you determine Sarah is a candidate for insulin pump therapy. She is started on an insulin pump and the family completes the required training. After being on insulin pump therapy for 3 months, her HgbA1c is 6.8%.

# Sarah

- Shortly after her last clinic visit, you receive a telephone call at 5:30 AM that Sarah is vomiting. The mother reported that Sarah was asymptomatic yesterday and had no history of sick contacts. She played volleyball in the afternoon, and was eating normally. She changed her infusion site after dinner and her blood glucose before going to bed was 172 mg/dl

# Case Study - Sarah

- Which of the following is the MOST likely explanation for Sarah's vomiting?
  - 1. Pregnancy
  - 2. Diabetic Ketoacidosis
  - 3. Urinary tract infection
  - 4. Food poisoning

# Case Study - Sarah

- Which of the following is the MOST likely explanation for Sarah's vomiting?
- 1. Pregnancy 5%
- 2. Diabetic Ketoacidosis 51%
- 3. Urinary tract infection 11%
- 4. Food poisoning 32%



# DIABETIC KETOACIDOSIS – DKA

- My pump only uses fast acting insulin!



- Check and change pump site
- Give ketone/sick day dose of insulin by syringe
- Drink water
- Contact clinic for assistance

# Case Study - Sarah

Once Sarah mastered her insulin pump therapy, she wanted to know if continuous glucose monitoring (CGM) would help her maintain better glycemic control. Which of the following statements about CGM is TRUE?

# Case Study - Sarah

1. CGM eliminates the need for blood glucose monitoring.
2. CGM can communicate with the insulin pump to “automate” insulin delivery.
3. CGM is a form of “biofeedback”, allowing the individual to better determine their glycemic profiles and response to insulin.
4. CGM is not feasible for home use at this time.

# Case Study - Sarah

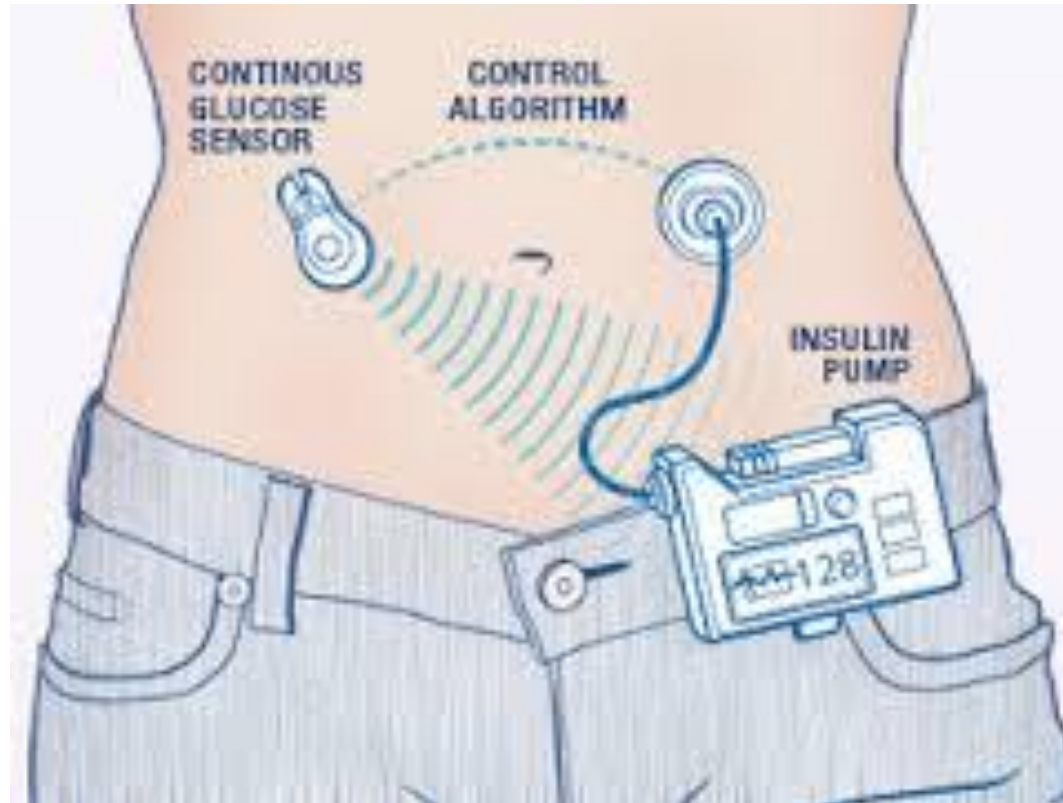
1. CGM eliminates the need for blood glucose monitoring. 0%
2. CGM can communicate with the insulin pump to “automate” insulin delivery. 42%
3. CGM is a form of “biofeedback”, allowing the individual to better determine their glycemic profiles and response to insulin. 55%
4. CGM is not feasible for home use at this time 3%

# CGM – CONTINUOUS GLUCOSE MONITORING



Approved  
placement on  
**ABDOMEN**  
or  
**UPPER**  
**BUTTOCKS**

# CGM WITH PUMP –continuous glucose monitoring and an insulin pump



# The Artificial Pancreas

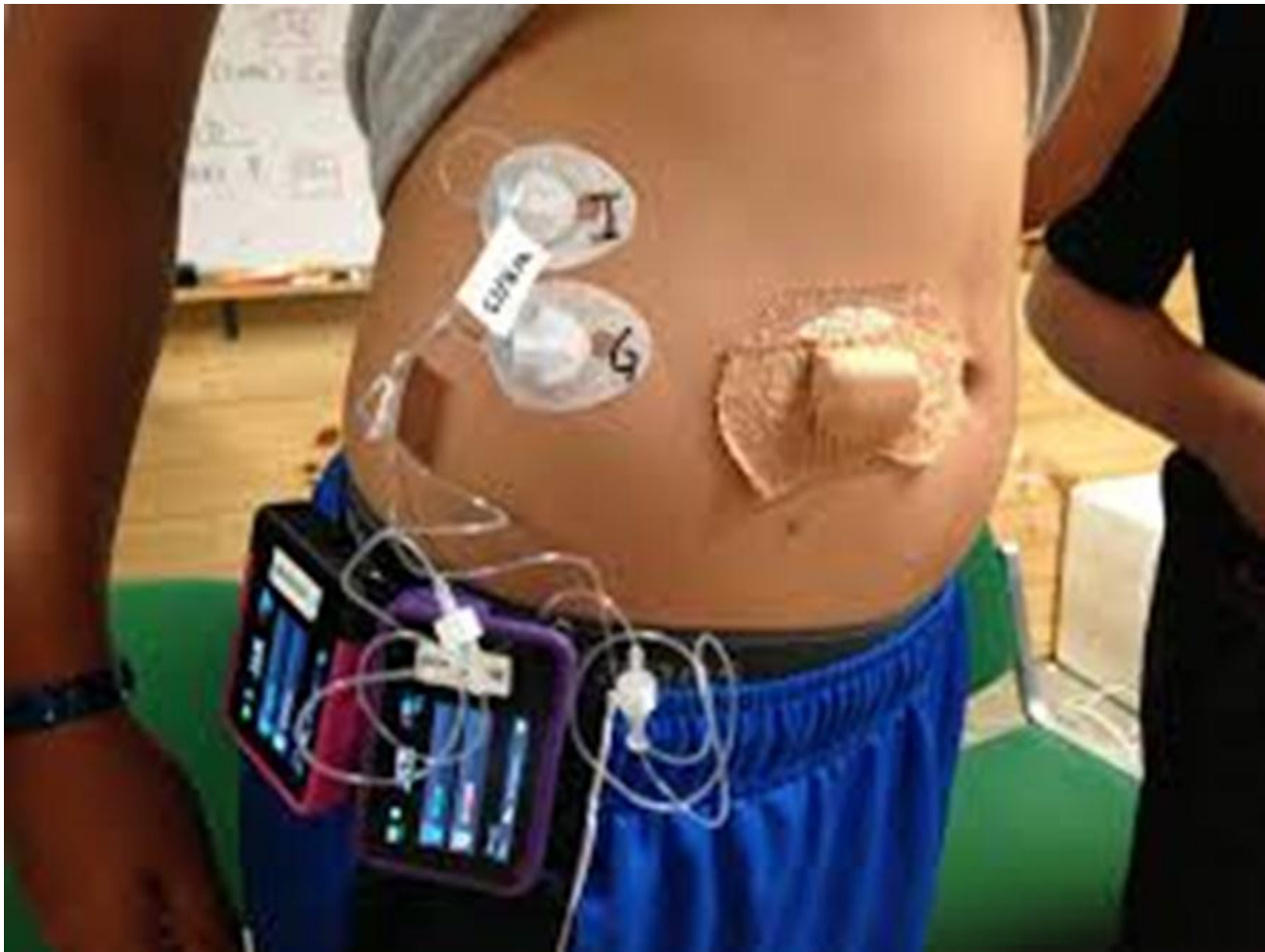
- First Steps
  - Medtronic 530 G
    - FDA's new class: "Artificial Pancreas Device System, Threshold Suspend."
    - Suspends insulin for 2 hours if no response to a low blood glucose (a pre-set value)
    - **Not indicated for use in children under 16 at this time**

# What next?

The future of diabetes



# Artificial Pancreas



# Encapsulated Beta Cells

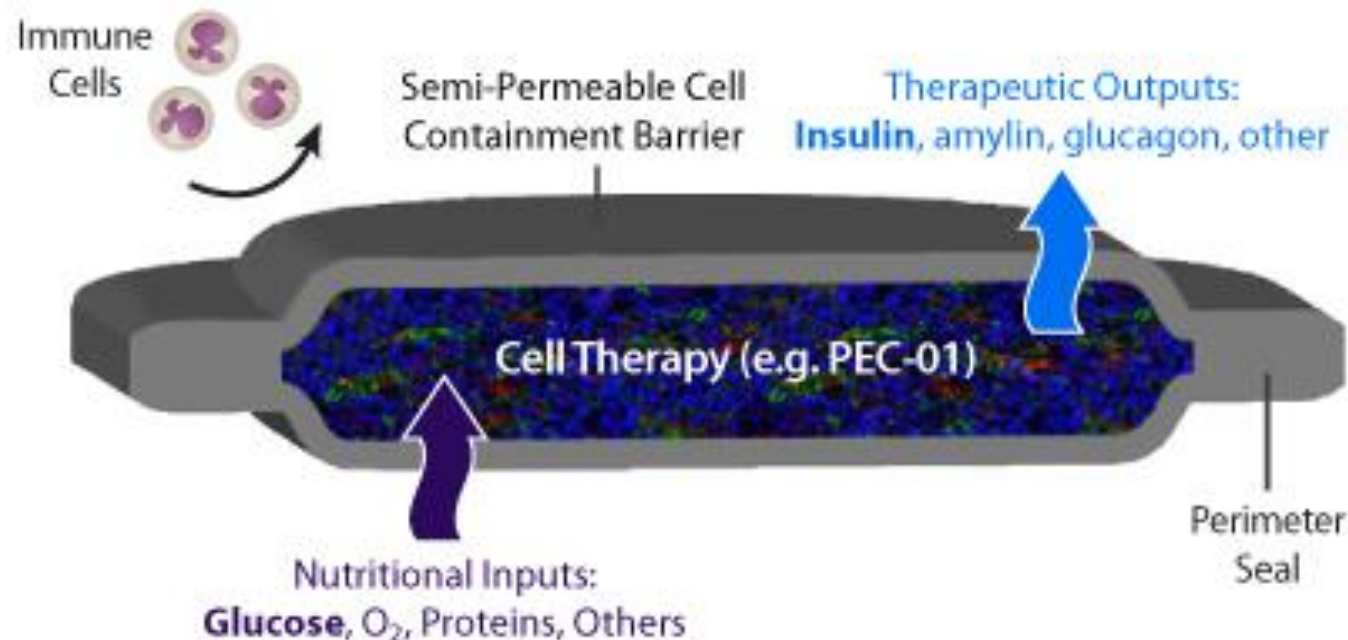
- ViaCyte company in San Diego
- Began work in 2011
- Stem cell-derived encapsulated cell replacement therapy
- Uses Pancreas endoderm cells from embryonic stem cells
- Size of a Band-Aid/width of a credit card
- To last 1 year to potentially 5 years

# Encapsulated Beta Cells

- Better than islet cell transplant-no need for anti-rejection drugs
- Glucose and insulin can be transferred through pores in the device-but not antibodies
- Other companies are working on similar encapsulation projects in the US and Canada

# Encapsulated Beta Cells

Cross Section of **Encaptra**<sup>®</sup> Drug Delivery System

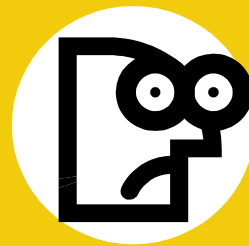
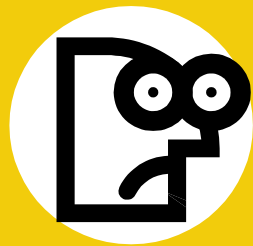


# Smart insulin

- SmartCells began work in 2003
- 2014 Merck purchased the company
- L-490
- Insulin that responds to blood sugar
- Phase 1 trials “late 2014”

# A Cure for Diabetes?





**It's QUESTION TIME !!**