GLUCOSE METABOLISM
Cells need glucose to make energy so that they can function.

Some cells can break down fats and proteins as a partial backup source to glucose.

Brain cells and red blood cells are particularly sensitive to low glucose levels---they have no other source for energy other than glucose.
Insulin is needed to help glucose to get access into most body cells (except brain cells). Insulin functions as a key to unlock pores in cell membranes to allow glucose to enter.

Insulin is secreted by the pancreas “on-demand” based on blood glucose levels.
Hypoglycemia is a condition of low blood glucose levels. Anyone can have this.

Hyperglycemia is a condition of high blood glucose levels.

<table>
<thead>
<tr>
<th>Blood Glucose Level</th>
<th>Fasting</th>
<th>After Eating</th>
<th>2-3 hours After Eating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>80-100</td>
<td>170-200</td>
<td>120-140</td>
</tr>
<tr>
<td>Impaired Glucose</td>
<td>101-125</td>
<td>190-230</td>
<td>140-160</td>
</tr>
<tr>
<td>Diabetic</td>
<td>126+</td>
<td>220-300</td>
<td>200 plus</td>
</tr>
</tbody>
</table>
Hypoglycemia is assessed using a glucometer and gathering history.

Hyperglycemia is assessed using a glucometer and gathering history.
Hypoglycemia is a condition of low blood glucose levels that tends to have a rapid onset with symptoms that may mimic shock.

Hyperglycemia is a condition of high blood glucose levels that tends to have a gradual onset with symptoms that may mimic the flu or a GI illness.
Hyperglycemic Crisis types:

- Diabetic Keto-acidosis (DKA) (no insulin produced---fats broken down). May have rapid / deep breathing and possibly a “fruity” or “acetone” breath odor.

- Hyperosmolar Hyperglycemic Non-ketotic Coma (HHNC) (some insulin produced---sugar excreted) (aka HONKS)
Hypoglycemia is treated with glucose and resolves in a few minutes.

Hyperglycemia is treated with insulin and resolves over many hours or days.
When in doubt, glucose should be given to the patient as it will correct hypoglycemia but it won’t make hyperglycemia any worse.
Patients can eat or drink to add glucose to their blood. Use caution in decreased level of consciousness.

EMTs can give oral glucose paste to be absorbed buccally (cheek and gum).
Some patient’s families may have Glucagon for IM injection. Most EMT protocols do not allow assisted medication administration of Glucagon.

Glucagon is a hormone that stimulates release of stored “glucose” from the liver (when available) to treat hypoglycemia.
Paramedics and AEMTs can administer IV glucose (“D-50” or “50% Dextrose”) to treat hypoglycemia.
Blood glucose levels:

- "Normal" is around 80-120 mg/dl
- Hypoglycemia symptoms begin around 50-60 mg/dl
- Hyperglycemia symptoms begin around 500-600 mg/dl
EMTs in Missouri can use a glucometer to obtain a blood glucose reading provided that they have received training in the use of these simple devices.
Hypoglycemic patients may appear:

- intoxicated

- to be having a stroke

- to be having a behavioral crisis

- actively seizing or post-ictal
Airway & Breathing must be managed.

Hypoglycemia can occur with other conditions or with injuries.

ANYONE can be hypoglycemic---you DO NOT have to be a diabetic.
Diabetes is a disease involving a problem with insulin and therefore a disruption in the mechanism for glucose movement from the blood into the cells.

Diabetic patients may present to EMS with either hypo or hyperglycemia.
Type 1 Diabetes involves a complete lack of insulin production by the pancreas---may be called “IDDM”.

Type 2 Diabetes involves a decrease in the effectiveness of the insulin that is produced.
Type 1 Diabetics typically take insulin daily by injection or they receive insulin throughout the day via an insulin pump.

Type 2 Diabetics typically use diet, exercise and oral medications to address their insulin function problems.
Meds for Type 2’s

- metformin (Glucophage)
- chlorpropamide (Diabinase)
- tobutamide (Orinase)
- glipizide (Glucotrol)
- rosiglitazone (Avandia)
- glyburide (Micronase)
- pioglitazone (Actos)
**Take-Away Key Points**

- Blood glucose levels must be checked in any altered mental status patient regardless of whether or not they have a history of diabetes.

- Airway & Breathing must be managed while glucose levels are assessed and managed.

- Hypoglycemia can cause seizures and mimic strokes or intoxication.