Ode to Glucagon

Canto I: Glucagon and Glycogen
After a meal is over, and blood glucose levels fall,
Brain and RBC’s panic, but the pancreas hears the call.
Alpha cells release glucagon, to find its binding site
On liver and adipose receptors, where it begins its fight.

In liver, active adenylate cyclase, increases cyclic AMP,
Which activates protein kinase and phosphorylase b,
Phosphorylated phosphophorylase b, now called phosphorylase a,
Degrades liver glycogen in time to save the day.

Glycogen synthase is inhibited by phosphorylation too,
Recycling is prevented, this is fortunately true.
Falling insulin levels enhance glucagon’s effect.
Phosphatases stay inhibited to give glucagon due respect.

Canto II: Glucagon and Gluconeogenesis
But glucose must be synthesized, glycogen won’t last too long,
From glycerol, lactate and amino acids, all of the precursors throng…
For essential gluconeogenic enzymes, transcription is induced,
And an increased supply of glycerol gives the path a boost!

Canto III: Glucagon and Metabolic Homeostasis
But to conserve that glucose, glucagon restricts its use,
Thereby decreasing the amount, the liver must produce.
Glucose to fatty acids is an inhibited pathway
Due to enzyme phosphorylation, by protein kinase A.

Glucagon in adipose tissue activates adenylate cyclase.
And protein kinase A activates hormone-sensitive lipase.
Adipose tissue triglycerides, are rapidly hydrolyzed.
Skeletal muscles get fatty acids, which are then oxidized.

And when all is done, glucagon sighs relief,
A glucose meal approaches; it’s reign has not been brief.
Insulin will take over, as blood glucose levels rise,
And dephosphorylate those enzymes with no compromise.

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Marks, Marks and Smith (Temple University)
the author of the poem is C.M. Smith