The apicoplast (a relict plastid of malaria parasites) has emerged as a promising target for new antimalarials. Apicoplasts are indispensable, but their exact function remains uncertain. The predicted organelle proteome identified complete pathways for fatty acid and isoprenoid biosynthesis plus a partial set of haem synthesis enzymes. Biochemical validation of these pathways, and the identification of inhibitors with drug potential, is ongoing in several laboratories. We isolated apicoplasts and determined the lipid content. Apicoplast phospholipids are enriched in C18:0 fatty acid but depleted in C18:1 and C18:2. Apicoplasts also contain a substantial quantity of C16:0 fatty acids. Unusually for plastids, apicoplast membranes contain cholesterol.

The sources of carbon, energy and reducing power for apicoplast anabolic activities are not yet clear. We determined substrate preferences for plant-like transporters located in the apicoplast membranes. Apicoplast transporters import triose phosphates, preferentially phosphoenolpyruvate. These reduced carbon compounds become substrates for fatty acid and isoprenoid biosynthesis, and they also generate reducing power and energy in the organelle. The apicoplast apparently taps into the parasite’s cytosolic glycolysis pathway, which burns glucose scavenged from the host. Our current understanding of how the apicoplast acquires carbon, ATP and NAD(P)H to drive its metabolism will be outlined.