SUPPORTING INFORMATION

Figure S1

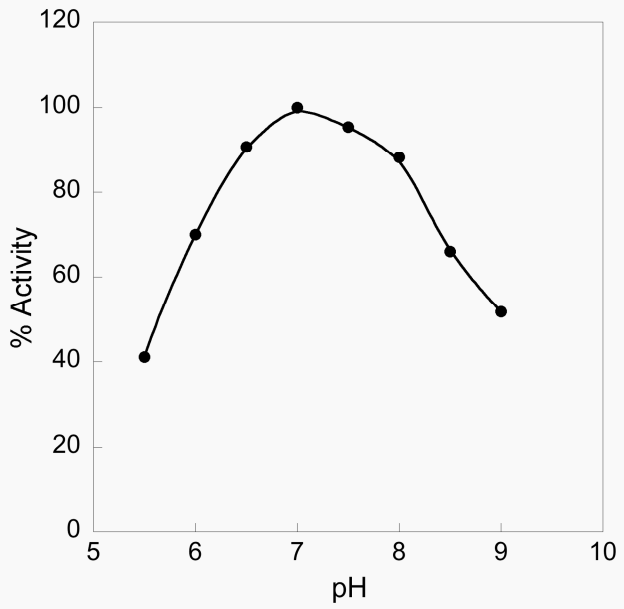
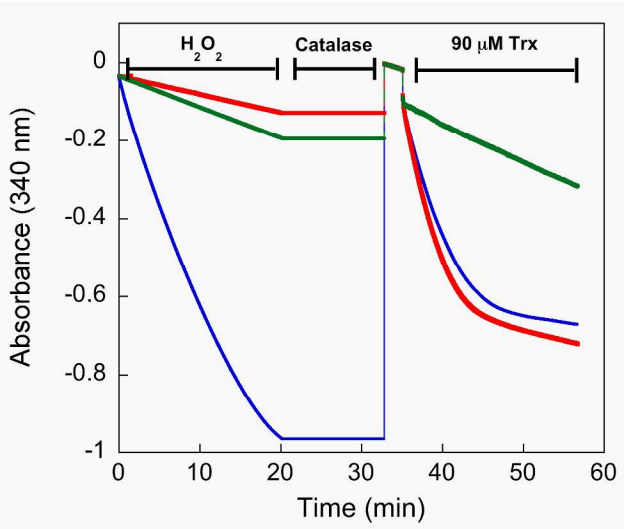


Figure S1: Activity vs. pH profile for WT mTR-GCUG using *E. coli* Trx as the substrate. The plot shows that the enzyme retains significant Trx-reductase activity from pH 6.0 to 8.5.

Figure S2

A



B

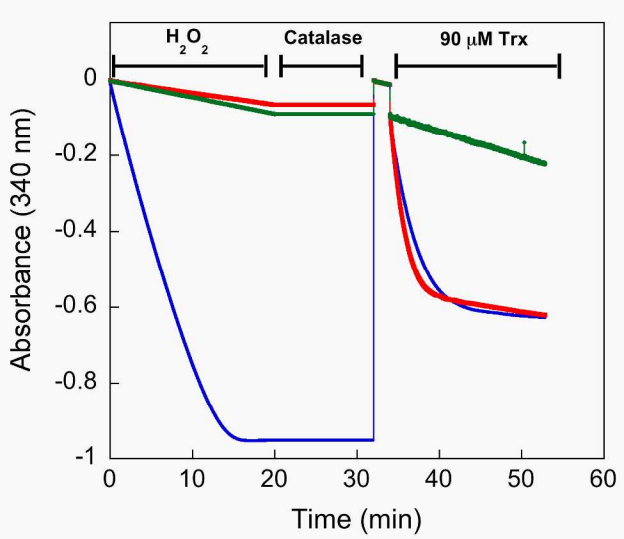


Figure S2: mTR resists inactivation at acidic pH. (A) Comparison of activity progress curves at pH 5.5 (100 mM sodium citrate) for mTR treated with H_2O_2 (blue = 50 mM) and control mTR (red = no H_2O_2). A control containing no enzyme is shown in green. After approximately 20 min, all of the NADPH in the reaction is consumed (for the enzyme treated with 50 mM H_2O_2) shown by a plateau in the slope. The samples were then treated with 14 units of catalase to remove

excess H_2O_2 for 12 min. During this quenching step the A_{340} was not monitored, but we have added a line to the plot for continuity. Since all of the NADPH was consumed in the sample treated with 50 mM H_2O_2, an additional bolus of NADPH was then added to the reaction to achieve a final concentration of 200 μM. The reaction was then monitored for 2 additional min at 340 nm to ensure all of the H_2O_2 was removed and then 90 μM Trx was added to each sample. (B) The same experiment shown in (A), but at pH 6.0 (100 mM sodium phosphate). The results show that at acidic pH mTR strongly resists irreversible inactivation by H_2O_2.

FIGURE S3

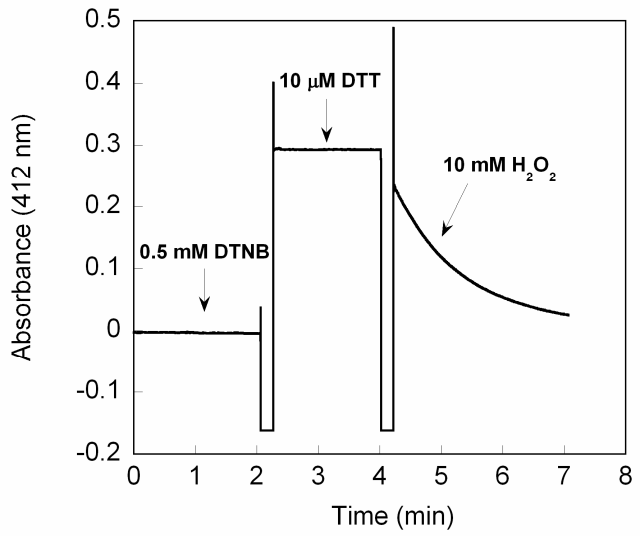


Figure S3: Non-enzymatic TNB anion re-oxidation by H_2O_2. Here we are investigating the ability of H_2O_2 to re-oxidize the TNB anion by first treating DTNB with DTT to produce the TNB anion followed by addition of H_2O_2 to the reaction. Following A_{412}, the first two minutes of the reaction correspond to baseline non-enzymatic hydrolysis of DTNB. After two minutes 10 μM DTT is added to the cuvette resulting in a rapid spike in A_{412} corresponding to the instantaneous formation of TNB anion. After an additional two minutes 10 mM H_2O_2 is pipetted into the cuvette and the subsequent decrease in A_{412} and re-oxidation of TNB anion back to DTNB is observed.