

## SUPPORTING INFORMATION

**Figure S1:** 12% reducing SDS-PAGE showing purity of enzymes used in this study. Lane 1: TriChromRanger™ prestained protein molecular weight marker mix, Lot:IE0014 (Pierce, Rockford, IL), Lane 2: HisCeTR2, Lane 3: HiscCeTR2 $\Delta$ 8, Lane 4: DmTR, Lane 5: DmTR $\Delta$ 8, Lane 6: semi-synthetic mTR3, Lane 7: mTR3 $\Delta$ 8.

**Figure S2:** Activity toward disulfide substrates as a function of pH for yeast glutathione reductase. **A)** DTNB (closed triangles). **B)** Acyclic PTPASC-TNB peptide (open triangles). **C)** Superimposition of the data in plots **A** and **B**. **D)** For comparison purposes, we show the data from Figure 3A superimposed with the plot of GR using DTNB as a substrate. Truncated mTR3 $\Delta$ 8 (closed squares), truncated DmTR $\Delta$ 8 (open circles) and yeast GR (closed triangles). Results are reported as a percentage of the maximal activity for each plot.

**Table S1: Activity of Truncated and Full-length TRs as a Function of pH.**

pH	Activity (mol TNB <sup>-</sup> /min/mol TR)			
	mTR-GCUG	mTR $\Delta$ 8	DmTR-SCCS	DmTR $\Delta$ 8
5.0	8.88	8.58	-	-
5.5	32.48	70.62	10.72	-
6.0	422.49	935.87	48.41	259.80
6.5	945.16	1570.7	189.34	612.00
7.0	1056.7	1409.7	216.30	797.00
7.5	1062.2	1149.1	226.41	974.00
8.0	849.88	810.05	233.46	900.25
8.5	733.15	383.17	246.63	800.00
9.0	617.03	330.47	205.58	570.83
9.5	481.62	-	168.50	313.73
10.0	368.57	-	98.65	123.00

**Table S2:** Concentration of Truncated TR and Peptide used in Peptide Complementation Experiments.

Peptide	Concentration Range	Enzyme	Concentration
Cyclic PTVTGCUG	0-20.0mM	mTR3- $\Delta$ 8	3nM
Acyclic PTVTGCUG	0-7.5mM	mTR3- $\Delta$ 8	50nM
Cyclic PTVTGCCG	0-20.0mM	mTR3- $\Delta$ 8	2000nM
Acyclic PTVTGCCG	0-20.0mM	mTR3- $\Delta$ 8	2000nM
Cyclic PTVTGUUG	0-7.5mM	mTR3- $\Delta$ 8	1000nM
Acyclic PTVTGC-TNB	0-2.0mM	mTR3- $\Delta$ 8	15nM
Cyclic PTPASCCS	0-25.0mM	DmTR- $\Delta$ 8	25nM
Acyclic PTPASCCS	0-20.0mM	DmTR- $\Delta$ 8	2000nM
Cyclic PTPASCUS	0-1.0mM	DmTR- $\Delta$ 8	5nM
Acyclic PTPASCUS	0-10.0mM	DmTR- $\Delta$ 8	50nM
Cyclic PTPASUCS	0-10.0mM	DmTR- $\Delta$ 8	500nM
Acyclic PTPASC-TNB	0-5.0mM	DmTR- $\Delta$ 8	50nM
Cyclic PRTQGCG	0-11.0mM	CeTR2- $\Delta$ 8	20nM
Acyclic PRTQGCG	0-10.0mM	CeTR2- $\Delta$ 8	2000nM
Cyclic PRTQGCUG	0-10.0mM	CeTR2- $\Delta$ 8	60nM
Acyclic PRTQGCUG	0-10.0mM	CeTR2- $\Delta$ 8	60nM
Cyclic PRTQGC-TNB	0-10.0mM	CeTR2- $\Delta$ 8	20nM

Figure S1

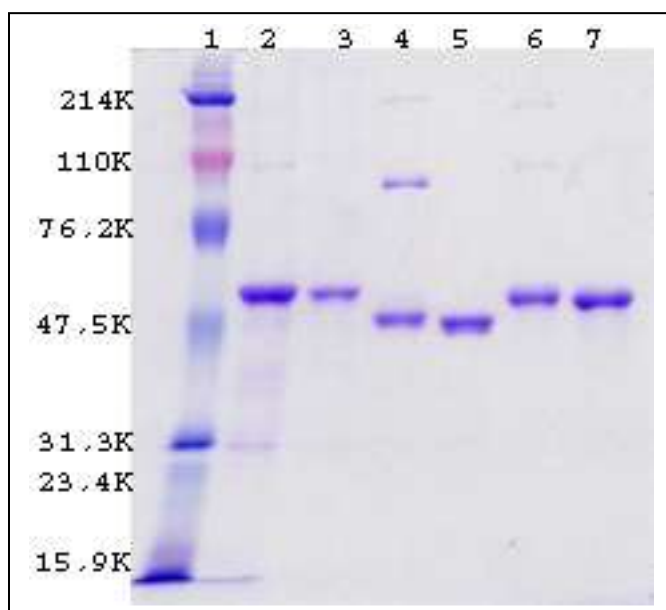


Figure S2

