Supplementary Materials

Table S1. Specific radiation damage to the disulfide bridges of different proteins as well as the area of solvent exposure for each cysteine. The absorbed dose is given in MGy. In red color is underlined those disulfide bonds that were reduced by radiation damage experiments.

Disulfide Bond	Residue	Solvent Accessibility (Å^2)	Absorbed Dose in MGy
Lisozyme			
Cys6-Cys127	Cys6	43	1 MGy PDB 4h8x, 4h8y, 4h8z,4h90, 4h91, 4h92, 4h93, 4h94, 4h9a, 4h9b, 4h9c, 4h9e, 4h9f, 4h9h, 4h9i
	Cys127	21	
Cys30-Cys115	Cys30	0	
	Cys115	0	
Cys64-Cys80	Cys64	0	
	Cys80	1	
Cys76-Cys94	Cys76	20	
	Cys94	2	
TcAChE			
Cys67-Cys94	Cys67	11.2	6 MGy PDB 1qid, 1qie, 1qif, 1qig, 1qih, 1qii, 1qij, 1qik, 1qim
	Cys94	3.5	
Cys254-Cys265	Cys254	18.8	
	Cys265	20.4	
Cys402-Cys521	Cys402	2.1	
	Cys521	11.9	
Elastase			
Cys58-Cys42	Cys58	4.2	13 MGy PDB 3mnb, 3mnc, 3mns, 3mnx, 3mo3, 3mo6, 3mo9, 3moc, 3mty, 3odf, 3mu0, 3mu1, 3mu4, 3odd, 3mu5, 3mu8
	Cys42	1.3	
Cys182-Cys168	Cys182	3.2	
	Cys168	0	
Cys220-Cys191	Cys220	1.8	
	Cys191	5.4	
Cys136-Cys201	Cys136	0.1	
	Cys201	0	
Trypsin			
Cys157-Cys22	Cys157	2.3	7 MGy PDB 1hj8, 1hj9
	Cys22	21.5	
Cys58-Cys42	Cys58	3.1	
	Cys42	4.0	
Cys232-Cys128	Cys232	24.7	
	Cys128	68.6	
Cys201-Cys136	Cys201	2.2	
	Cys136	1.2	
Cys168-Cys182	Cys168	0	
	Cys182	0	
Cys191-Cys220	Cys191	2.4	
	Cys220	11.4	
Thioredoxin *Lv*Trx			
Cys73-Cys73'	Cys73	23.3	0.67 MGy PDB 4aj7, 4aj8, 3zzx, 4aj6
	Cys73'	36.5	
ACys32-ACys35	ACys32	0	
	ACys35	0.2	
BCys32-BCys35	BCys32	0	
	BCys35	4.2	

Table S2. Comparison of solvent accessibility by the catalytic disulfide and Trx interface in different species depending on the arrangement in the crystal lattice (dimer and monomer).

Disulfide Bond	Residue	Solvent Accessibility (Å^2)	Absorbed Dose in MGy
Thioredoxin *Lv*Trx Dimer			
Cys73-Cys73'	Cys73	23.3	0.013 MGy PDB 3zzx Catalytic site Partially reduced
	Cys73'	36.5	
ACys32-ACys35	ACys32	0	
	ACys35	0.2	
BCys32-BCys35	BCys32	0	
	BCys35	4.2	
Thioredoxin LvTrx Dimer			
Cys73-Cys73'	Cys73	27.5	0.51 MGy PDB 4aj6 Catalytic site reduced
	Cys73'	32.1	
ACys32-ACys35	ACys32	0	
	ACys35	5.4	
BCys32-BCys35	BCys32	0	
	BCys35	4.7	
Thioredoxin LvTrx Dimer			
Cys73-Cys73'	Cys73	20.7	0.67 MGy PDB 4aj7 Catalytic site oxidized
	Cys73'	38.8	
ACys32-ACys35	ACys32	0	
	ACys35	4.4	
BCys32-BCys35	BCys32	0	
	BCys35	3.7	
Thioredoxin LvTrx Dimer			
Cys73-Cys73'	Cys73	27.7	0.019 MGy PDB 4aj8 Catalytic site Partially reduced
	Cys73'	28.3	
ACys32-ACys35	ACys32	0	
	ACys35	0	
BCys32-BCys35	BCys32	0	
	BCys35	0	
Human Thioredoxin Monomer			
Cys73	Cys73	62.2	Unkown
ACys32-ACys35	ACys32	14.5	1ert
	ACys35	6.9	Catalytic site reduced
Human Thioredoxin Monomer			
Cys73	Cys73	65.6	Unkown
ACys32-ACys35	ACys32	6.3	1eru
	ACys35	1.9	Catalytic site Oxidized
***E. coli* Thioredoxin Monomer**			
ACys32-ACys35	ACys32	5.2	Unkown
	ACys35	3.3	2trx Catalytic site Oxidized
***D. melanogaster* Thioredoxin Monomer**			
ACys32-ACys35	ACys32	6.9	Unkown
	ACys35	2.8	1xw9 Catalytic site Oxidized

Figure S1. Sequential deterioration of the catalytic and the interface disulfide bond at continue X-ray exposure. In the top panel are shown the first images of videos to correspond to crystal *Lv*Trx-1x and *Lv*Trx-3x. The videos can be visualized in an external file. In the below panel, the summary of the catalytic and interface disulfide bonds changes are shown during exposure to X-ray. Colors from white to deep red illustrate the dose received during the data collection. The black arrows indicate the dose in which these disulfide bonds are broken.