Evolutionary Considerations in Sexual Reproduction

More Rotifer Strangeness

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MI615

Reassembly of shattered chromosomes in Deinococcus radiodurans.

Nature. 2006 Oct 5;443(7111):569-73. Epub 2006 Sep 27.

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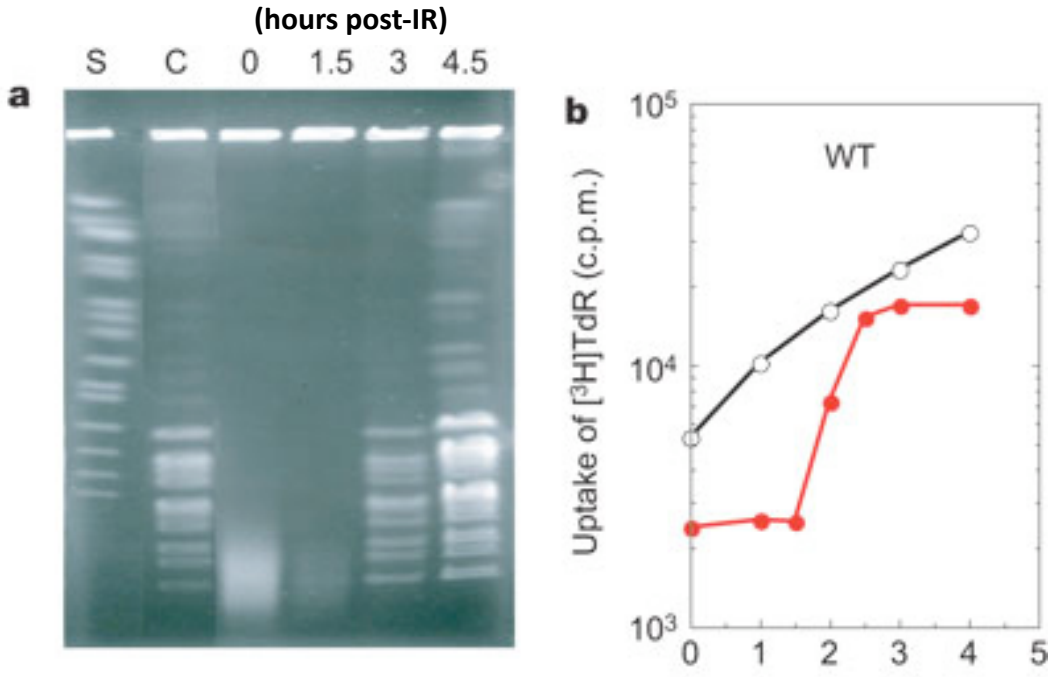
Figure 1

Not I digests

7000 Gy γ-IR (!)



Red: irradiated

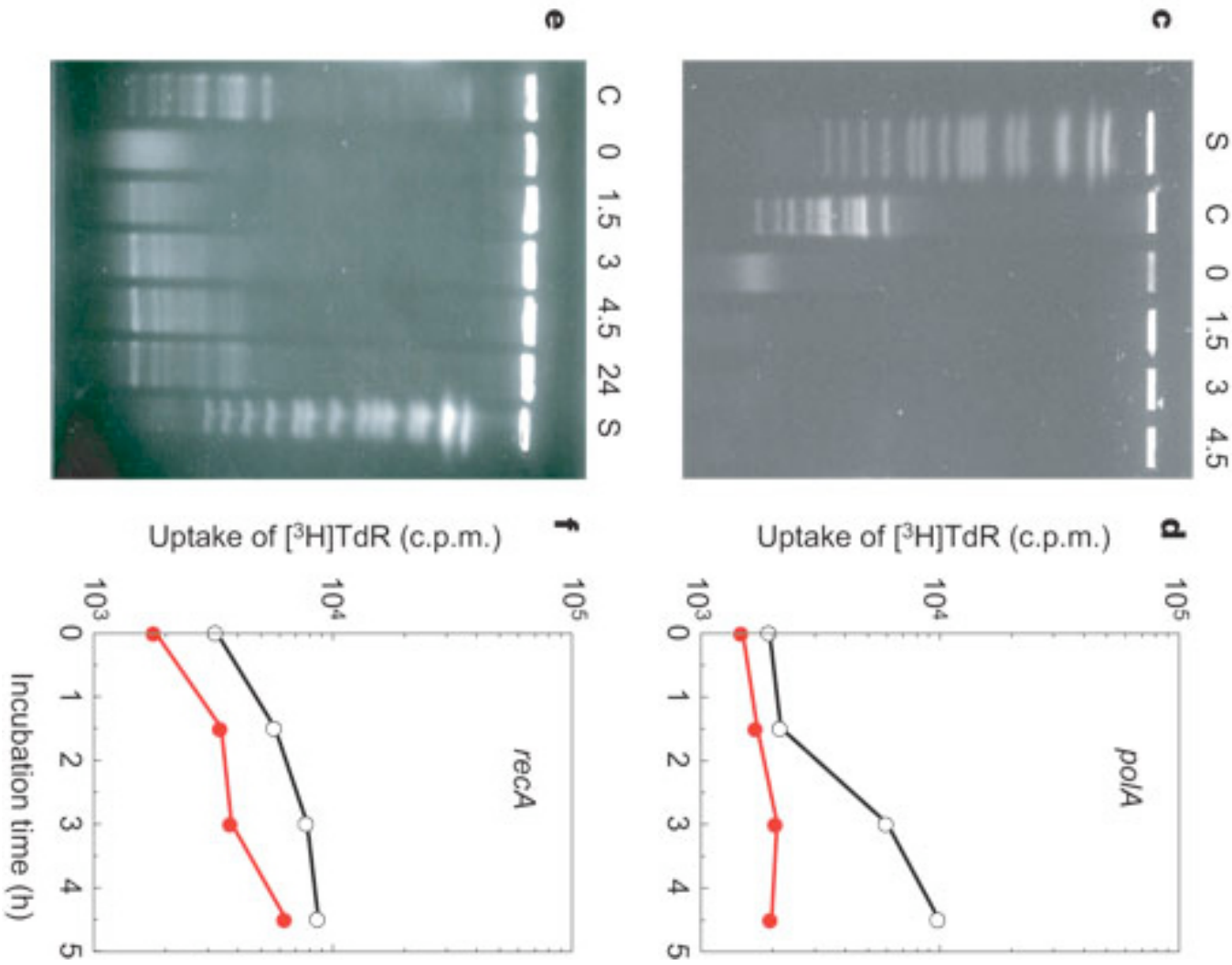


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Figure 2

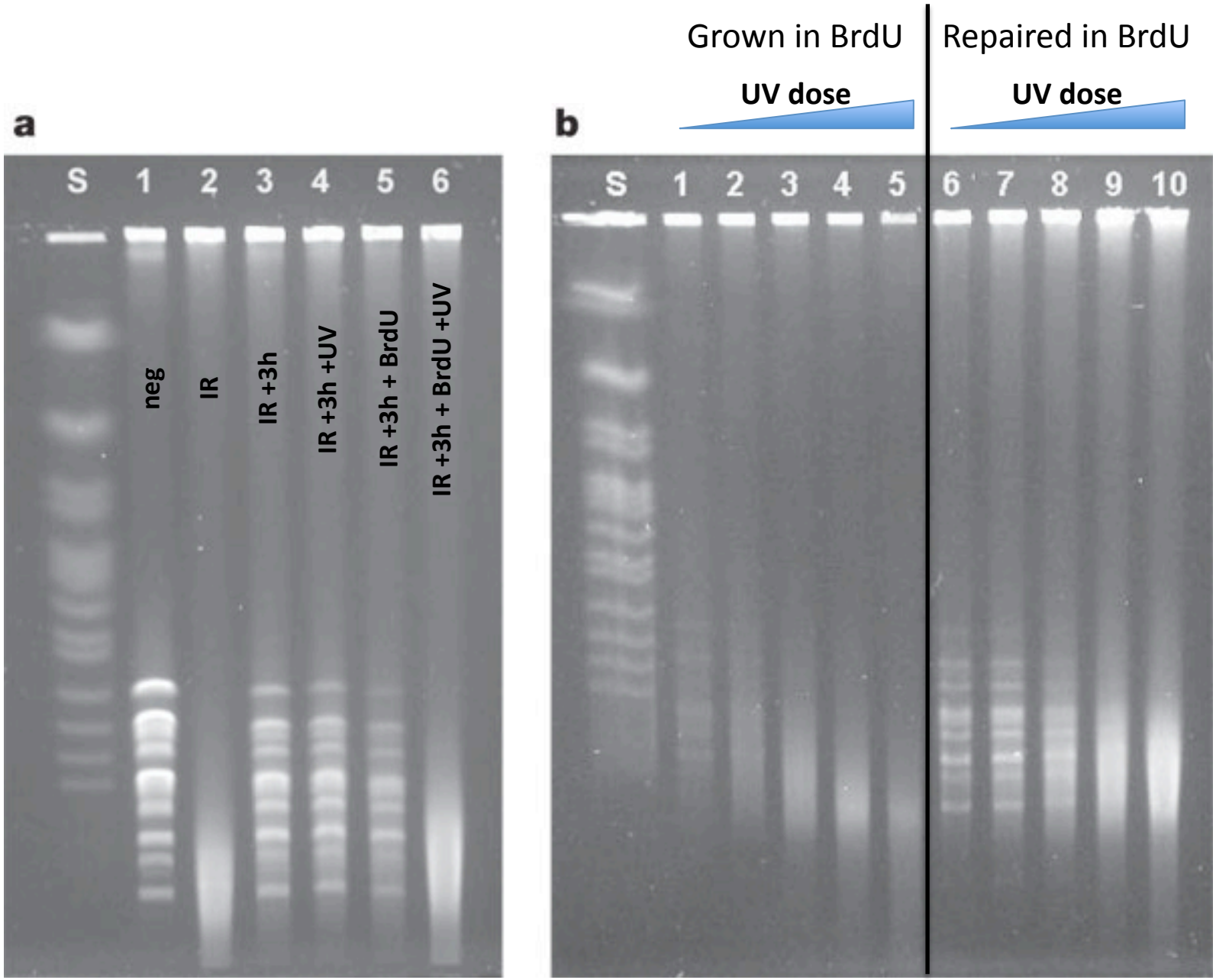

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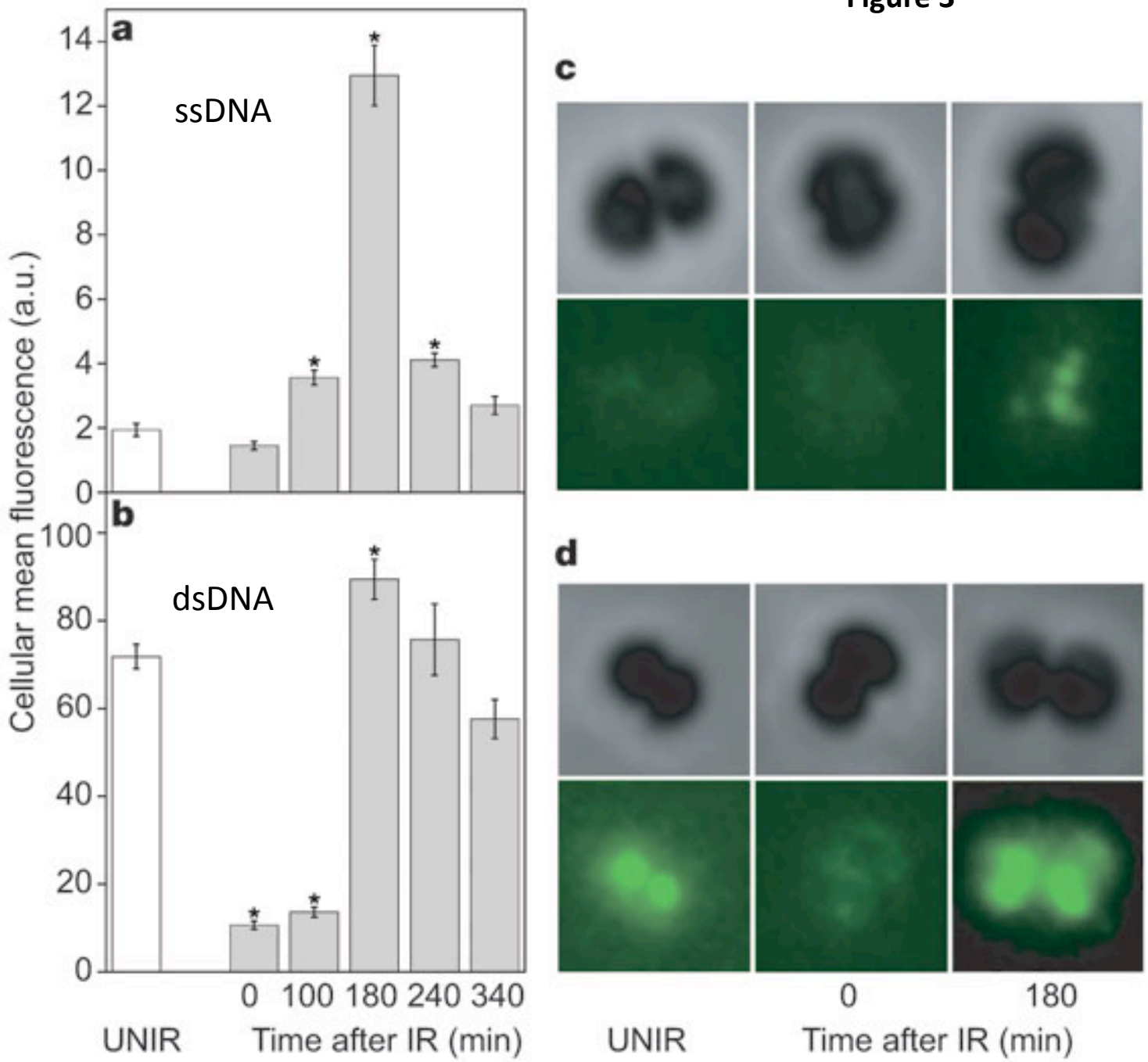
Figure 3



NATIVE

DENATURING

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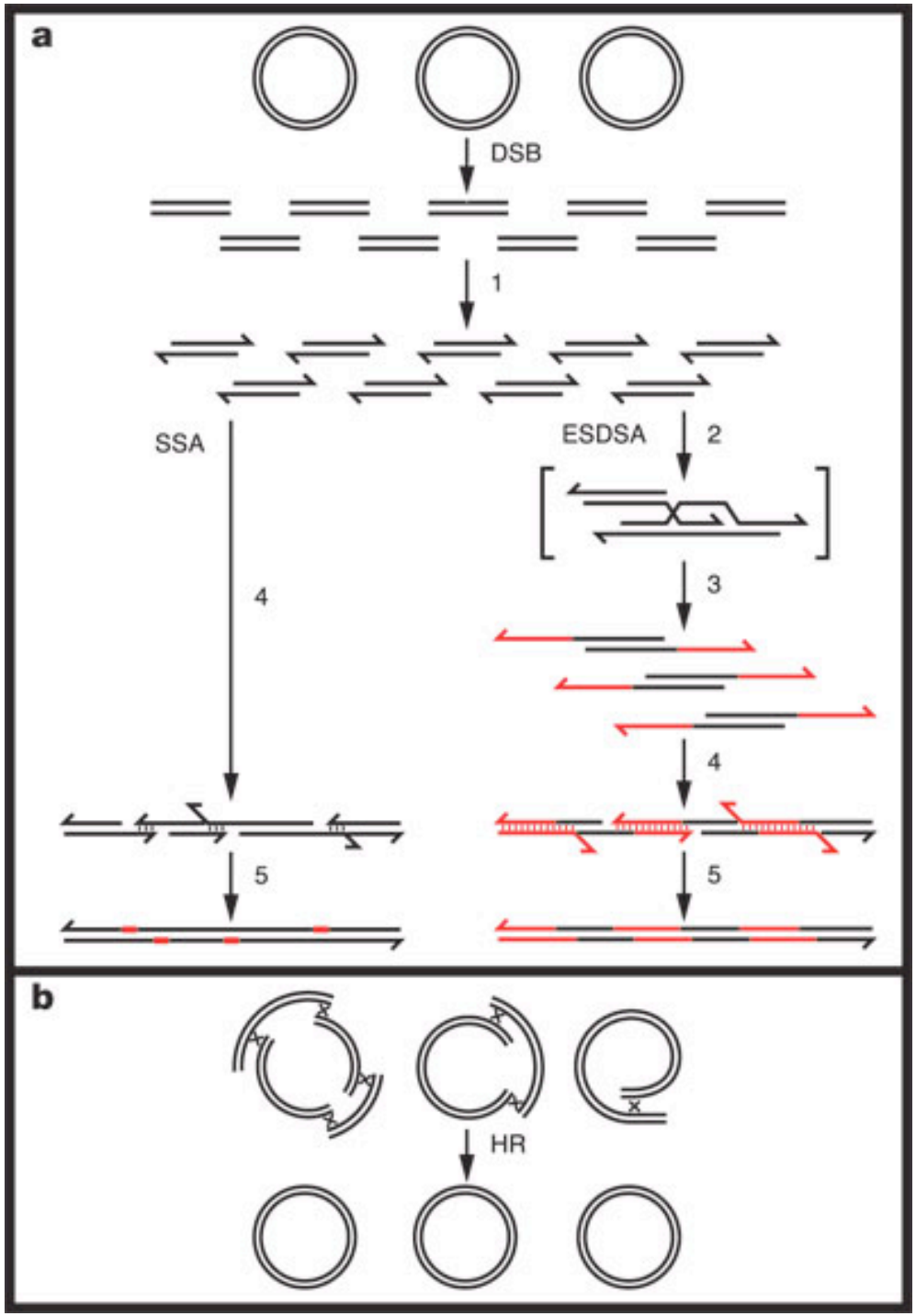
Figure 4



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Extreme resistance of bdelloid rotifers to ionizing radiation.

Proc Natl Acad Sci U S A. 2008 Apr 1;105(13):5139-44. Epub 2008 Mar 24.
Gladyshev E, Meselson M.

Table 1

Fertility: producing at least one active daughter

Fecundity: percent hatched eggs

Table 1. Reproductive performance of bdelloid and monogont rotifers exposed to IR

			Parental wells						Daughter wells				
	Species	Dose, h	Wells with eggs, *n*	Wells with F_1, *n*	Total eggs, *n*	Total eggs hatched, *n*	Relative parental fertility	Relative parental fecundity	Wells with eggs, *n*	Wells with F_2, *n*	Total eggs hatched, *n*	Relative F_1 fertility	Relative F_1 fecundity
Monogonant	*E. dilatata*	0	81	68	290	249	1.00	1.00	58	58		1.00	
		1	82	26	272	35	0.38	0.14	9	6		0.27	
		2	78	0	266	0	0.00	0.00	n/a	n/a		n/a	
		3	84	0	278	0	0.00	0.00	n/a	n/a		n/a	
	E. dilatata	0	88	86	324	291	1.00	1.00	65	64		1.00	
		0.5	87	80	302	160	0.93	0.55	45	40		0.67	
		1	87	24	278	58	0.28	0.20	15	10		0.56	
		2	85	2	316	2	0.02	0.01	1	0		0.00	
	E. dilatata	0	83	83	613	588	1.00	1.00	78	78	1,085	1.00	1.00
		0.25	86	86	577	461	1.04	0.78	74	72	977	0.89	0.87
		0.5	88	82	602	360	0.99	0.61	73	54	612	0.70	0.57
		1.5	82	14	538	24	0.17	0.04	4	1	9	0.08	0.05
Bdelloid	*A. vaga*	0	89	89	985	866	1.00	1.00	87	87		1.00	
		2	91	90	1,063	845	1.01	0.98	87	86		0.98	
		4	88	84	1,240	672	0.94	0.78	80	78		0.95	
		6	93	62	1,002	187	0.70	0.22	54	50		0.83	
		8	92	6	1,169	12	0.07	0.01	3	2		0.34	
	P. roseola	0	95	95	1,914	1,569	1.00	1.00	92	92	2,356	1.00	1.00
		2	96	95	1,956	1,134	1.00	0.72	91	89	1,877	0.97	0.80
		4	93	76	1,873	638	0.80	0.41	73	67	1,201	0.91	0.64
		6	89	46	1,690	217	0.48	0.14	36	29	240	0.65	0.21
		8	89	9	1,711	13	0.09	0.01	3	1	5	0.11	0.02

Rotifers were irradiated on ice for various times with a ^{137}Cs source delivering 140 Gy per h. Parental and F_1 relative fecundity and relative fertility are defined in *Materials and Methods*. The number of daughters transferred to new wells was in each case equal to the number of parental wells in which daughters were produced. For *E. dilatata* the number of hatched eggs was counted directly. For bdelloids it was taken as the number of progeny, as described in *Materials and Methods*.

Dose: 140 Gy / hr

Extreme resistance of bdelloid rotifers to ionizing radiation.

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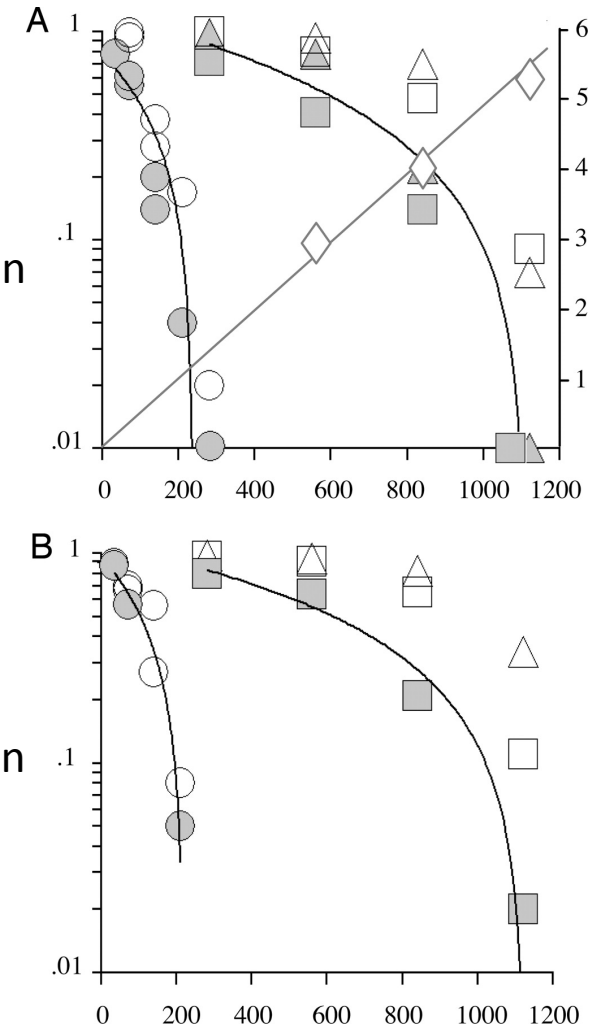
Figure 1

Dose dependence of bdelloid and monogonont reproduction

Parental Reproduction

F1 Reproduction



Diamonds: DSB / Mbp
Circles: E. dilatata (monogonant)
Squares: P. roseola (bdelloid)
Triangles: A. vaga (bdelloid)

Fertility: empty symbols
Fecundity: filled symbols

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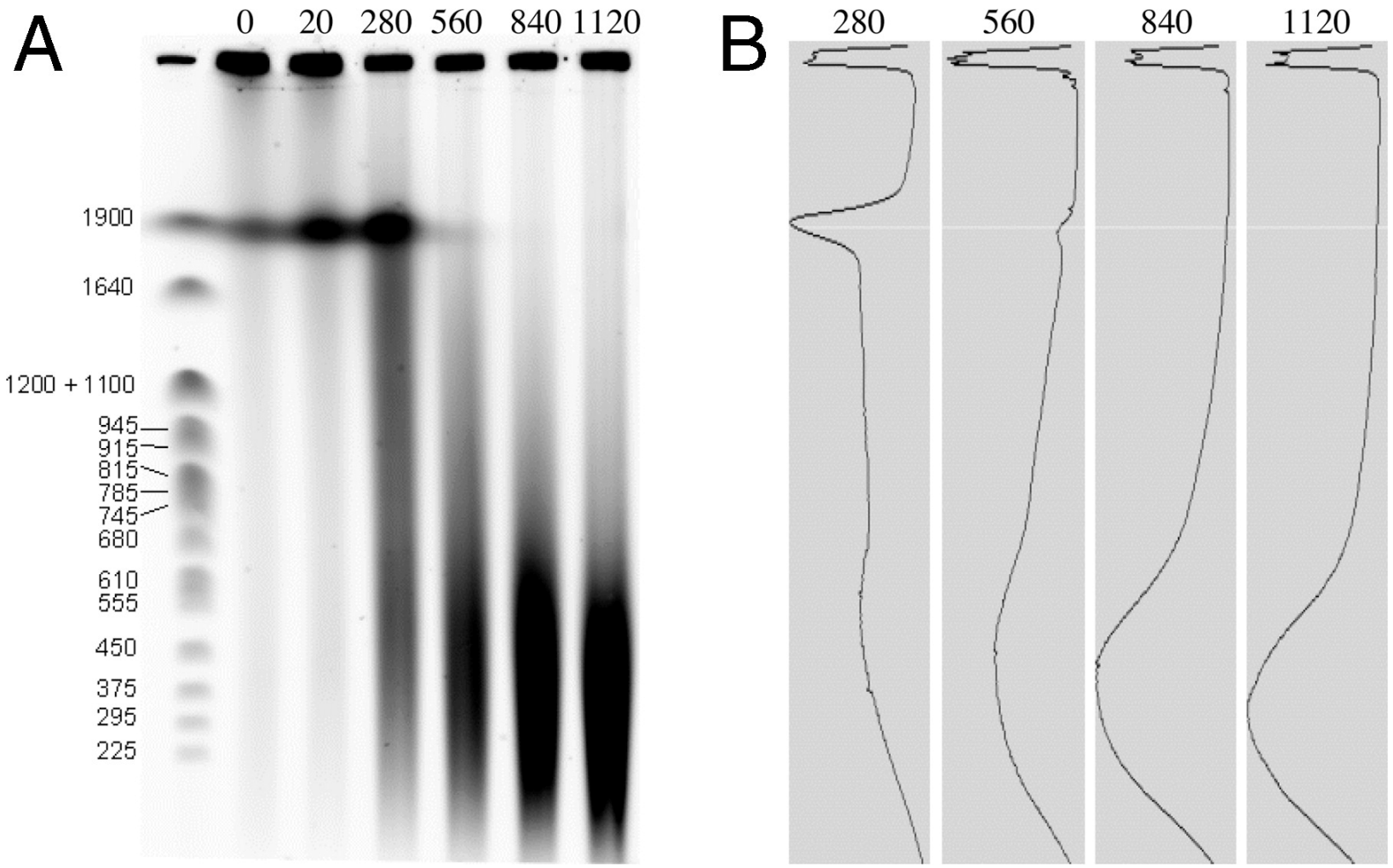
Figure 2

DNA double-strand breakage by IR in A. vaga (bdelloid)



Standard breakage: 5 x 10^{-3} breaks / Mbp / Gy

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Massive horizontal gene transfer in bdelloid rotifers.

Science. 2008 May 30;320(5880):1210-3.
Gladyshev EA, Meselson M, Arkhipova IR.

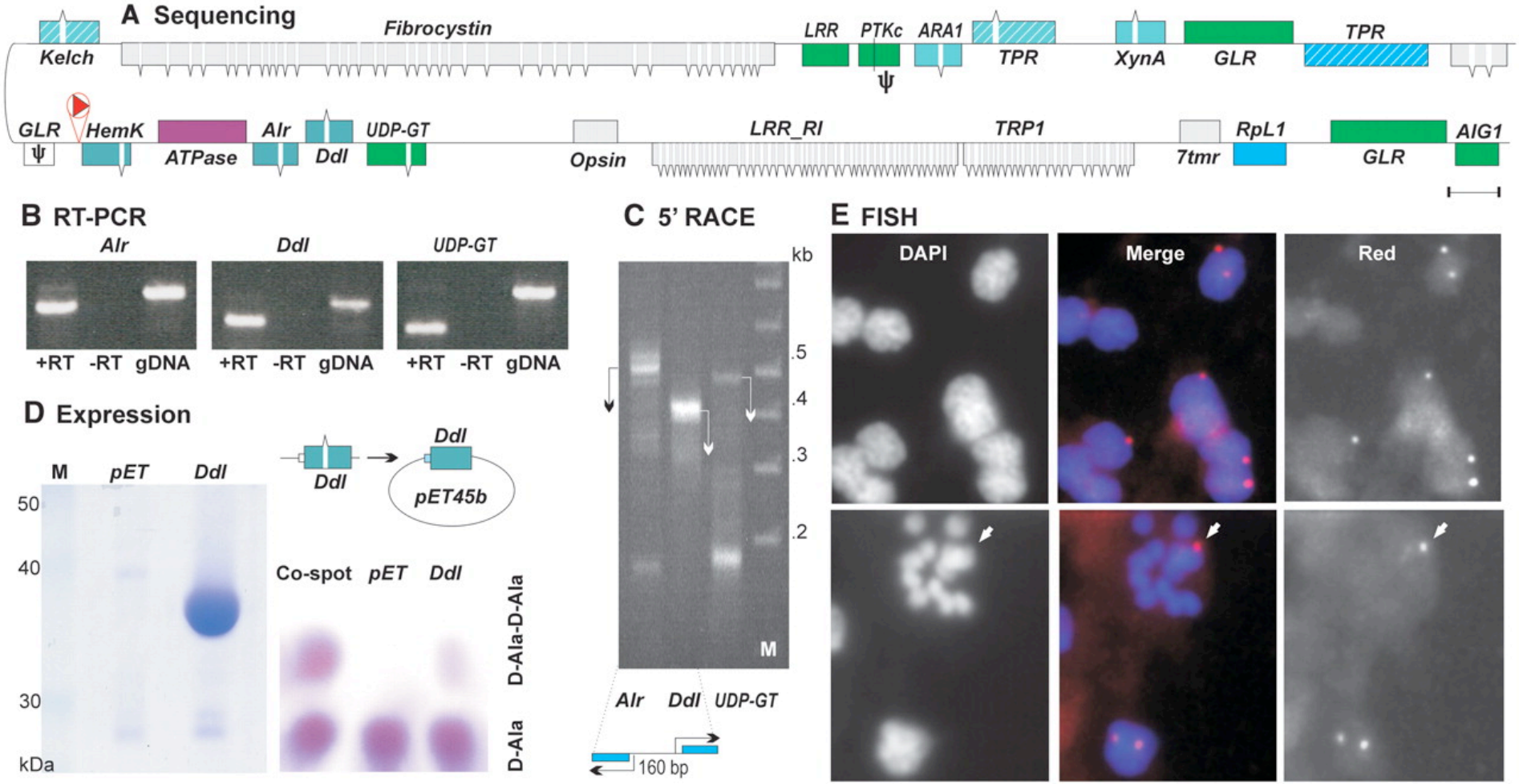

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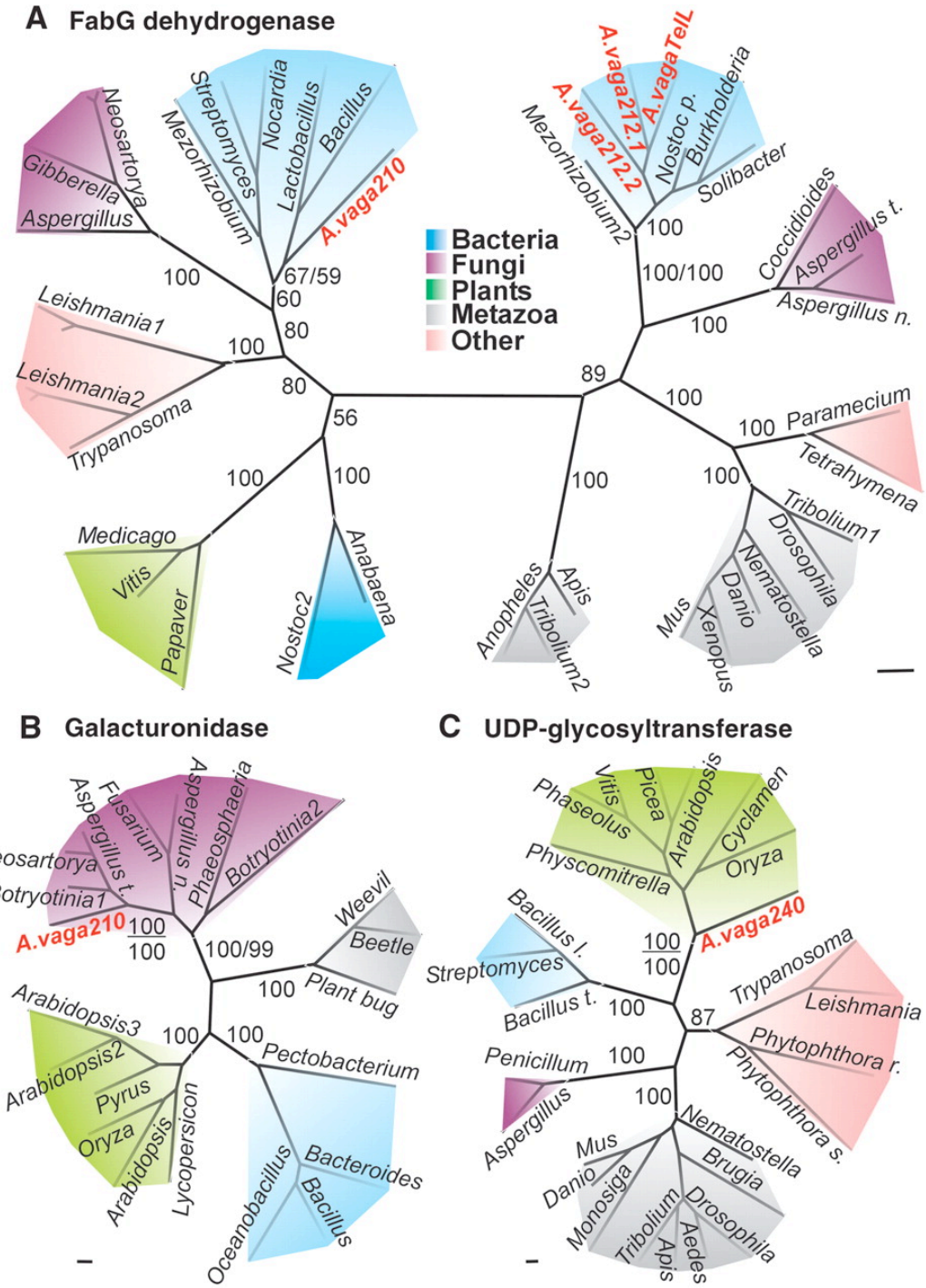
Table 1. Representative bdelloid CDS of foreign origin homologous to genes with known function. For a complete list and additional information on each CDS, see table S1. Data are from BLASTP similarity searches, as described in (*19*). Asterisks indicate putative pseudogenes.

Gene ID, name	Contig ID	Introns	AI	% Identity to best hit	Best hit, E-value	Best hit, metazoan	Best hit, taxonomy	Definition
AV10027_*XynB*	Av212A	0	460	63	0.00E+00	No hits	Bacteria; Bacteroidetes	Xylosidase/arabinosidase
AV10001_*NRPS*	Av110A	10	460	32	0.00E+00	No hits	Bacteria; (Proteobacteria/ Cyanobacteria)	Nonribosomal peptide synthetase
AV10134_*PheA*	161F07	0	400	61	1.00E-174	No hits	(Fungi; Bacteria)	Monooxygenase, FAD dependent
AV10002_*TrkA*	Av110A	0	379	54	1.00E-175	4.00E-11	Bacteria; Proteobacteria	Monooxygenase, NAD dependent
PR10002_*MviM*	182F10	0	327	67	1.00E-149	2.00E-07	Bacteria; (Acidobacteria/ Chloroflexi)	Oxidoreductase
PR10010_*DAP2*	182F10	0	310	27	1.00E-140	1.00E-05	Bacteria; (Acidobacteria/ Proteobacteria)	Prolyl oligopeptidase*
AV10104_*Dur3*	AvTelL.B	1	243	44	1.00E-132	4.00E-27	Eukaryota; Fungi	Urea active transporter*
PR10012_*RamA*	182J17	0	246	31	1.00E-107	No hits	(Bacteria; Fungi)	α-L-Rhamnosidase
AV10121_*NRPS*	99O7	4	237	30	1.00E-103	No hits	Bacteria; Cyanobacteria	Nonribosomal peptide synthetase
AV10153_*XghA*	210B3	0	212	50	1.00E-108	2.00E-16	Eukaryota; Fungi	Endo-xylogalacturonan hydrolase
AV10042_*HemK*	Av240B	1	199	56	2.00E-91	1.00E-04	Bacteria; Proteobacteria	HemK-like methyltransferase
AV10092_*β-Gal*	AvTelL.A	0	153	33	1.00E-105	4.00E-39	Eukaryota; Viridiplantae	β-D-Galactosidase
AV10044_*Alr*	Av240B	1	152	38	1.00E-67	No hits	Bacteria; Bacteroidetes	Alanine racemase
AV10025_*AMH*	Av212A	1	150	52	8.00E-77	2.00E-11	Eukaryota; Fungi	Amidohydrolase
AV10045_*Ddl*	Av240B	1	138	40	1.00E-60	No hits	Bacteria; Bacteroidetes	D-Alanine-D-alanine ligase
AV10140_*PLDc*	193E18	2	126	31	1.00E-55	No hits	Eukaryota; Fungi	Phospholipase-D active site motif protein*
AV10016_*FabG*	Av212A	0	98	58	1.00E-74	8.00E-32	Bacteria	Short-chain dehydrogenase/reductase
AV10109_*FabG*	AvTelL.B	0	92	57	4.00E-73	5.00E-33	Bacteria	Short-chain dehydrogenase/reductase*
AV10011_*FabG*	Av212A	0	88	54	6.00E-67	2.00E-28	Bacteria	Short-chain dehydrogenase/reductase
AV10071_*HAL*	AvTelK.A	0	77	48	2.00E-61	1.00E-27	Bacteria	Histidine ammonia-lyase
AV10095_*GCN5*	AvTelL.A	0	59	35	2.00E-27	No hits	Bacteria; Proteobacteria	GCN5-related *N*-acetyltransferase$^{+/*}$
AV10158_*FabG*	210B3	2	46	41	2.00E-39	2.00E-19	Bacteria	Short-chain dehydrogenase/reductase



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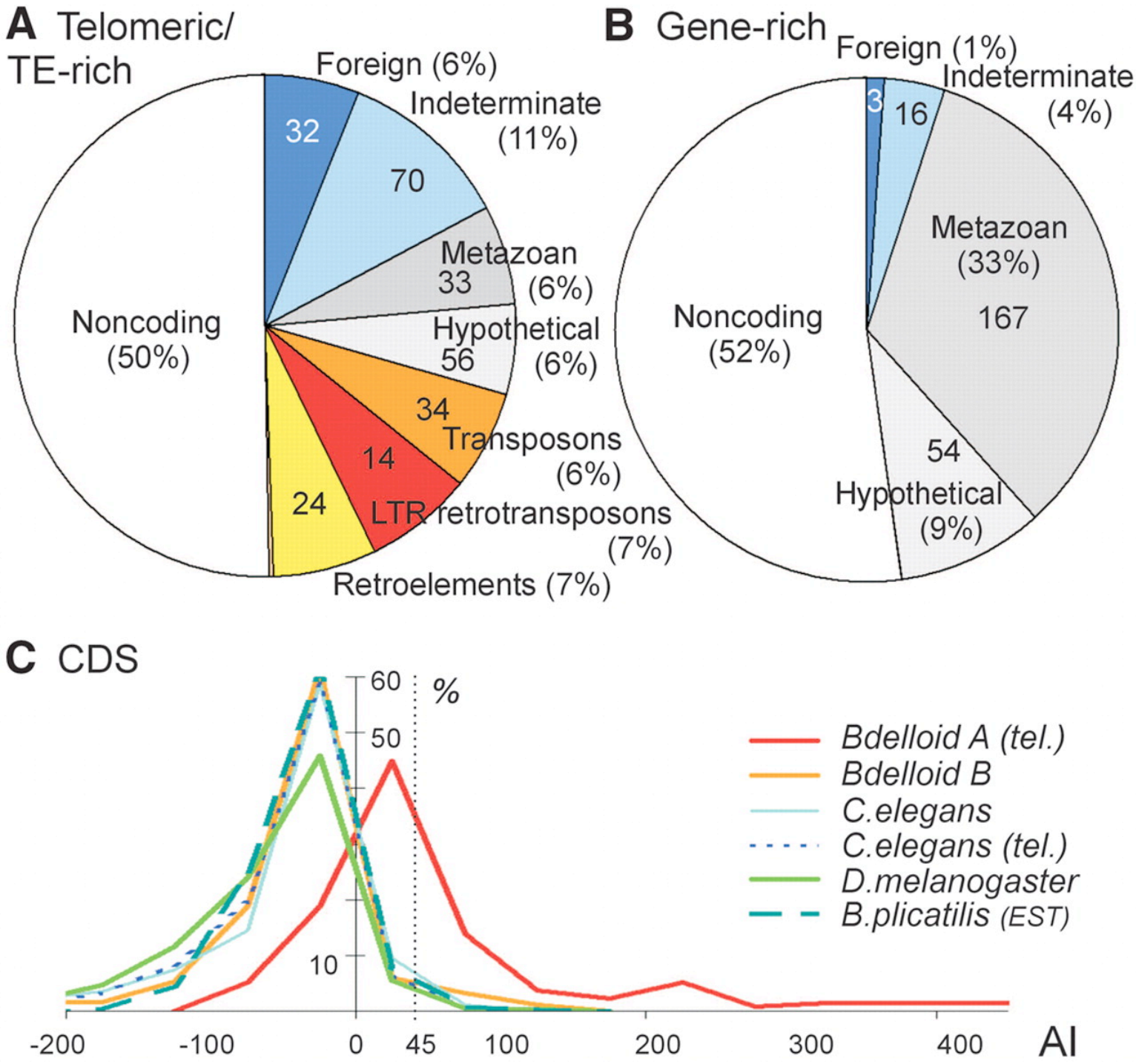

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