

Table S1. Diet composition used in the *in vitro* digestibility experiment (% of dry matter, DM).

Item	Oat hay	Pellet concentrate
Dry matter	91.56	89.19
Crude protein	3.55	16.20
Crude fat	2.15	4.08
Crude fiber	27.40	8.66
Crude ash	5.02	6.95
Calcium	0.09	1.22
Phosphorus	0.09	0.65
ADF	30.87	13.23
NDF	54.17	31.10

ADF, acid detergent fiber; NDF, neutral detergent fiber.

Table S2. Sample information and sequencing statistics of 16S rRNA gene amplicon sequencing variants.

Sample ID	Treatment	No. of input paired reads	Quality filtered reads	Denoised reads	Chimera-filtered reads	Taxa-filtered*
CON-1	CON	91,952	74,257	66,841	38,331	38,331
CON-2	CON	96,798	79,777	71,842	36,250	36,250
CON-3	CON	91,777	76,287	68,784	34,713	34,713
ENTO-1	ENTO	96,726	79,912	71,800	34,756	34,756
ENTO-2	ENTO	97,029	79,695	71,641	36,442	36,442
ENTO-3	ENTO	96,144	79,269	71,320	37,542	36,577
EPI-1	EPI	92,480	76,777	68,869	33,620	33,620
EPI-2	EPI	95,462	78,335	70,798	36,934	36,934
EPI-3	EPI	93,556	76,063	67,975	33,281	31,199
ISO-1	ISO	87,285	72,135	64,560	33,486	33,484
ISO-2	ISO	91,093	74,992	66,787	32,348	32,348
ISO-3	ISO	97,106	79,647	71,575	37,906	37,906
OPH-1	OPH	82,796	68,063	61,106	31,719	31,719
OPH-2	OPH	88,620	71,607	64,408	32,285	32,285
OPH-3	OPH	97,053	79,590	71,466	33,740	33,740
MIX-1	MIX	92,480	76,014	67,688	31,442	31,442
MIX-2	MIX	103,118	84,124	75,196	35,268	35,266
MIX-3	MIX	86,219	70,684	63,352	32,311	32,309

* Amplicon sequencing variants (ASVs) identified as “mitochondria”, and “chloroplast” were filtered out.

CON, control group without ciliate added; ENTO, small entodinia inoculated; EPI, *Epidinium* spp. inoculated; ISO, isotrichids inoculated; OPH, *Ophryoscolex* spp. inoculated; MIX, mixed group with small entodinia., *Epidinium* spp., isotrichids. and *Ophryoscolex* spp. inoculated; Pooled SEM, pooled standard error of the mean.

Table S3. Number of KEGG orthologs and pathways among each group after 24 h of incubation.

Item	CON	ENTO	EPI	ISO	OPH	MIX	P-value	Pooled SEM
KEGG pathway	118	119	118	118	117	115	0.713	4.91
KEGG ortholog	5,056	5,160	4,924	5,127	5,075	4,793	0.185	252.28

CON, control group without ciliate added; ENTO, small entodinia inoculated; EPI, *Epidinium* spp. inoculated; ISO, isotrichids inoculated; OPH, *Ophryoscolex* spp. inoculated; MIX, mixed group with small entodinia., *Epidinium* spp., isotrichids. and *Ophryoscolex* spp. inoculated; Pooled SEM, pooled standard error of the mean.