

## CORRECTION

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## Correction: Organic contaminants of emerging concern in Norwegian digestates from biogas production

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Correction for 'Organic contaminants of emerging concern in Norwegian digestates from biogas production' by Aasim M. Ali *et al.*, *Environ. Sci.: Processes Impacts*, 2019, 21, 1498–1508.

After revisiting and evaluating the data of our recent publication "Organic contaminants of emerging concern in Norwegian digestates from biogas production", we identified several minor erroneous details in Table 1 which need to be corrected in order to allow correct interpretation of the results. In Table 1, the operating conditions of the biogas processes are listed according to information from the respective biogas plants. An updated version of Table 1 is included here, as well as amendments to sections as corrections of the earlier assumptions.

### Corrections

#### p. 1499 Materials and methods – Biogas process conditions

**Original interpretation:** "The sample set also included one liquid sample ( $I_{\text{sub}}$ ) and a liquid digestate sample ( $I_{\text{dig}}$ ) from an experimental biogas reactor associated with plant I. Biogas plant I uses 20% sludge from young fish and 80% manure as a raw substrate (Table 1)."

**Correction:** Biogas plant I and the experimental biogas reactor are two separate reactors with different operating conditions, but are listed as one reactor in the original paper. The experimental reactor is now added to the modified Table 1 (named  $I_{\text{EXP}}$  in Table 1).  $I_{\text{EXP}}$  uses 20% sludge from young fish and 80% manure as a substrate, while biogas plant I uses 72% sewage sludge and 28% food waste as substrate.

**Corrected text:** "The sample set also included one liquid sample ( $I_{\text{sub}}$ ) and a liquid digestate sample ( $I_{\text{dig}}$ ) from an experimental biogas reactor  $I_{\text{EXP}}$ , associated with plant I. This experimental biogas plant  $I_{\text{EXP}}$  uses 20% sludge from young fish and 80% manure as a raw substrate (Table 1)."

#### p. 1500 Results and discussion – Substrate composition

**Original interpretation:** "High levels of octocrylene (a sun-screen ingredient), in some cases exceeding the uLOQ method limit, were found almost exclusively when sewage sludge was used for biogas production."

**Correction:** Elevated levels of octocrylene were found across all investigated biogas digestates produced from food waste, in amounts which are comparable to the concentrations found in those produced from sewage sludge. In  $E_{(\text{s})}$  (solid digestate from biogas plant E) the concentration was  $>600 \text{ ng g}^{-1}$ . In the liquid digestates, the concentrations in digestates produced from food waste were  $25.8 \text{ ng g}^{-1}$  (plant L),  $224 \text{ ng g}^{-1}$  (plant E), and  $44.8 \text{ ng g}^{-1}$  (plant G).

**Corrected text:** "High levels of octocrylene (a sunscreen ingredient), in some cases exceeding the uLOQ method limit, were found in food waste and sewage sludge-based biogas digestates."

#### p. 1500 Results and discussion – Substrate composition

**Original interpretation:** "The correlation calculations revealed a significant positive correlation between the CEC level and the use of thermal hydrolysis (PTTHP) in the pre-treatment of the substrate prior to AD as well as the dry-matter content (% DM)."

**Correction:** The correlation analysis was repeated with the updated information from Table 1. PTTHP still has a positive correlation with the CEC level, but this corrected correlation is not significant, whereas the correlation between CEC level and dry matter is still significant.

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**Table 1** Plant specific procedure strategies for optimized biogas production obtained from the representative Norwegian biogas production plants<sup>a</sup>

Location	Solid (S)/liquid (L) sample available	Substrate	Reactor temperature		Retention time [days]	Inoculum	Pre-treatment	Precipitant added	Dry matter [%]	Polymer
			[°C]							
A	L + S	45% food waste, 53% sewage sludge, 2% fish silage	40	16	No	THP	No	No	L = 1; S = 27	Yes
B	S	15% food waste, 85% sewage sludge	38	40	Yes	THP	No	No	S = 26	Yes
C	L	27% manure, 72% food waste	39	35	Yes	Temp.	FeCl <sub>3</sub>	FeCl <sub>3</sub> & AlCl <sub>3</sub>	L = 5	No
D	S	100% sewage sludge	37	20	No	No	No	No	S = 47	Yes
E	L + S	100% food waste	41	35	Yes	THP	No	No	L = 3; S = 27	Yes
F	L + S	45% food waste, 55% sewage sludge	62	20	Yes	Temp.	FeCl <sub>3</sub>	FeCl <sub>3</sub>	L = 2; S = 21	Yes
G	L	100% food waste	40	20	No	THP	Micronox	Micronox	L = 4	No
H	S	100% sewage sludge	54	15	No	Temp.	FeCl <sub>3</sub> , PAX	FeCl <sub>3</sub> , PAX	S = 26	Yes
I	S + L	72% sewage sludge, 28% food waste	40	20	No	THP	No	No	L = 5; S = 39	Yes
I <sub>EXP</sub>	Substrate and digestate	20% sludge from young fish, 80% manure	40	20	No	No	No	No		No
J	S	100% sewage sludge	55	14	No	No	FeSO <sub>4</sub> × 7H <sub>2</sub> O	FeSO <sub>4</sub> × 7H <sub>2</sub> O	S = 32	Yes
K	S	100% sewage sludge	40	25	No	THP	Ecofloc	Ecofloc	S = 33	Yes
L	L + S	100% food waste	53	20	No	No	FeS	FeS	L = 3; S = 35	No

<sup>a</sup> THP = thermal hydrolysis processing; temp. = pre-treatment at 70 °C for 30–60 min; L = liquid samples; EcoFloc = liquid, commercially available flocculant (Ecolab, Naperville, IL, USA) mainly composed of FeCl<sub>3</sub> in water solution. Micronox = a precipitant containing a mixture of iron oxides, iron hydroxides and other oxides. I-EXP. = an experimental biogas reactor associated with plant I. For details of polymers added to the digestates, see Table S11.



**Corrected text:** “The correlation calculations revealed a significant positive correlation between the CEC level and the dry-matter content (% DM).”

p. 1501 **Results and discussion – Biogas production and processing**

*Original interpretation:* “The results presented in Fig. 1 indicate that the careful selection of substrate composition (including dry matter content) and optimised conditioning strategies for biogas production may be considered a first important step to reduce the occurrence of potential CECs in the digestate.”

**Corrected text:** “The results presented in Fig. 1 indicate that the careful selection of substrate composition and optimised conditioning strategies for biogas production may be considered a first important step to reduce the occurrence of potential CECs in the digestate.”

p. 1503 **Results and discussion – Contaminants of emerging concern in liquid digestates**

*Original interpretation:* “Ibuprofen was detected in two liquid biogas digestates mainly derived from sewage sludge based substrates ( $E_{(L)}$ ) and  $A_{(L)}$ ) at concentrations of  $36 \mu\text{g L}^{-1}$  and  $26.7 \mu\text{g L}^{-1}$ , respectively.”

**Correction:** The liquid biogas digestate  $E_{(L)}$  is produced from food waste.

**Corrected text:** “Ibuprofen was detected in two liquid biogas digestates derived from food waste alone or in combination with sewage sludge as substrates, *i.e.*  $E_{(L)}$  and  $A_{(L)}$ , at concentrations of  $36 \mu\text{g L}^{-1}$  and  $26.7 \mu\text{g L}^{-1}$ , respectively.”

The Royal Society of Chemistry apologises for these errors and any consequent inconvenience to authors and readers.

