

# **TESTING PROPOSAL ON VERTEBRATE ANIMALS: OECD 489**

## **in vivo ALKALINE COMET ASSAY**

### **NON-CONFIDENTIAL NAME OF SUBSTANCE:**

- Name of the substance on which testing is proposed to be carried out: Acid Black 234
- EC: 605-104-5
- CAS: 157577-99-6

### **CONSIDERATIONS THAT THE GENERAL ADAPTATION POSSIBILITIES OF ANNEX XI OF THE REACH REGULATION ARE NOT ADEQUATE TO GENERATE THE NECESSARY INFORMATION**

- Available GLP studies
- Mammalian Erythrocyte Micronucleus test (OECD 474)

- Available non-GLP studies: Not Available

- Historical human data: Not Available

- (Q)SAR: Not Available

- Weight of evidence:

available results from in vitro studies (GLP) were both taken into account, but no definitive conclusion could be drawn

- Grouping and read-across:

no read across data available for finalisation of the genotoxicity potential

### **CONSIDERATIONS THAT THE SPECIFIC ADAPTATION POSSIBILITIES OF ANNEXES VI TO X (AND COLUMN 2 THEREOF) OF THE REACH REGULATION ARE NOT ADEQUATE TO GENERATE THE NECESSARY INFORMATION:**

Under Annex VIII Section 8.4., column 2 of REACH, further mutagenicity studies must be considered in case of a positive result in an in vitro gene mutation study in bacteria.

Guidance on information requirements R7a, section 7.7.6 (2017), states that REACH Annex VII substances for which only a bacterial gene mutation test has been conducted and for which the result is positive should be studied further, according to the requirements of Annex VIII.

Regarding Annex VIII, when both the mammalian cell tests are negative but there was a positive result in the bacterial test, it will be necessary to decide whether any further testing is needed on a case-by-case basis. For example, suspicion that a unique positive response observed in the bacterial test was due to a specific bacterial metabolism of the test substance could be explored further by investigation in vitro. Alternatively, an in vivo test may be required

The present dossier contains positive results for the in vitro gene mutation study in bacteria, following OECD 471 which raises the concern for gene mutation.

Annex VIII, Column 2 requires the registrant to consider appropriate mutagenicity in vivo studies already at the Annex VIII tonnage level, in cases where positive results in genotoxicity studies have been obtained, which involves studies mentioned in Annex IX ( as first step OECD 474. Mammalian Erythrocyte micronucleus test, OECD 488 Transgenic Rodent Mutation Assay, OECD 489 In vivo mammalian Alkaline Comet Assay and OECD 486 Unscheduled DNA Synthesis).

## **CONSIDERATIONS ON THE STUDIES INSERTED IN THE PRESENT DOSSIER AND EXPERT ASSESSMENT ON TESTING PROPOSAL**

In the present dossier an OECD 474 (Mammalian Erythrocyte micronucleus test) in vivo study is available on the read across substance Acid Black 210 with negative results, which is adequate to cover the chromosomal aberration potential of the substance.

The following table summarises the whole situation for both analogue and target substances:

	<b>Acid Black 210</b>	<b>Acid Black 234</b>
	Target substance	Analogue substance
EC	421-880-6	605-104-5
In vitro gene mutation in bacteria OECD 471	POSITIVE (TA98 and TA1537)	POSITIVE (TA98, TA100 and TA 1537)
In vitro gene mutation in mammalian cells	NEGATIVE	NEGATIVE (read across from Acid Black 210)
In vitro cytogenicity in mammalian cells	NEGATIVE	NEGATIVE (read across from Acid Black 210)
In vivo micronucleus OECD 474	NEGATIVE	NEGATIVE (read across from Acid Black 210)
In vivo Comet Assay OECD 489	Read Across from Acid Black 234	SUBMITTED TESTING PROPOSAL
In vivo Transgenic Rodent Assay OECD 488	Not required	Not required

Based on the available information on gene mutation and in order to further and completely assess the gene mutation properties of the substance in different tissues of the animal a Comet Assay, OECD 489, is presented as testing proposal.

EC 605-104-5 is in fact, considered as representative of the mutagenic behaviour in a worst-case scenario approach, as the Ames test in Acid Black 234 can be considered as most conservative substance in relation to Acid Black 210, because the positivity is seen in three strain (TA 98, TA100 and TA 1537). Moreover one metabolite of ABK234 is Aniline.

Aniline is classified as a category 3 mutagen, however the Ames test on this substance arises no concern, therefore the positivity that can be found in Acid Black 234 Ames test seems not to be involved with the release of Aniline in this case.

OECD 489 allows to measure DNA strand breaks, that may result from direct interactions with DNA, alkali labile sites or as a consequence of incomplete excision repair. Therefore, the alkaline comet assay recognises primary DNA damage that would lead to gene mutations and/or chromosome aberrations, but will also detect DNA damage that may be effectively repaired or lead to cell death. The comet assay can be applied to almost every tissue of an animal from which single cell or nuclei suspensions can be made, including specific site of contact tissues.

OECD 488 is not considered the first choice for assessing the gene mutation in vivo for this substance, since preliminary data for gene mutation in vivo (OECD 474) already indicates negativity in the somatic bone marrow cells. A confirmation by the Comet assay performed over other tissues (and for azo dyes the intestinal tract is the site of major metabolism and dye/metabolites absorption<sup>i</sup>) would be sufficient to assess the genotoxic potential of the substance<sup>ii</sup>.

Finally, as reported in literature, from the analysis of 91 chemicals with published data from Comet Assay and Transgenic rodent mutation assay (TGR), the comet assay appears to yield similar results to the TGR assay in liver and gastrointestinal tract (predominantly stomach and colon data) and, hence, can be confidently performed to confirm in vivo gene mutation activity in terms of genotoxicity in general. <sup>iii</sup>

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- <sup>i</sup> Levine WG, Metabolism of azo dyes: implication for detoxication and activation, *Drug Metab Rev.* 1991; 23(3-4):253-309
- <sup>i</sup> Golka et Al., Carcinogenicity of Azo Colorants: Influence of Solubility and Bioavailability, *Toxicology Letters* 151(1, July 2004, 203-10
- <sup>i</sup> Yoshida.O., and Miyakawa.M. (1973), Etiology of bladder cancer: metabolic aspects, in Nakahara.W., Wirayoma.T., and Nishioka.K. (eds.), *Analytical and Experimental Epidemiology of Cancer*, Baltimore Univ. Park Press, pp. 31-39.
- <sup>i</sup> Chung KT, Fulk GE, Egan M. *Appl Environ Microbiol.* 1978;35:558–562
- <sup>i</sup> Chung KT, Stevens SE Jr, Cerniglia CE , The reduction of azo dyes by the intestinal microflora., *Crit Rev Microbiol.* 1992; 18(3):175-90
- <sup>i</sup> Chung K-T. *Environ Carcino & Ecotox Revs.* 2000:C18, 51–74
- <sup>i</sup> Cerniglia CE, Freeman JP, Franklin W, Pack LD Metabolism of azo dyes derived from benzidine, 3,3'-dimethylbenzidine and 3,3'-dimethoxybenzidine to potentially carcinogenic aromatic amines by intestinal bacteria. *Carcinogenesis.*1982 Aug 31;107(4):1224–1229
- <sup>i</sup> Xu, H.; Heinze, T.M.; Donald D. Paine, D.D.; Cerniglia, C.E.; Chen, H. (2010). Sudan azo dyes and Para Red degradation by prevalent bacteria of the human gastrointestinal tract. *Anaerobe*, Vol. 16, No. 2, pp. 114-119, ISSN 1075-9964
- <sup>i</sup> Brantom PG (2005) Review of some other dyes with current non-food uses. *EFSA J* 263:41–71
- <sup>i</sup> Wang RF, Chen H, Paine DD, Cerniglia CE, Microarray method to monitor 40 intestinal bacterial species in the study of azo dye reduction, *Biosens Bioelectron.* 2004 Nov 1; 20(4):699-705
- <sup>i</sup> C N Martin, J C Kennelly, Rat liver microsomal azoreductase activity on four azo dyes derived from benzidine, 3,3'-dimethylbenzidine or 3,3'-dimethoxybenzidine, *Carcinogenesis*, . 1981;2(4):307-12
- <sup>i</sup> Kennelly, J.C.; Hertzog, P.J.; Martin, C.N. (1982). The release of 4,4'-diaminobiphenyls from azodyes in the rat. *carcinogenesis*, Vol. 3, No. 8, pp. 947–951
- <sup>ii</sup> [https://echa.europa.eu/documents/10162/21650280/oecd\\_test\\_guidelines\\_genotoxicity\\_en.pdf/56ab5788-0103-4716-8903-59ab0c942efe](https://echa.europa.eu/documents/10162/21650280/oecd_test_guidelines_genotoxicity_en.pdf/56ab5788-0103-4716-8903-59ab0c942efe)
- <sup>iii</sup> *Mutat Res Genet Toxicol Environ Mutagen*, . 2019 Mar;839:21-35.