



**BISPHENOL A**  
IN RELINING OF  
WATER PIPES

**RENOVATION OF WATER PIPES** with so-called relining could result in leaching of the problematic chemical Bisphenol A (BPA) – recently banned in baby bottles – into drinking water. Relining is an increasingly common and less expensive method of restoring old water pipes instead of replacing them.

**EXAMPLES OF BPA LEACHING** from relined drinking water pipes give reason for concern and highlight the need to further investigate this issue.

There is a need to test for, and systematically screen, the level of high concern chemicals leaching into drinking water from relined pipes, as well as from other water pipes containing materials that can leach BPA.

**BPA IS A CHEMICAL OF HIGH CONCERN** which even at low doses has been linked to health and environmental problems. Taking a precautionary approach, materials with the potential to release BPA should not be used in drinking water pipes.

**THERE IS CURRENTLY** no EU-wide legislation handling the issue of relining. There is an urgent need for regulating the use of BPA in materials in contact with drinking water.

## WHAT IS RELINING?

Relining is a process of recoating the entire inside of the water pipe instead of replacing the old pipes with new ones. The concept of relining rather than replacing drinking water pipes was developed in the late 1980s.<sup>1</sup> The recoating of the drinking water pipes is often done with an epoxy resin containing Bisphenol A (BPA) or Bisphenol A Diglycidyl Ether (BADGE), which can leach BPA.<sup>2</sup>

There are also alternative materials being used in the relining process, e.g. materials based on BPA-free polyester/polyurethane and silicone resins.<sup>3</sup>

From a construction point of view, relining is less expensive, less labour intensive and less disruptive than replacing old pipes. Relining has most frequently been done on sewage pipes, but relining of drinking water pipes is getting more and more common.<sup>4</sup>

Epoxy resins containing BPA are also used in other food and drinking water contact materials such as the lining of tin cans and as a surface coating on residential drinking water storage tanks and other water basins.<sup>5</sup>

## CAN BPA LEACH FROM WATER PIPES INTO THE WATER?

There are not many studies where water from relined pipes has been analysed for its chemical content. However, there are reports of BPA and BADGE leaching into water if the epoxy resin has not been mixed properly, or is not given enough time to dry.<sup>6,7,8</sup>

In one case, reported from Germany, BPA levels up to 280 µg/litre leached into the hot water system after a relining procedure had not been properly done.<sup>9</sup> This was way above the level of 30 µg/litre approved in Germany for migration of BPA into drinking water.<sup>10</sup> In another case, after the relining of drinking water pipes with epoxy resin, a court in Cologne (Germany) ruled that the water was contaminated with BPA and unsuitable for drinking.<sup>11</sup>

The amount of BPA in water has been reported to increase with the water or pipe temperature.<sup>12</sup> There have been

reports of BPA concentrations above 30 µg/litre in the water after it had been heated up to 70°C.

Epoxy linings already in place have the potential to affect water quality for decades and research shows high migration of BPA with the deterioration of resins over time.<sup>13,14</sup> Research has also shown higher levels of BADGE in pipes where the water has been still for more than 72 hours, compared with water from pipes that have been flushed.<sup>15</sup>

BPA migration is mostly a matter of concern in drinking water pipes, since there is the possibility of BPA contaminating the drinking water. BPA is also used in relining of sewage pipes, adding an additional load of BPA for sewage water treatment plants to process.

## WHY IS THERE CONCERN ABOUT BPA?

BPA is an endocrine disruptor with oestrogenic (feminising) properties. Being an endocrine disruptor means that it can interfere with hormonal communication between cells. Since hormones play a vital role in many processes, including organ development, mood and reproduction, endocrine disrupting chemicals can have profound effects on our health. BPA is also classified by the EU as toxic to reproduction category 2.<sup>16</sup>

A wide range of health effects are associated with BPA, such as obesity, heart disease, breast and prostate cancer, diabetes, fertility problems, birth defects, and effects on brain development and behaviour.<sup>17</sup>

## WHAT DOES REGULATION SAY?

There is currently no EU wide legislation on approved products or practices in relation to relining. Since epoxy resins are for polymeric use, they are outside the scope of the EU chemicals regulation, REACH. However compounds used to make epoxy resin are covered under REACH.

Three regulatory areas could regulate the use of BPA in relining. In relation to water, the Water Framework Directive and the Drinking Water Directive, and when it comes to products and materials used in pipes, the Construction Product Regulation. There are also regulations regarding

The foetus and young children are particularly at risk from exposure to BPA as it can cross the placenta and the foetus can be constantly exposed at critical stages of development. Even at very low doses of exposure, BPA can have an effect, and BPA can cause permanent effects after very short periods of exposure.<sup>18</sup>

BPA leaches from a wide range of products such as baby bottles, tin cans, and cash receipts, and can be found in humans all over the world as well as in our environment.<sup>18</sup> BPA can enter our bodies e.g. by ingesting BPA contaminated water or food, or via the skin by holding cash receipts or other paper products containing BPA, or bathing in BPA contaminated water.<sup>18, 19</sup>

food contact materials. Currently none of these EU regulations covers relining and levels of BPA in drinking water.

The European Food Standards Agency (EFSA) current accepted tolerable daily intake <sup>20</sup> of BPA for an adult human is 50µg BPA/kg body weight, a level which has remained unchanged since 1986.<sup>21</sup> However a number of animal studies have reported significant effects at levels far below that limit, such as precancerous modifications of mammal cells in mice from 0.025 µg/kg body weight /day.<sup>22</sup>

## HOW ARE DIFFERENT COUNTRIES ADDRESSING RELINING?

In Germany relining is covered by the “Guideline for Hygienic Assessment of Organic Coatings in Contact with Drinking Water”, setting the threshold levels for migration of BPA into drinking water at 30 µg/litre. The German Environment Agency (UBA) encourages companies to certify the substances and processes used in relining.<sup>9</sup>

The UK Drinking Water Inspectorate lists approved products for use in the public water system which must be applied by certified contractors.<sup>23</sup>

In Sweden relining is being considered as a possibility for the many apartment buildings built by the Swedish government in 1965-1975, however there are no regulations in Sweden addressing this situation. The Swedish Construction Federation has strongly discouraged the use of relining with epoxy plastics, and calls for co-ordinated regulation on relining under one responsible authority.<sup>24</sup> The Swedish Chemicals Agency intends to examine the extent of BPA leaching from renovated water pipes, and if reliable data is found, a national ban on BPA in relining might be possible.<sup>25</sup>

## WHERE ELSE IS BPA USED?

BPA is one of the world’s most widely-manufactured chemicals and has been utilised in a vast array of consumer goods over the last 50 years. BPA is mainly used in polycarbonate plastics, however the second largest area of usage is in epoxy resins.<sup>26</sup> It is found in products such as the lining of tin cans, dental fillings, plastic toys, computers, medical equipment, thermal paper in cash receipts and construction materials.<sup>27</sup>

Over the last few years a number of countries have regulated the use of BPA in different products, especially in products for children. BPA in baby feeding bottles is banned in the EU, Australia, China, Canada and several US states. Denmark has also banned BPA from all materials in contact with food for children up to three years of age and France is on the way to ban the use of BPA in all food contact materials from 2014.

## WHAT NEEDS TO BE DONE?

Taking a precautionary approach, materials with the potential to release BPA should not be used in drinking water pipes. All stakeholders involved need to act now to prevent further contamination of our water by BPA lined drinking water pipes.

- ▶ **Regulators:** to immediately regulate the use of BPA in materials in contact with drinking water.
- ▶ **Authorities:** to look into the materials used in relining, test and systematically screen the level of chemicals of

high concern leaching into drinking water from relined pipes, as well as from other water pipes containing materials that can leach BPA.

- ▶ **Householders and housing associations:** to request more information about the risks of relining, and require safer alternatives.
- ▶ **Companies performing relining:** to conduct full disclosure on the substances used in the relining procedure, and develop and use safer alternatives.

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