



**UNIVERSITAS ANDALAS**

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**STUDI INVESTIGASI DAN RISIKO KESEHATAN LINGKUNGAN  
PAJANAN MIKROPLASTIK PADA AIR SUMUR DI SEKITAR DAERAH  
ALIRAN SUNGAI BATANG ARAU, KOTA PADANG TAHUN 2025**

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xi + 135 halaman, 27 tabel, 19 gambar, 10 lampiran

**ABSTRAK**

**Tujuan Penelitian**

Mikroplastik (MP) merupakan kontaminan yang berasal dari degradasi limbah plastik dan telah menjadi perhatian global karena potensi dampak kesehatan jangka panjang akibat akumulasinya di dalam tubuh manusia. Batang Arau merupakan sungai paling tercemar dan wilayah dengan timbunan sampah paling tinggi di Kota Padang, sehingga risiko masuknya MP ke dalam sumber air minum termasuk air sumur, dapat meningkat secara signifikan. Penelitian ini bertujuan untuk mengetahui tingkat risiko kesehatan lingkungan akibat pajanan MP melalui konsumsi air sumur pada masyarakat Kelurahan Batang Arau.

**Metode**

Penelitian ini menggunakan metode Analisis Risiko Kesehatan Lingkungan (ARKL), dilaksanakan pada bulan Januari – Juli 2025 melibatkan 98 responden dan 34 sampel air sumur dengan teknik pengambilan sampel menggunakan *purposive sampling*. Sampel air sumur diambil sebanyak 2 liter dan disaring menggunakan jaring plankton 100  $\mu\text{m}$ . Sampel air diproses melalui penyaringan awal, oksidasi dengan  $\text{H}_2\text{O}_2$  30%, pemisahan padatan dengan NaCl, dan perhitungan jumlah partikel menggunakan mikroskop. Identifikasi polimer MPs menggunakan metode spektroskopi *Fourier Transform Infrared-Attenuated Total Reflectance* (FTIR-ATR) dengan membandingkan hasil spektrum dengan referensi pustaka polimer mikroplastik. *Polymer Hazard Index* (PHI) dihitung dengan menjumlahkan hasil perkalian proporsi dan nilai bahaya masing-masing polimer yang mewakili seluruh sampel air sumur di Kelurahan Batang Arau.

**Hasil**

Partikel MP ditemukan pada seluruh sampel air sumur dengan kelimpahan rata-rata 29,61 partikel/liter dan konsentrasi rata-rata 0,00981 mg/l. Partikel ditemukan dalam bentuk *fragments* (4–700  $\mu\text{m}$ ), *fibers* (20–2.472  $\mu\text{m}$ ), dan *film* (20–968  $\mu\text{m}$ ). Hasil uji FTIR-ATR pada sampel menunjukkan urutan kandungan polimer Polyethylene (PE) > Polyethylene Terephthalate (PET) > Polystyrene (PS) > Polyvinyl Klorida (PVC) = Polypropylene (PP). Analisis pajanan *intake realtime* yaitu 0,00025 mg/kg/hari dan *lifetime* 0,00030 mg/kg/hari. Nilai rata-rata RQ *realtime* dan *lifetime* didapatkan untuk polimer PS (*realtime* 0,00025, *lifetime* 0,00030), polimer PE laki-laki (*realtime* 0,00023, *lifetime* 0,00032), polimer PE perempuan (*realtime* 0,00063, *lifetime* 0,00070). Nilai perhitungan PHI didapatkan sebesar 310,89 (level III).

**Kesimpulan**

Karakterisasi tingkat risiko akibat pajanan MP untuk polimer PS dan PE melalui konsumsi air sumur di Kelurahan Batang Arau berada dalam kategori aman ( $\text{RQ} \leq 1$ ). Nilai PHI berada pada level III yaitu kategori bahaya cukup tinggi. Penggunaan sumber air minum alternatif seperti air minum isi ulang dianjurkan untuk meminimalkan risiko kesehatan akibat konsumsi air sumur yang terkontaminasi MP.

Daftar Pustaka : 145 (2008-2025)

Kata Kunci : Mikroplastik, ARKL, Air Sumur, Daerah Aliran Sungai

**FACULTY OF PUBLIC HEALTH  
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**INVESTIGATIVE STUDY AND ENVIRONMENTAL HEALTH RISKS OF  
MICROPLASTIC EXPOSURE IN WELL WATER NEAR THE BATANG ARAU RIVER  
BASIN, PADANG CITY, 2025**

xi + 135 pages, 27 table, 19 figures, 10 appendices

**ABSTRACT**

**Objective**

Microplastics (MPs) are contaminants resulting from the degradation of plastic waste and have become a global concern due to their potential long-term health impacts resulting from their accumulation in the human body. Batang Arau is the most polluted river and the area with the highest waste accumulation in Padang City, which significantly increases the risk of MPs entering drinking water sources, including well waters. This study aimed to determine the level of environmental health risk due to MPs exposure through well water consumption among the residents of the Batang Arau Subdistrict.

**Methods**

This study used the Environmental Health Risk Analysis (EHRA) method, conducted from January to July 2025, involving 98 respondents and 34 well water samples, with sampling techniques using purposive sampling. 2 liters of well water samples were filtered using a 100  $\mu\text{m}$  plankton net. The water samples were processed through initial filtration, oxidation with 30%  $\text{H}_2\text{O}_2$ , solid separation with NaCl, and particles counted using a microscope. MPs polymers were identified using Fourier Transform Infrared-Attenuated Total Reflectance (FTIR-ATR) spectroscopy by comparing the spectrum results with the microplastic polymer reference library. The Polymer Hazard Index (PHI) was calculated by summing the results of the multiplication of the proportion and hazard value of each polymer representing all well water samples in Batang Arau Subdistrict.

**Results**

MPs particles were found in all well water samples with an average abundance of 29.61 particles/liter and an average concentration of 0.00981 mg/l. The particles were found in the form of fragments (4–700  $\mu\text{m}$ ), fibers (20–2,472  $\mu\text{m}$ ), and films (20–968  $\mu\text{m}$ ). FTIR-ATR analysis of the samples showed the following polymer composition order: Polyethylene (PE) > Polyethylene terephthalate (PET) > Polystyrene (PS) > Polyvinyl Chloride (PVC) = Polypropylene (PP). Realtime intake exposure analysis resulted values of 0.00025 mg/kg/day and lifetime exposure of 0.00030 mg/kg/day. The average realtime and lifetime RQ values were obtained for PS polymer (realtime 0.00025, lifetime 0.00030), PE polymer in males (realtime 0.00023, lifetime 0.00032), female PE polymer (realtime 0.00063, lifetime 0.00070). The PHI calculation value was 310.89 (Level III).

**Conclusion**

The risk level characterization due to MPs exposure for PS and PE polymers through well water consumption in Batang Arau Subdistrict is in the safe category ( $\text{RQ} \leq 1$ ). The PHI value is at level III, which is in the moderately high hazard category. The use of alternative drinking water sources such as refillable drinking water is recommended to minimize health risks from consuming well water that is contaminated with MPs.

References : 145 (2008-2025)

Keywords : Microplastics, EHRA, Well Water, River Basin