Q&A on VCM Migration from PVC Pipes in France (July 2025)

1. General context

Q: What triggered public concern about VCM in drinking water in France?
A: A study by the PhD student Gaspard Lemaire (Chaire Earth from the Université of Angers) published on January 16, 2025, and subsequent media coverage, have raised questions about the presence of vinyl chloride monomer (VCM) in old PVC water pipes and a potential link to liver cancer, particularly angiosarcoma.

Q: What is VCM and why is it a concern in drinking water?
A: VCM (vinyl chloride monomer) is the monomer used to manufacture PVC. It is a colourless flammable gas under normal conditions. VCM is classified as a Group 1 carcinogen (like alcohol and tobacco) and linked to rare liver cancers in industrial exposure.

The residual concentration of VCM in PVC resins manufactured before 1980 could reach several hundred parts per million. *Under specific hydraulic conditions* (pipe length, temperature, water flow rate..), VCM can migrate from PVC pipes installed before 1980 into drinking water in concentrations that exceed statutory limits. Under normal hydraulic conditions, supply networks comprising pipes manufactured before 1980 do not produce concentration levels exceeding authorised limits. The pipes currently being marketed do not present any risk of causing concentrations beyond permissible levels, irrespective of the network's operating conditions.

2. Old vs. New PVC Pipes

Q: Are modern PVC pipes (post-1980) safe for drinking water?
A: Yes. Pipes manufactured since 1980 use improved resins with very low residual VCM concentrations. Health authorities have confirmed that they pose no risk under any operating conditions.

Q: What about older pipes installed before 1980?
A: A small fraction of these pipes contains higher residual VCM. Migration into water may occur only under very specific environmental conditions—warm water, low flow, and long stagnation times.

3. *VCM Migration*

Q: What causes VCM to migrate from pipes into water?
A: The migration of VCM from the PVC pipe to drinking water is driven by the Fick's Law of Diffusion. Main parameters driving migration are:

- **Initial VCM concentration** in the pipes
- **Water temperature**. The higher temperature leads to more diffusion.
- **Water residence time**. A stagnant water leads to more risk.

Q: How do the VCM migration risk vary by pipe type?

A: Pipes containing

- VCM ≤10 ppm poses **no risk**, regardless of water temperature or flow.
- VCM ~100 ppm lead to **moderate risk** under short residence time and cold water (5°C), risk increases significantly with warmer water.
- VCM >100 ppm lead to **high risk**, regardless of the use conditions.

4. *Health Impacts and Monitoring*

Q: Is there a proven link between VCM in water and liver cancer?
A: No. According to French health agencies (institut de Veille Sanitaire, Direction Générale de la Santé), no epidemiological evidence links VCM in drinking water to liver cancers like angiosarcoma or hepatocarcinoma.

Q: What is known about VCM toxicity?
A: VCM may prove toxic if inhaled or ingested. VCM was classified as a Group 1 carcinogen in 1987 by the International Agency for Research on Cancer (IARC), which forms part of the World Health Organisation, mainly based on industrial exposure (inhalation in high doses). It may cause two forms of liver cancer, one of which is specific and rare (angiosarcoma of the liver) while the other is more frequent (hepatocellular carcinoma). The second type is however more often associated with other factors, such as alcoholism and viral infections.

No evidence has been yet established of people contracting angiosarcoma or hepatocellular carcinoma through tap water intake. Its role in cancer from drinking water remains unproven and very limited.

Q: What about rare liver cancers like angiosarcoma?
A: While high industrial exposure increases risk, other factors also contribute (arsenic, thorium, oestrogens). Waterborne VCM's role is considered marginal due to low concentrations and limited case numbers.

Q: Are current VCM exposures in water significant?
A: No. Even in exceedance situations, exposure remains below risk thresholds (1 additional cancer per 1 million people), according to a report from the French Agency for Food, Environmental and Occupational Health & Safety (ANSES).

Regulation and Surveillance

Q: What is the regulatory threshold for VCM in drinking water?
A: 0.5 µg/l. This limit has been introduced in the EU Directive 98/83/CE and enforced in France from 2001, with systematic testing required since 2007.

Q: What measures are in place to monitor and control VCM?
A: The Direction Générale de la Santé (DGS) has issued protocols to:

- Identify the pre-1980 PVC pipes with a VCM migration risk;
- Define and implement sampling plans ;
- Initiate corrective actions whenever exceedances occur.

5. ***French Populations at Risk***

Q: Who is most at risk in France from residual VCM?
A: Approximately 600,000 people in rural areas, particularly in pipe endpoints with long water stagnation. Urban areas and systems with continuous flow are not affected.

Q: How many French municipalities are impacted?
A: Fewer than 1% may be affected by VCM exceedance.

6. ***Industrial Response and PVC Safety***

Q: How has the PVC industry responded to health concerns?
A: As soon as the hazard have been clarified, the PVC resin manufacturers have adjusted their process to significantly reduce the residual VCM concentration in PVC resins:

- 1975: Hot degassing reduced VCM concentrations below 20 ppm.
- 1977: Stripping brought VCM concentrations below 5 ppm.
- 1980s: Further refinement brought VCM concentrations below 1 ppm.

Q: Are modern PVC pipes tested for safety?
A: Yes. All PVC pipes installed in France must have:

- **ACS certification** delivered by labs approved by the Health Ministry.
- **NF Mark** (NF 055), ensuring conformity to French and EU standards.

7. Solutions to VCM Contamination

Q: What are the short-term measures to avoid exposure to VCM?

- **Flushing.** The PVC pipes are purged to refresh water.
- **Tubing.** Smaller diameter pipes are inserted into old ones. This solution is however limited by flow constraints.
- **Usage restrictions** such as boiling the water before use. This solution is however temporary and only adequate in emergencies.

Q: What are long-term solutions?

- **Network meshing** to improve water circulation and prevent stagnation.
- **Pipe replacement**, but this represents a major infrastructure investment.