The Key Characteristics of Human Carcinogens

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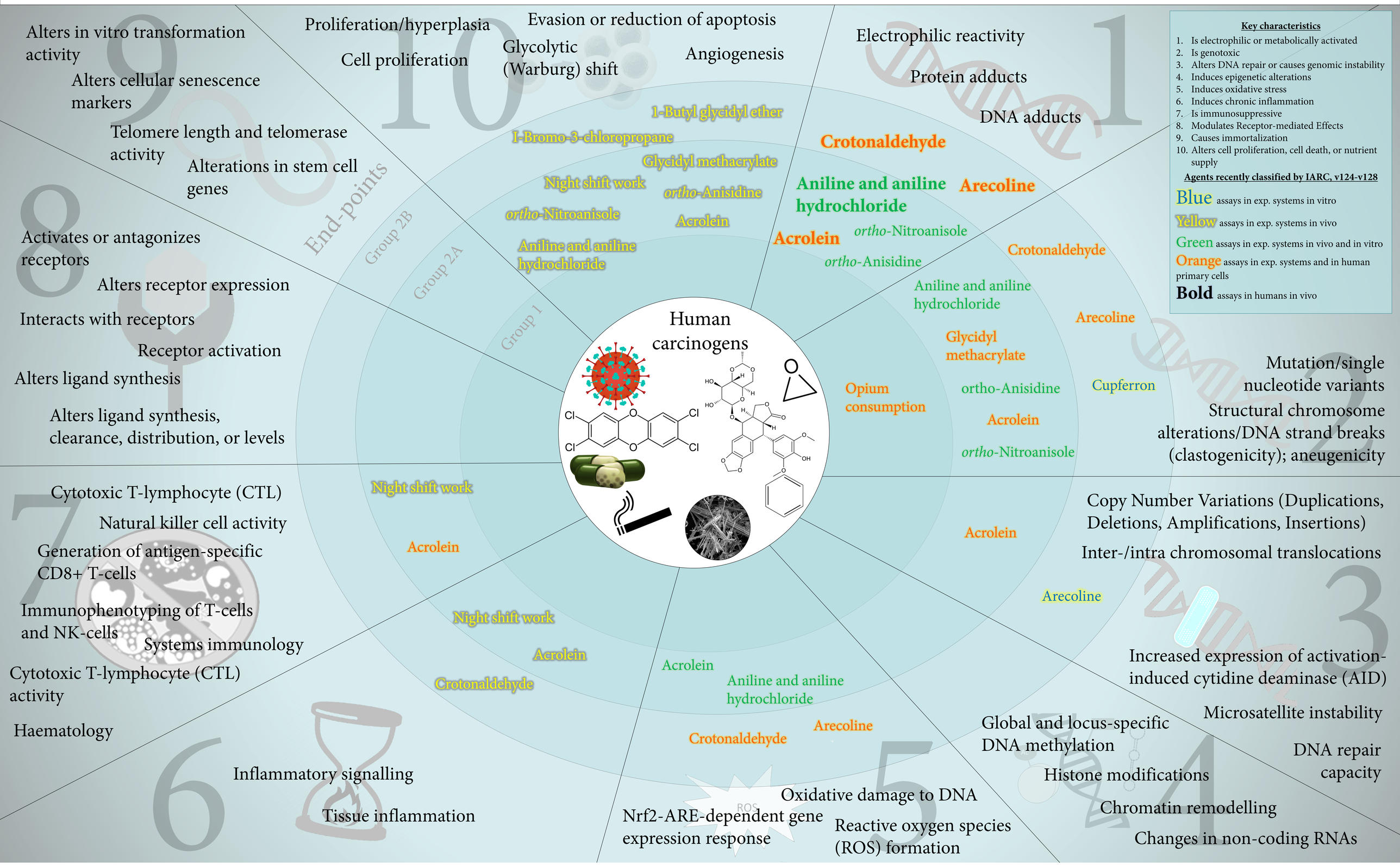

Key characteristics

1. Is electrophilic or metabolically activated
2. Is genotoxic
3. Alters DNA repair or causes genomic instability
4. Induces epigenetic alterations
5. Induces oxidative stress
6. Induces chronic inflammation
7. Is immunosuppressive
8. Modulates Receptor-mediated Effects
9. Causes immortalization
10. Alters cell proliferation, cell death, or nutrient supply

Agents recently classified by IARC, v124-v128

Blue assays in exp. systems in vitro

Yellow assays in exp. systems in vivo

Green assays in exp. systems in vivo and in vitro

Orange assays in exp. systems and in human primary cells

Bold assays in humans in vivo

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The authors declare the following competing financial interest(s): MTS has served as a consultant and expert witness in US litigation involving chemical and pharmaceutical exposures and various disease outcomes, including neuropathies and cancer.

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For more on the key characteristics: https://keycharacteristics.org/