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Electric and magnetic fields occur naturally and also come from human-made sources. Scientists and oversight agencies generally agree that low-frequency EMFs pose little danger to human health. Most of us are used to the gadgets that make our world work.Our power lines, cellphones, microwaves, Wi-Fi routers, computers, and other appliances send out a stream of invisible energy waves. Electric and magnetic fields (EMFs) are produced anywhere electricity is used, including at home and in the workplace. fields. But should we be worried?While most researchers dont believe most EMFs are safet, there are still some scientists who question the safety of EMF are safet. Lets take a closer look. Since the beginning of the universe, the sun has sent out waves that create EMFs, or radiation. At the same time the sun sends out EMFs, we can see its energy radiating out. This is visible light. At the turn of the 20th century, electric power lines and indoor lighting spread across the world. Scientists realized that the power lines supplying all that energy to the worlds population were sending off EMFs, just like the sun does naturally. Over the years, scientists learned that many of the emerging electrical appliances also create EMFs. As the medical world advanced, much of its diagnostic and treatment equipment, like imaging devices for X-rays and CT scans, were also found to make EMFs. Today, 90 percent of the worlds population has access to electricity and uses electrical appliances. That means lots of electricity and EMFs are created around the world. But even with all those waves, scientists generally dont think EMFs are a health concern. Radiation exists across what called the electromagnetic spectrum. to very low-energy (or low-frequency) on the other end. Examples of high-energy radiation include: x-raysgamma rayssome higher-energy ultraviolet (UV) rays This is ionizing radiation, meaning this energy can affect cells on the atomic level by removing an electron from an atom, or ionizing it. Ionizing radiation can damage the bodys DNA and cells, which may contribute to genetic mutations and cancer. On the other end of the spectrum is extremely low-frequency (ELF) radiation. This is a type of non-ionizing radiation. It can move atoms around in the body or make them vibrate, but most researchers agree that it isnt enough to damage DNA or cells. In between ELF radiation and high-energy radiation on the spectrum are other types of non-ionizing radiation, like: radiofrequency (RF) radiationvisible lightinfraredElectric and magnetic fields in ELF radiation can act independently. So we use the terms magnetic field and electric field to refer to these two different fields in ELF radiation. In summary, here are the two types of EMFs that you might be exposed to:High-frequency EMFs. This is the ionizing type of radiation. Scientific literature agrees that large exposures can damage DNA or cells. Medical devices like X-ray imaging machines and CT scans produce low levels of this type of radiation. Other sources include gamma radiation from radioactive elements and UV radiation. Its mild and thought to be harmless to people. Household appliances like microwave ovens, cellphones, hair dryers, and washing machines, as well as power lines and MRIs, produce this type of radiation. This category of EMFs includes extremely low frequency EMFs (RF-EMFs). Non-ionizing EMFs come from both natural and human-made sources. The earths magnetic field is an example of a natural EMF. Humanmade EMFs are classified into two types, both generated by non-ionizing radiation: Extremely low-frequency EMFs (ELF-EMFs). This non-ionizing radiation field can be generated by a variety of sources, including power lines, electrical wiring, and personal appliances like electric shavers, hair dryers, and electric blankets. Radiofrequency radiation. This non-ionizing radiation field is emitted from wireless devices, like cell phones, smart meters, tablets, and laptop computers. Its also generated by radio and television signals, radar, satellite stations, and MRI machines. EMF exposure intensity decreases as you increase your distance from the object thats sending out waves. Some common sources of EMFs that emit varying levels of radiation include the following:microwave ovenscomputerssmart meterswireless (Wi-Fi) routerscellphonesBluetooth devicespower linesMRI machinesultraviolet light (UV) radiation. UV radiation comes naturally from the sun, and from man-made sources like tanning beds, phototherapy, and welding torchesX-rays and gamma rays. This type of radiation comes from both natural and human-made sources include radon gas, the earths radioactive elements, and cosmic rays that hit the earth from beyond the solar system. Human-made sources include radon gas, the earth from beyond the solar system. over whether EMFs pose a danger to human health and, if so, how much. The International Agency for Research on Cancer (IARC) has classified non-ionizing EMFs in the radiofrequency range as Group 2B, a possible human carcinogen. These fields are produced by electronic products like cellphones, smart devices, and tablets. IARC operates under the World Health Organization (WHO). It convenes working groups of scientists from around the world regularly to evaluate the cancer risks presented to humans by environmental and lifestyle factors. The current IARC evaluation from 2011 pointed to a possible link between RF radiation and cancer in people, particularly glioma, a malignant type of brain cancer. This conclusion means that there could be some risk. The report emphasized that the link between cellphone use and cancer risk needed into long-term, heavy use of mobile phones. Some research was needed into a cancer risk needed into a ca long-term, low-level exposure to non-ionizing radiation that the IARC should upgrade the classification to a Group 1, a known carcinogen. Researchers began substantial research into the potential link between cellphones and cancer in 2000 in what would become the largest study to compare cancer cases in cellphone users and nonusers. The researchers followed cancer rates and cellphone use in more than 5,000 people in 13 countries. There was an association between the highest rate of exposure and glioma. However, this research also mentioned various potential biases and confounding variables that make the potential association difficult to interpret. The gliomas were more often found on the same side of the head that people used to speak on the phone. Even so, the researchers analyzed data over almost 2 decades and found that people exposed to high levels of extremely low-level frequency magnetic fields (ELF-EMFs) over a long duration showed an increased risk of acute myeloid leukemia in adults. European scientists also uncovered a possible link between 1.5 to 5 percent of childhood leukemia can be attributed to ELF-EMFs.But they noted that the result was inconclusive because monitoring of EMF was lacking. They recommended more research and better monitoring. One review of more than two dozen studies on low-frequency EMFs suggests that these energy fields may cause various neurological and psychiatric problems in people.In one study, researchers found that an electromagnetic pulse (EMP), or a short burst of electromagnetic energy, can affect nerve activity in rats. They suggested that long-term EMP exposure could be harmful to cognitive ability and may induce pathology similar to that of Alzheimers disease. research suggests that the bodys tissues and its nervous system may be affected by the heat generated by RF-EMFs. A study conducted on rats and mice suggested that radiofrequency EMFs might contribute to neurological cognitive disorders. But since the reported research was performed either on cells or animals, its results dont necessarily apply to people. Most researchers said further studies are needed. Possible symptoms related to EMFs in the studies included:headachetremordizzinessmemory lossloss of concentrationsleep disturbanceEMF exposure levels are monitored and enforced at the global, national, and local levels in a varied patchwork of procedures by multiple organizations, depending on where you live. The electric industry in the United Kingdom maintains a database where you can see the widely varied exposure limits and enforcement measures in countries around the world. Internationally, the primary guidance on radiofrequency EMFs comes from the International Commission on Non-Ionizing Radiation over many years of peer-reviewed scientific literature concerning health effects from RF EMF exposure. In 2020, WHO updated its international ICNIRP Guidelines for limiting exposure to larger RF electromagnetic fields ranging from 100 KHz (kilohertz) to 300 GH (gigahertz). The ICNERP guidelines currently specify that people at work shouldnt be exposed to current electric densities in the bodys head, neck and trunk of greater than 10 mA m-2 (the basic restriction). A lower limit of 2 mA m-2 is given for the general population to account for children and people who may be more sensitive. The expression 10 mA m-2 represents a measurement of electric current density. It translates as 10 milliampere is one 1/1000th of an ampere. Its the level above which electric current density. brain function. In the United States, there are no federal restrictions on overall EMF exposure, but a few states have responsibility for managing EMF exposure from certain products and technologies. Environmental Protection Agency (EPA) coordinates EMF exposure recommendations in the United States. It generally relies on the ICNERP EMF exposure limits protect people from well-known biological and health effects of exposure to high EMF levels. But the EPA takes a difference stance on low levels of EMF radiation. The EPA states in its EMF Guidelines that it neither recommends nor imposes limits on low-level EMFs because theres no scientific evidence that low levels of electromagnetic radiation, the EPA issued its 2020 official report, a literature review of 70 major studies conducted between 2008 and 2018. The report focused on cancer but also discussed many other health concerns. In the United States, a variety of governmental agencies have specific responsibilities for managing EMF exposure from various technologies, facilities, and products Local governments sometimes impose their own controls and regulations. Here are some examples of federal controls: Electronic devices. Standards for all electronic devices. Standards for all electronic devices emitting non-ionizing or ionizing radiation are set by the U.S. Food and Drug Administration (FDA). Cell phones. The Federal Communications Commission (FCC) sets exposure limits on electromagnetic radiation from both cell phones and cell phone towers. The FCC rules and guidelines are based on standards developed by the Institute of Electrical and Electronics Engineers (IEEE) and the National Council on Radiation Protection and Measurements (NCRP), plus input from other governmental agencies. Smart meters. The FCC sets exposure limits for radiation emitted from smart meters, those boxes on sides of houses and businesses that use a cellular transmitter to track power lines in either residential or occupational settings. Medical use. Many medical devices and procedures use ionizing radiation to diagnose and treat conditions and disease. Some examples include X-rays, CT scans, and radiation therapy. Various regulatory agencies share responsibility for the safety of these procedures and devices, including the Centers for Disease Prevention and Control (CDC), the FDA, the EPA, and the U.S. Nuclear Regulatory Commission (NRC).Nuclear power. Several regulatory agencies share response, including the EPA, the Federal Emergency Management Agency (FEMA), and the NRC.Imported products. The U.S. Customs and Border Protection (CBP) screens imported goods to be sure theyre free of harmful substances.Workplace. Exposure to EMF in workplaces is governed by legislation and enforced by the Health and Safety Authority (HSA). Electric fields are produced by voltage, and magnetic fields are produced by the Health and Safety Authority (HSA). electric and magnetic fields vary in strengths at different times and locations. Electric fields vary because of differences in the amount of voltage used by various devices. The higher the voltage supplied to a device, the stronger the electric fields vary in strengths at different times and locations. Electric fields are produced by the flow of electric current and therefore vary depending on the strength and amount of the current being used. The more electric current a device uses, the strength of a magnetic field may not depend on how large or powerful the device is. Also, the strength of the magnetic field may vary a lot even among similar products. For example, some hair dryers have a very strong field, while others produce hardly any EMF. It all depends on the product design. Also, exposure levels vary considerably depending on the distance you are from the device and how long your exposed. Because of these variances, its difficult to say with accuracy what the EMF is for products. But both ICNERP and WHO internationally, and the EPA nationally, and the EPA nationally, have stated that the EMF is for products. living. The strongest electric fields that we encounter in daily life are beneath high-voltage transmission lines. Transformers reduce this high voltage before it goes into your home act as a shield to some degree. Directly beneath the power lines is where the field is strongest. Both fields (electric and magnetic drop off significantly with distance. The further your home is from high-voltage power lines, the weaker the field. In homes not located near power lines, the background magnetic field may be relatively light. Computer screens and television sets work similarly, producing both electric and magnetic fields at various frequencies. Screens with liquid crystal displays (LCDs) dont produce significant electric and magnetic fields. For this reason, modern TVs, which generally use LCD, LED, or plasma screens, emit only small amounts of radiation. But its enough that you should keep children from getting too close. Watching from a couch several feet away is thought to pose little danger. The FCC requires that all wireless communications devices sold in the United States meet minimum guidelines for safe human exposure to radiofrequency (RF) energy. For wireless devices that operate at 6 GHz or less and are designed for use near or against the body (cellphones, tablets, and other portable devices), FCC has set exposure limits in terms of Specific Absorption Rate (SAR). This is a measure of the rate at which the body absorbs RF energy. The FCC limit is 1.6 watts per kilogram (W/kg). All wireless devices sold in the United States are certified by the FCC learns that a device doesn't perform according to its disclosure, the FCC can withdraw its approval. To find the SAR value for your phone or one you intend to buy, go to the FCC ID search database and enter your phones FCC ID number. Youll usually find the number somewhere on either the case or the device. You may have to remove the battery to find the number. Microwaves are used to detect speeding cars, send television communications, raise bread, and even cook potato chips! But most of us use microwave ovens are considered to be safe if you use them correctly. People have experienced burns and other injuries from microwave radiation and superheating, but mostly from misuse. Microwave ovens operate at very high power levels, but they have shields to reduce leakage of radiation outside the oven to almost nothing. The FDA says this is lifetime to 5 milliwatts (mW) per square centimeter, measured about 2 inches away. The FDA says this is lifetime to 5 milliwatts (mW) per square centimeter, measured about 2 inches away. limit is far below a level known to harm people. Microwave ovens also must have safety features to prevent the generation of microwaves if the door is open. FDA tests ovens in its lab to make sure its standards are met. All ovens sold in the United States must have a label stating that they meet the safety standard. Every electrical appliance in your home emits EMFs. Still, according to the ICNIRP guidelines, most peoples exposure to EMF in daily life is very low. Much of your EMF exposures when you are near electrical appliances like refrigerators, microwaves, and washing machines. The EMF radiation drops off sharply as you move away from these appliances. You can check EMF levels in your home with an EMF meter. These handheld devices can be purchased online. But be aware that most cant measure EMFs of very high frequencies, and their accuracy is generally low, so their efficacy is limited. You can also call your local power company to schedule an on-site reading. Remember that ELF fields vary by location. If you hold your meter to the right of a clothes dryer, for example, you might be higher. So be sure to test in different locations around the electrical appliance, and within your house. Also, check readings at various points on your walls since much of your homes electrical current is transported via wires that run through the walls. If you find a reading is lower. Possible human health effects from exposure to EMFs hasnt yet been determined with precision and accuracy. Research in the coming years may better inform us. Some studies point to various symptoms coming from EMF exposure, but researchers generally say more study is needed. Many of the studies use animal or cell models, which are unreliable if applied to human health. The medical field hasnt substantiated field hasnt su EHS, although people do experience symptoms that are sometimes distressing and even disabling. No credible research currently links EHS symptoms to EMF exposure, and EHS isnt considered to be a medical field advises that further research is needed. Still, some research gives tentative support to EMF symptomatology. Here are symptoms that some studies have suggested: sleep disturbances, including insomniaheadachedepression and depressive symptomstiredness and fatiguedysesthesia (a painful, often itchy sensation) lack of concentrationchanges in memory dizzinessirritability loss of appetite and weight lossrest estimates and anxiety an tinglingThe actions you can take to reduce your EMFs includes extremely low frequency EMFs (ELF-EMFs) and radiofrequency EMFs (RF-EMFs). This type of radiation is produced by any electric device These devices range from refrigerators and vacuum cleaners to televisions and computer monitors (when theyre turned on). According to WHO, extremely low frequency and radiofrequency EMFs are unlikely to cause any adverse health effects. You should feel safe using your cell phone and appliances. Power lines are also considered safe, as long as you keep a safe distance from them. The EMF strength around appliances are more than 100 times lower than the limit in the ICNERP guidelines for the general public. Dont sit or linger near appliances. One of the best ways to avoid EMF exposure in your home is to keep your distance from appliances. You need to get up close to turn on the television, open the fridge or microwave, and load the washing machine. Just keep these close encounters short, and dont sit next to appliances or allow your kids to.Put your phone down. Especially when you arent using the phone, place it away from you. At night when you sleep, put it in another room. Use the speaker function or earbuds with your phone. This will reduce RF exposure to your head. Earpieces or speakerphone, you can greatly reduce exposure to your head. Dont carry your phone in a pocket. Try to carry your phone in a bag or briefcase when youre out.Unplug occasionally from electronic devices and electricity. Take a day off from electronic, or even several days. Your body will thank you! Remember, this is the type of radiation thats potentially dangerous to your health. High levels of high-frequency EMFs can damage DNA and cells. Low levels of this radiation come from medical devices like X-rays imaging machines, and UV rays from tanning beds or the sun. To reduce high-level exposure and associated risks, try these tips:Limit X-rays. Only receive X-rays that are medically necessary.Limit your time in the sun. You need some sun for your health, just not too much. Also, avoid sun during the middle of the day when the rays are strongest. Limit time in tanning beds. If you must have that quick summer tan, just limit your time under the lights. If you want to calculator. It carries a warning from the EPAs base of ionizing radiation is the type of EMF thats dangerous because it can potentially harm body tissues and DNA.EMFs occur naturally and also come from human-made sources. Scientists and regulatory agencies generally agree that low-frequency EMFs pose little danger to human health. But some researchers offer preliminary evidence that some danger may exist for long-term use, specifically to the nervous system and brain cognitive function. Exposure to large levels of high-frequency EMFs is known to damage human DNA and cells. But its very unlikely that youll be exposed to levels high enough to endanger your health in your daily life. smart about your exposure. This is a developing field of research that will undoubtedly expand as our use of wireless devices and labor-saving machines increases. Keep an eye on the news for developing research that will undoubtedly expand as our use of wireless devices and labor-saving machines increases. Keep an eye on the news for developing research. Healthline has strict sourcing guidelines and relies on associations. We only use quality, credible sources to ensure content accuracy and integrity. You can learn more about how we ensure oven safely. (n.d.). to electricity (% population). (2019). your radiation dose. (n.d.). M. (2020). Electromagnetic hypersensitivity: A critical review of explanatory hypotheses. the product emit radiation? (2018). and magnetic fields. (2020). fields and cancer [Fact sheet]. (2014). at a glance. (n.d.). ID search. (n.d.). ID search. (n.d.). J, et al. (2014). Potential health impacts of residential exposures to extremely low frequency magnetic fields in Europe. L. (2017). 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Effect of cell phone radiofrequency radiation on body temperature in rodents: Pilot studies of the National Toxicology Program's reverberation chamber exposure system. and magnetic fields occur naturally and also come from human-made sources. Scientists and oversight agencies generally agree that low-frequency EMFs pose little danger to human health. Most of us are used to the electronic conveniences of modern life. But few of us are aware of the possible health risks presented by the gadgets that make our world work. Our power lines, cellphones, microwaves, Wi-Fi routers, and other appliances send out a stream of invisible energy waves. Electric and magnetic fields (EMFs) are produced anywhere electricity is used, including at home and in the workplace. Some experts are concerned about potential health effects from these fields. But should we be worried? While most researchers dont believe most EMFs are dangerous, there are still some scientists who question the safety of EMF exposure. Many say there hasnt been enough research into understanding whether EMFs are safe. Lets take a closer look. Since the beginning of the universe, the sun has sent out waves that create EMFs, or radiation. At the same time the sun sends out EMFs, we can see its energy radiating out. This is visible light. At the turn of the 20th century, electric power lines and indoor lighting spread across the world. Scientists realized that the power lines supplying all that energy to the worlds population were sending off EMFs, just like the sun does naturally. Over the years, scientists learned that many of the emerging electrical appliances also create EMFs. As the medical world advanced, much of its diagnostic and treatment equipment, like imaging devices for X-rays and CT scans, were also found to make EMFs. Today, 90 percent of the worlds population has access to electricity and EMFs are created around the world. But even with all those waves, scientists generally dont think EMFs are a health concern. Radiation exists across whats called the electromagnetic spectrum. This radiation ranges from very high-energy (called high-frequency) on one end of the spectrum, to very low-energy (or low-frequency) on one end of the spectrum, to very low-energy (or low-frequency) on one end of the spectrum. energy can affect cells on the atomic level by removing an electron from an atom, or ionizing it. Ionizing radiation can damage the bodys DNA and cells, which may contribute to genetic mutations and cancer. On the other end of the spectrum is extremely low-frequency (ELF) radiation. This is a type of non-ionizing radiation. It can move atoms around in the body or make them vibrate, but most researchers agree that it isnt enough to damage DNA or cells. In between ELF radiation and high-energy radiation and high-energy radiation on the spectrum are other types of non-ionizing radiation. The result is called an electromagnetic field in ELF radiation. In summary, here are the two types of EMFs. This is the ionizing types of EMFs. This is the ionizing type of EMFs. of radiation. Scientific literature agrees that large exposures can damage DNA or cells. Medical devices like X-ray imaging machines and UV radiation from radioactive elements and UV radiation from radioactive elements and UV radiation. Other sources include gamma radiation from radioactive elements and UV radiation. non-ionizing type of radiation. Its mild and thought to be harmless to people. Household appliances like microwave ovens, cellphones, hair dryers, and washing machines, as well as power lines and MRIs, produce this type of radiation. This category of EMFs includes extremely low frequency EMFs (ELF-EMFs) and radiofrequency EMFs (RF-EMFs) Non-ionizing EMFs come from both natural and human-made sources. The earths magnetic field is an example of a natural EMF. Human-made EMFs (ELF-EMFs). This non-ionizing radiation field can be generated by a variety of sources, including power lines, electrical wiring, and personal appliances like electric shavers, hair dryers, and electric blankets. Radiofrequency radiation. This non-ionizing radiation field is emitted from wireless devices, like cell phones, smart meters, tablets, and MRI machines.EMF exposure intensity decreases as you increase your distance from the object thats sending out waves. Some common sources of EMFs that emit varying levels of radiation include the following:microwave ovenscomputerssmart meterswireless (Wi-Fi) routerscellphonesBluetooth devicespower linesMRI machinesultraviolet light (UV) radiation. UV radiation comes naturally from the sun, and from man-made sources like tanning beds, phototherapy, and welding torchesX-rays and gamma rays. This type of radiation comes from both natural and human-made sources. Natural sources include radon gas, the earths radioactive elements, and cosmic rays that hit the earth from beyond the solar system. Human-made sources include medical X-rays and CT scans and cancer treatment. Theres disagreement in scientific literature over whether EMFs pose a danger to human health and, if so, how much. The International Agency for Research on Cancer (IARC) has classified non-ionizing EMFs in the radiofrequency range as Group 2B, a possible human carcinogen. These fields are produced by electronic products like cellphones, smart devices, and tablets. IARC operates under the world regularly to evaluate the cancer risks presented to humans by environmental and lifestyle factors. The current IARC evaluation from 2011 pointed to a possible link between RF radiation and cancer in people, particularly glioma, a malignant type of brain cancer. This conclusion means that there could be some risk. The report emphasized that the link between cellphone use and cancer risk needs to be carefully monitored by the scientific community. It said more research was needed into long-term, heavy use of mobile phones. Some researchers feel theres already enough evidence of harm from long-term, low-level exposure to non-ionizing radiation that the IARC should upgrade the classification to a Group 1, a known carcinogen. Researchers began substantial research into the potential link between cellphones and cancer in 2000 in what would become the largest study to compare cancer cases in cellphone users and nonusers. The researchers followed cancer rates and cellphone users and nonusers. The researchers followed cancer cases in cellphone users and nonusers. mentioned various potential biases and confounding variables that make the potential association difficult to interpret. The gliomas were more often found on the same side of the head that people used to speak on the phone. Even so, the researchers said that the connection wasnt strong enough to conclude that cellphone use caused cancer. In a smaller, more recent study, researchers analyzed data over almost 2 decades and found that people exposed to high levels of extremely low-level frequency magnetic fields (ELF-EMFs) over a long duration showed an increased risk of acute myeloid leukemia (AML), a type of leukemia in adults. European scientists also uncovered a possible link between EMF and leukemia in children. In a literature review of previous studies, they suggested that between 1.5 to 5 percent of childhood leukemia can be attributed to ELF-EMFs.But they noted that the result was inconclusive because monitoring of EMF was lacking. than two dozen studies on low-frequency EMFs suggests that these energy fields may cause various neurological and psychiatric problems in people. In one study, researchers found that an electromagnetic pulse (EMP), or a short burst of electromagnetic nergy, can affect nerve activity in rats. They suggested that long-term EMP exposure could be harmful to cognitive ability and may induce pathology similar to that of Alzheimers disease. They added that more research suggests that the bodys tissues and its nervous system may be affected by the heat generated by RF-EMFs. A study conducted on rats and mice suggested that the heat from cellphones affected by the heat generated by RF-EMFs. body tissue heating and nerve activity. Again, researchers said more study is needed. Another research review suggested that radiofrequency EMFs might contribute to neurological cognitive disorders. But since the reported research was performed either on cells or animals, its results dont necessarily apply to people. Most researchers said further studies are needed. Possible symptoms related to EMFs in the studies included:headachetremordizzinessmemory lossloss of concentrationsleep disturbanceEMF exposure levels in a varied patchwork of procedures by multiple organizations, depending on where you live. The electric industry in the United Kingdom maintains a database where you can see the widely varied exposure limits and enforcement measures in countries around the world. Internationally, the primary guidance on radiofrequency EMFs comes from the International Commission on Non-Ionizing Radiation Protection (ICNIRP). It bases its guidelines on its evaluation over many years of peer-reviewed scientific literature concerning health effects from RF EMF exposure. In 2020, WHO updated its international ICNIRP Guidelines for limiting exposure to larger RF electromagnetic fields ranging from 100 KHz (kilohertz) to 300 GH (gigahertz). The ICNERP guidelines currently specify that people at work shouldnt be exposed to current electric densities in the bodys head, neck and trunk of greater than 10 mA m-2 (the basic restriction). A lower limit of 2 mA m-2 is given for the general population to account for children and people who may be more sensitive. The expression 10 mA m-2 represents a measurement of electric current density. It translates as 10 milliamperes per meter squared. A milliampere is one 1/1000th of an ampere. Its the level above which electric and magnetic fields have been shown to have effects on bodily tissue and cognitive brain function. In the United States, there are no federal restrictions on overall EMF exposure, but a few states have issued their own restrictions. Also, a variety of federal governmental agencies have responsibility for managing EMF exposure from certain products and technologies. The Environmental Protection Agency (EPA) coordinates EMF exposure recommendations in the United States. It generally relies on the ICNERP Guidelines. In its EMF Guidelines, the EPA points out that the ICNERP EMF exposure limits protect people from well-known biological and health effects of exposure to high EMF levels. But the EPA states in its EMF Guidelines that it neither recommends nor imposes limits on low-level EMFs because theres no scientific evidence that low levels of electromagnetic radiation damage human health. To support its statement regarding the relative safety of low-level EMF radiation, the EPA issued its 2020 official report, a literature review of 70 major studies conducted between 2008 and 2018. 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The FCC sets exposure limits for radiation emitted from smart meters, those boxes on sides of houses and businesses that use a cellular transmitter to track power consumption. Power lines. Currently, there are no federal restrictions on EMFs from power lines in either residential or occupational settings. Medical use. Many medical devices and procedures use ionizing radiation to diagnose and treat conditions and disease. Some examples include X-rays, CT scans, and radiation therapy. Various regulatory agencies share responsibility for the safety of these procedures and devices, including the Centers for Disease Prevention and Control (CDC), the FDA, the EPA, and the U.S. Nuclear power and coordinating disaster response, including the EPA, the Federal Emergency Management Agency (FEMA), and the NRC.Imported products. The U.S. Customs and Border Protection (CBP) screens imported goods to be sure theyre free of harmful substances. Workplace is governed by legislation and enforced by the Health and Safety Authority (HSA). Electric fields are produced by voltage, and magnetic fields are produced by electric current. Electric fields are measured in V/m (volts per meter). Magnetic fields are measured in T (microteslas). Both electric fields vary because of different times and locations. Electric fields vary in strengths at different times and locations. a device, the stronger the electric field will be. An electric field exists even when theres no current flowing. Magnetic fields are produced by the flow of electric current a device uses, the stronger the magnetic field will be. It might be surprising to learn just how varied magnetic field levels are around products. The strength of a magnetic field may not depend on how large or powerful the device is. Also, the strength of the magnetic field may not depend on how large or powerful the device is. depends on the product design. Also, exposure levels vary considerably depending on the distance you are from the device and how long youre exposed. Because of these variances, its difficult to say with accuracy what the EMF exposure in the average living environment is extremely low. Read on to learn about some of the most common EMF fields you may encounter in daily living. The strongest electric fields that we encounter in daily living. The walls of your home act as a shield to some degree. Directly beneath the power lines, the weaker the field is strongest. Both fields (electric and magnetic) drop off significantly with distance. The further your home is from high-voltage power lines, the weaker the field may be relatively light. Computer screens and television sets work similarly, producing both electric and magnetic fields at various frequencies. Screens with liquid crystal displays (LCDs) dont produce significant electric and magnetic fields. For this reason, modern TVs, which generally use LCD, LED, or plasma screens, emit only small amounts of radiation. But its enough that you should keep children from getting too close. Watching from a couch several feet away is thought to pose little danger. The FCC requires that all wireless communications devices that operate at 6 GHz or less and are designed for use near or against the body (cellphones, tablets, and other portable devices), FCC has set exposure limits in terms of Specific Absorption Rate (SAR). This is a measure of the rate at which the body absorbs RF energy. The FCC limit is 1.6 watts per kilogram (W/kg). All wireless devices sold in the United States are certified by the FCC that they dont exceed FCC exposure limits. The FCC incorporates a safety margin in these limits. If the FCC ID number. Youll usually find the number somewhere on either the case or the device. You may have to remove the battery to find the number. Microwave are used to detect speeding cars, send television communications, raise bread, and even cook potato chips! But most of us use microwave energy the most in microwave ovens. Microwave ovens are considered to be safe if you use them correctly. People have experienced burns and other injuries from microwave radiation and superheating, but mostly from misuse. Microwave ovens operate at very high power levels, but they have shields to reduce leakage of radiation and superheating. leak in its lifetime to 5 milliwatts (mW) per square centimeter, measured about 2 inches away. The FDA says this limit is far below a level known to harm people. Microwaves if the door is open. FDA tests ovens in its lab to make sure its standards are met. All ovens sold in the United States must have a label stating that they meet the safety standard. Every electrical appliance in your home emits EMFs. Still, according to the ICNIRP guidelines, most peoples exposure to EMF in daily life is very low. Much of your EMF exposure in your home emits EMFs. Still, according to the ICNIRP guidelines, most peoples exposure to EMF in daily life is very low. term high exposures when you are near electrical appliances. You can check EMF levels in your home with an EMF meter. These handheld devices can be purchased online. But be aware that most cant measure EMFs of very high frequencies, and their accuracy is generally low, so their efficacy is limited. You can also call your neter to the right of a clothes dryer, for example, you might get a zero reading. A foot to the left, the reading might be higher. So be sure to test in different locations around the electrical appliance, and within your house. Also, check readings at various points on your walls since much of your homes electrical current is transported via wires that run through the walls. If you find a reading is highest near your bed, for example, consider moving it to a different part of the room where the reading is lower. Possible human health effects from exposure to EMFs hasnt yet been determined with precision and accuracy. Research in the coming years may better inform us. Some studies use animal or cell models, which are unreliable if applied to human health. The medical field hasnt substantiated EHS, although people do experience symptoms to EMF exposure, and EHS isnt considered to be a medical field advises that further research is needed.Still, some research gives tentative support to EMF symptomatology. Here are symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepressive symptoms that some memorydizzinessirritabilityloss of appetite and weight lossrestlessness and anxietynauseaskin burning and tinglingThe actions you can take to reduce your EMF exposure depends on the type of radiation youre concerned about. Read on to learn what steps you can take to reduce your EMF exposure depends on the type of radiation youre concerned about. (ELF-EMFs) and radiofrequency EMFs (RF-EMFs). This type of radiation is produced by any electric device. These devices range from refrigerators and vacuum cleaners to televisions and computer monitors (when theyre turned on). According to WHO, extremely low frequency EMFs are unlikely to cause any adverse health effects. You should feel safe using your cell phone and appliances are more than 100 times lower than the limit in the ICNERP guidelines for the general public. Dont sit or linger near appliances. You need to get up close to turn on the television, open the fridge or microwave, and load the washing machine. Just keep these close encounters short, and dont sit next to appliances. or allow your kids to.Put your phone down. Especially when you arent using the phone, place it away from you. At night when you sleep, put it in another room. Use the speaker function or earbuds with your phone. Using earpieces or speakerphone, you can greatly reduce exposure to your head. Dont carry your phone in a bag or briefcase when youre out. Unplug occasionally from electronics, or even several days. Your body will thank you! Remember, this is the type of radiation thats potentially dangerous to your health. High levels of high-frequency EMFs can damage DNA and cells. Low levels of this radiation come from medical devices like X-ray imaging machines , and UV rays from tanning beds or the sun. To reduce high-level exposure and associated risks, try these tips: Limit X-rays. Only receive X-rays that are medically necessary.Limit your time in the sun. You need some sun for your health, just not too much. Also, avoid sun during the middle of the day when the rays are strongest.Limit time in tanning beds. If you must have that quick summer tan, just limit your time under the lights.If you want to calculate your effective dose of ionizing radiation per year, you can try using the EPAs Dose Calculator. It carries a warning from the EPA that ionizing radiation is the type of EMF thats dangerous because it can potentially harm body tissues and DNA.EMFs occur naturally and also come from human-made sources. Scientists and regulatory agencies generally agree that low-frequency EMFs pose little danger to human health. But some researchers offer preliminary evidence that some danger may exist for long-term use, specifically to the nervous system and brain cognitive function. Exposure to large levels of high-frequency EMFs is known to damage human DNA and cells. But its very unlikely that youll be exposed to levels high enough to endanger your health in your daily life. Exposure comes mostly in small amounts. The best approach is to be aware that EMFs exist and be smart about your exposure. This is a developing field of research that will undoubtedly expand as our use of wireless devices and labor-saving machines increases. Keep an eye on the news for developing research. Healthline has strict sourcing guidelines and relies on peer-reviewed studies, academic research institutions, and medical journals and associations. We only use quality, credible sources to ensure content accuracy and integrity. You can learn more about how we ensure our content is accurate and current by reading our editorial policy.5 tips for using your microwave oven safely. (n.d.). to electricity (% population). (2019). your radiation dose. (n.d.). M. (2020). Electromagnetic hypersensitivity: A critical review of explanatory hypotheses. the product emit radiation? (2014). at a glance. (n.d.). guidelines. (n.d.). limits for people. (n.d.). ID search. (n.d.). J, et al. (2014). Potential health impacts of residential exposures to extremely low frequency magnetic fields in Europe. L. (2017). 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US Department of Health, Education, and Welfare, Public Health Service, Food and Drug Administration, Bureau of Radiological Health (1977) Google Scholar Electric and magnetic fields occur naturally and also come from human-made sources. Scientists and oversight agencies generally agree that low-frequency EMFs pose little danger to human health. Most of us are used to the electronic conveniences of modern life. But few of us are aware of the possible health risks presented by the gadgets that make our world work. Our power lines, cellphones, microwaves, Wi-Fi routers, and other appliances send out a stream of invisible energy waves. Electric and magnetic fields (EMFs) are produced anywhere electricity is used, including at home and in the workplace. Some experts are concerned about potential health effects from these fields. But should we be worried? While most researchers dont believe most EMFs are dangerous, there are still some scientists who question the safety of EMF exposure. Many say there hasnt been enough research into understanding whether EMFs, or radiation. At the same time the sun sends out EMFs, we can see its energy radiating out. This is visible light. At the turn of the 20th century, electric power lines and indoor lighting spread across the world. Scientists realized that the power lines supplying all that energy to the worlds population were sending off EMFs, just like the sun does naturally. Over the years, scientists learned that many of the emerging electrical appliances also create EMFs. As the medical world advanced, much of its diagnostic and treatment equipment, like imaging devices for X-rays and CT scans, were also found to make EMFs. Today, 90 percent of the worlds population has access to electricity and uses electricity and EMFs. generally dont think EMFs are a health concern. Radiation exists across whats called the electromagnetic spectrum. This radiation ranges from very high-energy (or low-frequency) on the other end. Examples of high-energy radiation include: x-raysgamma rayssome higher-energy ultraviolet (UV) rays This is ionizing radiation, meaning this energy can affect cells on the atomic level by removing an electron from an atom, or ionizing it. Ionizing radiation can damage the bodys DNA and cells, which may contribute to genetic mutations and cancer. On the other end of the spectrum is extremely low-frequency (ELF) radiation. This is ionizing radiation can damage the bodys DNA and cells, which may contribute to genetic mutations and cancer. is a type of non-ionizing radiation. It can move atoms around in the body or make them vibrate, but most researchers agree that it isnt enough to damage DNA or cells. In between ELF radiationvisible lightinfraredElectric and magnetic fields join as one field in most forms of radiation. The result is called an electric field and electric field to refer to these two different fields in ELF radiation. In summary, here are the two types of EMFs that you might be exposed to:High-frequency EMFs. This is the ionizing type of radiation. Scientific literature agrees that large exposures can damage DNA or cells. Medical devices like X-ray imaging machines and UV radiation from either tanning beds or the sun.Low- to mid-frequency EMFs. This is the non-ionizing type of radiation. Its mild and thought to be harmless to people. Household appliances like microwave ovens, cellphones, hair dryers, and washing machines as well as power lines and MRIs, produce this type of radiation. Its mild and thought to be harmless to people. low frequency EMFs (ELF-EMFs) and radiofrequency EMFs (RF-EMFs). Non-ionizing EMFs come from both natural EMF. Human-made EMFs are classified into two types, both generated by non-ionizing radiation: Extremely low-frequency EMFs (ELF-EMFs). This nonionizing radiation field can be generated by a variety of sources, including power lines, electrical wiring, and personal appliances like electric shavers, hair dryers, and electric blankets. Radiofrequency radiation. This non-ionizing radiation field is emitted from wireless devices, like cell phones, smart meters, tablets, and laptop computers. Its also generated by radio and television signals, radar, satellite stations, and MRI machines.EMF exposure intensity decreases as you increase your distance from the object thats sending out waves. Some common sources of EMFs that emit varying levels of radiation include the following:microwave ovenscomputerssmart meterswireless (Wi-Fi) routerscellphonesBluetooth devicespower linesMRI machinesultraviolet light (UV) radiation. UV radiation comes naturally from the sun, and from man-made sources like tanning beds, phototherapy, and welding torchesX-rays and gamma rays. This type of radiation comes from both natural and human-made sources. Natural sources include radon gas, the earths radioactive elements, and cosmic rays that hit the earth from beyond the solar system. Human-made sources include medical X-rays and CT scans and cancer treatment. Theres disagreement in scientific literature over whether EMFs pose a danger to human health and, if so, how much. The International Agency for Research on Cancer (IARC) has classified non-ionizing EMFs in the radiofrequency range as Group 2B, a possible human carcinogen. These fields are produced by electronic products like cellphones, smart devices, and tablets. IARC operates under the World Health Organization (WHO). It convenes working groups of scientists from around the world regularly to evaluate the cancer risks presented to humans by environmental and lifestyle factors. The current IARC evaluation from 2011 pointed to a possible link between RF radiation and cancer. This conclusion means that there could be some risk. The report emphasized that the link between cellphone use and cancer risk needs to be carefully monitored by the scientific community. It said more research was needed into long-term, low-level exposure to non-ionizing radiation that the IARC should upgrade the classification to a Group 1, a known carcinogen. Researchers began substantial research into the potential link between cellphone users and cancer rates and cancer rates and cellphone users and cancer rates and cellphone users and association between the highest rate of exposure and glioma. However, this research also mentioned various potential biases and confounding variables that make the potential biases and confounding variables that the connection wasnt strong enough to conclude that cellphone use caused cancer. In a smaller, more recent study, researchers analyzed data over almost 2 decades and found that people exposed to high levels of extremely low-level frequency magnetic fields (ELF-EMFs) over a long duration showed an increased risk of acute myeloid leukemia (AML), a type of leukemia in adults. European scientists also uncovered a possible link between EMF and leukemia in children. In a literature review of previous studies, they suggested that between 1.5 to 5 percent of childhood leukemia in children. In a literature review of previous studies, they suggested that between 1.5 to 5 percent of childhood leukemia in children. In a literature review of previous studies, they suggested that between 1.5 to 5 percent of childhood leukemia in children. recommended more research and better monitoring. One review of more than two dozen studies on low-frequency EMFs suggests that these energy fields may cause various neurological and psychiatric problems in people. In one study, research energy, can affect nerve activity in rats. They suggested that long-term EMP exposure could be harmful to cognitive ability and may induce pathology similar to that of Alzheimers disease. They added that more research is needed. Also, tentative research suggests that the bodys tissues and its nervous system may be affected by the heat generated by RF-EMFs. A study conducted on rats and mice suggested that the heat from cellphones affected body tissue heating and nerve activity. Again, research review suggested that radiofrequency EMFs might contribute to neurological cognitive disorders. But since the reported research was performed either on cells or animals, its results dont necessarily apply to people. Most researchers said further studies are needed. Possible symptoms related to EMFs in the studies included:headachetremordizzinessmemory lossloss of concentrationsleep disturbanceEMF exposure levels are monitored and enforced at the global, national, and local levels in a varied patchwork of procedures by multiple organizations, depending on where you live. The electric industry in the United Kingdom maintains a database where you can see the widely varied exposure limits and enforcement measures in countries around the world. Internationally, the primary guidance on radiofrequency EMFs comes from the International Commission on Non-Ionizing Radiation Protection (ICNIRP). It bases its guidelines on its evaluation over many years of peer-reviewed scientific literature concerning health effects from RF EMF exposure. In 2020, WHO updated its international ICNIRP Guidelines for limiting exposure to larger RF electromagnetic fields ranging from 100 KHz (kilohertz) to 300 GH (gigahertz). The ICNERP guidelines currently specify that people at work shouldnt be exposed to current electric densities in the bodys head, neck and trunk of greater than 10 mA m-2 (the basic restriction). A lower limit of 2 mA m-2 is given for the general population to account for children and people who may be more sensitive. The expression 10 mA m-2 represents a measurement of electric current density. It translates as 10 milliamperes per meter squared. A milliampere is one 1/1000th of an ampere. Its the level above which electric current density. It translates as 10 milliamperes per meter squared to the sensitive. The expression 10 mA m-2 represents a measurement of electric current density. It translates as 10 milliamperes per meter squared to the end of the electric current density. It translates as 10 milliamperes per meter squared to the electric current density. It translates as 10 milliamperes per meter squared to the electric current density. 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But takes a difference stance stance on low levels of exposure takes a difference stance nor imposes limits on low-level EMFs because theres no scientific evidence that low levels of electromagnetic radiation, the EPA issued its 2020 official report, a literature review of 70 major studies conducted between 2008 and 2018. The report focused on cancer but also discussed many other health concerns. In the United States, a variety of governmental agencies have specific responsibilities for managing EMF exposure from various technologies, facilities, and products. Local governmental agencies have specific responsibilities for managing EMF exposure from various technologies, facilities, and products. controls:Electronic devices. Standards for all electronic devices emitting non-ionizing or ionizing radiation are set by the U.S. Food and Drug Administration (FCC) sets exposure limits on electromagnetic radiation from both cell phones. The Federal Communications Commission (FCC) sets exposure limits on electromagnetic radiation from both cell phone towers. The Federal Communications Commission (FCC) sets exposure limits on electromagnetic radiation from both cell phone towers. are based on standards developed by the Institute of Electrical and Electronics Engineers (IEEE) and the National Council on Radiation Protection and Measurements (NCRP), plus input from other governmental agencies. Smart meters. The FCC sets exposure limits for radiation emitted from smart meters, those boxes on sides of houses and businesses that use a cellular transmitter to track power consumption. Power lines. Currently, there are no federal restrictions on EMFs from power lines. Many medical devices and procedures use ionizing radiation to diagnose and treat conditions and disease. Some examples include X-rays CT scans, and radiation therapy. Various regulatory agencies share responsibility for the safety of these procedures and devices, including the Centers for Disease Prevention and Control (CDC), the FDA, the EPA, and the U.S. Nuclear Regulatory Commission (NRC). Nuclear Regulatory agencies share responsibility for regulating nuclear power and coordinating disaster response, including the EPA, the Federal Emergency (FEMA), and the NRC.Imported products. The U.S. Customs and Border Protection (CBP) screens imported goods to be sure theyre free of harmful substances. Workplaces is governed by legislation and enforced by the Health and Safety Authority (HSA). Electric fields are produced by voltage, and magnetic fields are measured in V/m (volts per meter). Magnetic fields are measured in V/m (volts per meter). because of differences in the amount of voltage used by various devices. The higher the voltage supplied to a device, the stronger the electric field will be. An electric field will be. An electric field sare produced by the flow of electric current and therefore vary depending on the strength and amount of the current being used. The more electric current a device uses, the stronger the magnetic field may not depend on how large or powerful the device is. Also, the strength of the magnetic field may vary a lot even among similar products. For example, some hair dryers have a very strong field, while others produce hardly any EMF. It all depends on the product design. Also, exposure levels vary considerably depending on the distance you are from the device and how long youre exposed. Because of these variances, its difficult to say with accuracy what the EMF is for products. But both ICNERP and WHO internationally, and the EPA nationally, have stated that the EMF exposure in the average living. The strongest electric fields that we encounter in daily life are beneath high-voltage transmission lines. Transformers reduce this high voltage before it goes into your home or business. Also, the walls of your home act as a shield to some degree. Directly beneath the power lines is where the field is strongest. Both fields (electric and magnetic) drop off significantly with distance. The further your home is from high-voltage power lines the weaker the field. In homes not located near power lines, the background magnetic fields at various frequencies. Screens and television sets work similarly, producing both electric and magnetic fields. For this reason, modern TVs, which generally use LCD, LED, or plasma screens, emit only small amounts of radiation. But its enough that you should keep children from getting too close. Watching from a couch several feet away is thought to pose little danger. The FCC requires that all wireless communications devices sold in the United States meet minimum guidelines for safe human exposure to radiofrequency (RF) energy. For wireless devices that operate at 6 GHz or less and are designed for use near or against the body (cellphones, tablets, and other portable devices), FCC has set exposure limits in terms of Specific Absorption Rate (SAR). This is a measure of the rate at which the body absorbs RF energy. The FCC limit is 1.6 watts per kilogram (W/kg). All wireless devices sold in the United States are certified by the FCC that they dont exceed FCC exposure limits. The FCC incorporates a safety margin in these limits. The FCC hat they dont exceed FCC exposure limits. value for your phone or one you intend to buy, go to the FCC ID Search database and enter your phones FCC ID number. Youll usually find the number. Microwaves are used to detect speeding cars, send television communications, raise bread, and even cook potato chips! But most of us use microwave energy the most in microwave ovens. Microwave ovens are considered to be safe if you use them correctly. People have experienced burns and other injuries from microwave radiation and superheating, but they have shields to reduce leakage of radiation outside the oven to almost nothing. The FDA limits the amount of microwaves that an oven can leak in its lifetime to 5 milliwatts (mW) per square centimeter, measured about 2 inches away. The FDA limit is far below a level known to harm people. prevent the generation of microwaves if the door is open. FDA tests ovens in its lab to make sure its standards are met. All ovens sold in the United States must have a label stating that they meet the safety standards are met. All ovens sold in the United States must have a label stating that they meet the safety standards are met. life is very low. Much of your EMF exposure in your home probably comes from the wires carrying electrical current. You also get short-term high exposures when you are near electrical appliances. You can check EMF levels in your home with an EMF meter. These handheld devices can be purchased online. But be aware that most cant measure EMFs of very high frequencies, and their accuracy is generally low, so their efficacy is limited. You can also call your local power company to schedule an on-site reading. Remember that ELF fields vary by location. If you hold your meter to the right of a clothes dryer, for example, you might get a zero reading. A foot to the left, the reading might be higher. So be sure to test in different locations around the electrical appliance, and within your house. Also, check readings at various points on your walls since much of your homes electrical current is transported via wires that run through the walls. If you find a reading is highest near your bed, for example, consider moving it to a different part of the room where the reading is lower. Possible human health effects from exposure to EMFs hasnt yet been determined with precision and accuracy. Research in the coming years may better inform us. Some studies point to various symptoms coming from EMF exposure, but researchers generally say more study is needed. Many of the studies use animal or cell models, which are sometimes distressing and even disabling. No credible research currently links EHS symptoms to EMF exposure, and EHS isnt considered to be a medical diagnosis. The medical diagnosis. The medical diagnosis. The medical diagnosis that some studies have suggested: sleep disturbances, including insomniaheadachedepression and depressive symptomstiredness and fatiguedysesthesia (a painful, often itchy sensation)lack of concentrationchanges in memorydizzinessirritabilityloss of appetite and weight lossrestlessness and anxietynauseaskin burning and tinglingThe actions you can take to reduce your EMF exposure depends on the type of radiation youre concerned about. Read on to learn what steps you can take. Remember that this category of EMFs includes extremely low frequency EMFs (ELF-EMFs) and radiofrequency EMFs (ELF-EMFs) and radiofrequency EMFs (et al. 2010). This type of radiation is produced by any electric device. on). According to WHO, extremely low frequency EMFs are unlikely to cause any adverse health effects. You should feel safe using your cell phone and appliances diminishes rapidly with distance. At 1 foot, the magnetic fields surrounding most household appliances. One of the best ways to avoid EMF exposure in your distance from appliances. You need to get up close to turn on the television, open the fridge of the best ways to avoid EMF exposure in your distance from appliances. or microwave, and load the washing machine. Just keep these close encounters short, and dont sit next to appliances or allow your kids to.Put your phone down. Especially when you arent using the phone, place it away from you. At night when you sleep, put it in another room. Use the speaker function or earbuds with your phone. This will reduce RF exposure to your head. Earpieces do generate and emit fields, but not nearly as much as your phone in a bag or briefcase when youre out. Unplug occasionally from electronic devices and electricity. Take a day off from electronics, or even several days. Your body will thank you! Remember, this is the type of radiation thats potentially dangerous to your health. High levels of this radiation come from medical devices like X-ray imaging machines , and UV rays from tanning beds or the sun. To reduce high-level exposure and associated risks, try these tips:Limit X-rays. Only receive X-rays that are medically necessary.Limit your time in the sun. You need some sun for your health, just not too much. Also, avoid sun during the middle of the day when the rays are strongest.Limit time in tanning beds. If you must have that quick summer tan, just limit your time under the lights. If you want to calculate your effective dose of ionizing radiation is the type of EMF thats dangerous because it can potentially harm body tissues and DNA. EMFs occur naturally and also come from humanmade sources. Scientists and regulatory agencies generally agree that low-frequency EMFs pose little danger to human health. But some researchers offer preliminary evidence that some danger may exist for long-term use, specifically to the nervous system and brain cognitive function. Exposure to large levels of high-frequency EMFs is known to damage human DNA and cells. But its very unlikely that youll be exposed to levels high enough to endanger your health in your daily life. Exposure comes mostly in small amounts. The best approach is to be aware that EMFs exist and be smart about your exposure. This is a developing field of research that will undoubtedly expand as our use of wireless devices and labor-saving machines increases. Keep an eye on the news for developing research. Healthline has strict sourcing guidelines and relies on peer-reviewed studies, academic research institutions, and medical journals and associations. We only use guality, credible sources to ensure content accuracy and integrity. You can learn ensure our content is accurate and current by reading our editorial policy.5 tips for using your microwave oven safely. (n.d.). to electricity (% population). (2019). your radiation dose. (n.d.). M. (2020). Electromagnetic hypersensitivity: A critical review of explanatory hypotheses. the product emit radiation? (2018). and magn fields. (2020). fields and cancer [Fact sheet]. (2019). fields and public health: mobile phones. (2014). at a glance. (n.d.). Jy et al. (2014). Potential health impacts of residential exposures to extremely low frequency magnetic fields in Europe. L. (2017). World Health Organization, radiofrequency radiation and health - a hard nut to crack (Review). L and Carlbert M. (2018). Comments on the US National Toxicology Program technical reports on toxicology Program technical reports on toxicology Program technical reports on toxicology and carcinogenesis study in rats exposed to whole-body radiofrequency radiation at 1,900 MHz. and electromagnetic fields. (n.d.). A, et al. (2018). Occupational extremely low frequency magnetic fields (ELF-MF) exposure to humans. (2011). Guidelines for limiting exposure to electromagnetic fields (100 KHZ TO - 300 GH). (2010). Brain tumour risk in relation to mobile telephone use: results of the Interphone international case-control study. study reports on mobile telephone use: results of the Interphone international case-control study. cognitive dysfunction through oxidative stress and overexpression of APP and BACE1 [Abstract]. around the world. (n.d.). SN, et al. (2018). Preliminary upper estimate of peak currents in transcranial magnetic stimulation at distant locations from a TMS coil. oven radiation. (n.d.). of device regulation. (2020). ML. (2015). Microwave frequency electromagnetic fields (EMFs) produce widespread neuropsychiatric effects including depression. Electromagnetic fields. (2016). resources outside of EPA. (n.d.). devices and health concerns. (2020). M, et al. (2016). Report of partial findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley SD rats (Whole Body Exposures) US National Toxicology Program (NTP). ME, et al. (2018). Effect of cell phone radiofrequency radiation on body temperature in rodents: Pilot studies of the National Toxicology Program (NTP). Program's reverberation chamber exposure system. Electromagnetic fields (EMF) have become an integral part of modern life, with sources ranging from power lines and household appliances to wireless communication devices. As our exposure to EMF continues to increase, concerns about potential health effects have grown. This comprehensive article examines the latest scientific evidence on EMF exposure and its possible impacts on human health. Understanding Electromagnetic fields are invisible areas of energy associated with electrical power and various forms of natural and artificial lighting. They are characterized by wavelength and frequency, and fall into two main categories:Non-ionizing radiation: High-frequency radiation which is generally perceived as harmless to humansIonizing radiation: High-frequency radiation: High-frequency radiation which is generally perceived as harmless to humansIonizing radiation which is generally perceived as harmless to humansIonizing radiation which is generally perceived as harmless to humansIonizing radiation which is generally perceived as harmless to humansIonizing radiation which is generally perceived as harmless to humansIonizing radiation which is generally perceived as harmless to humansIonizing radiation which is generally perceived as harmless to humansIonizing radiation which is generally perceived as harmless to humansIonizing radiation which is generally perceived as harmless to humansIonizing radiation. (Radiofrequency - RF)Medical imaging equipment like MRI scanners (Static fields)Industrial equipment (Intermediate Frequency - IF)EMF Exposure to EMF varies greatly depending on the source and proximity. Some key points about everyday exposure include:Environmental EMF levels have increased significantly since the 1980s due to the proliferation of wireless technologiesMobile phones remain a primary source of RF exposure, especially to brain tissueIndoor sources like Wi-Fi routers and smart home devices contribute to overall exposure. industriesIt's important to note that while EMF exposure has increased, most environmental sources result in exposure levels well below international safety guidelines. Potential Health Effects of EMF exposure has increased, most environmental sources result in exposure the scientific community has conducted extensive research on the potential health Effects of EMF exposure. Here's an overview of the current evidence for various health concerns: Cancer RiskBrain Tumors: Overall, epidemiological studies do not show an increased risk of brain tumors associated with mobile phone use. However, some studies have raised questions about potential risks for heavy users. Other Cancers: There is no consistent evidence linking EMF exposure to increased risk of other types of cancer, including childhood cancers. Neurological EffectsBrain Activity, as measured by EEG during both wake and sleep states. However, the clinical significance of these small changes remains unclear. Cognitive Function: The majority of studies have not found consistent effects of RF exposure on cognitive function in humans. Neurodegenerative Diseases: Current evidence does not support an association between ELF magnetic field exposure and increased risk of neurodegenerative diseases like dementia. Reproductive and Developmental Effects of RF exposure and increased risk of neurodegenerative diseases like dementia. and provide little evidence of EMF-related effects. Pregnancy Outcomes: Epidemiological studies show no evidence for adverse pregnancy outcomes related to ELF magnetic field exposure has produced conflicting results and has methodological limitations.Electromagnetic HypersensitivitySome individuals report a variety of non-specific symptoms (e.g., headaches, fatigue, skin irritation) which they attribute to EMF exposure and these symptoms. Double-blind provocation studies consistently show that self reported electromagnetic hypersensitivity is not related to actual EMF exposure. Other Potential EffectsOxidative Stress: Some studies suggest EMF exposure may increase oxidative stress in cells, but the implications for human health are not clear. DNA Damage: While some in vitro studies have reported DNA damage from RF exposure, these findings have not been consistently replicated. Immune System Effects: Limited evidence exists for EMF-induced changes in immune system function, but more research is needed to draw firm conclusions. EMF Safety Guidelines for EMF exposure based on known biological effects: The International Commission on Non-Ionizing Radiation Protection (ICNIRP) provides widely adopted guidelines are based on established mechanisms of interaction between EMF and biological systems, focusing on thermal effects for RF fields. Safety limits include substantial safety factors to protect even vulnerable populations. Many countries have adopted these international guidelines or developed their own similar standards. It's worth noting that current safety guidelines or developed these international guidelines do not account for potential long-term effects of chronic low-level exposure, as scientific evidence for such effects remains inconclusive. Ongoing Research and Future DirectionsWhile extensive research has been conducted on EMF health effects of EMF exposurePotential biological effects of new and emerging technologies (e.g., 5G networks, millimeter waves)Combined effects of EMF exposure with other environmental factorsImproved exposure assessment methods for epidemiological systems at non-thermal levelsResearchers are also calling for more studies on specific populations, such as children and occupationally exposed individuals. Precautionary Measures and Reducing EMF ExposureWhile current scientific evidence does not confirm health risks from EMF exposure below international guidelines, some individuals and organizations advocate for precautionary measures to reduce exposure. wireless devices away from the body when not in useLimiting children's use of mobile phonesChoosing wired internet connections over Wi-Fi when possibleIt's important to note that these measures are precautionary and not based on established health effects has not conclusively demonstrated adverse health impacts from exposure levels encountered in daily life. While some studies have reported biological effects, the overall evidence does not support a causal relationship between EMF exposure is below international safety guidelines. However, given the ubiquity of EMF in modern environments and ongoing technological developments, continued research is essential to address remaining uncertainties and ensure public safety. As our understanding evolves, health and safety guidelines may need to be updated to reflect new findings. Individuals concerned about EMF exposure can take simple precautionary steps to increasingly connected world. Citations:[1] Electric and magnetic fields occur naturally and also come from human-made sources. Scientists and oversight agencies generally agree that low-frequency EMFs pose little danger to human health. health risks presented by the gadgets that make our world work. Our power lines, cellphones, microwaves, Wi-Fi routers, and other appliances send out a stream of invisible energy waves. Electric and magnetic fields (EMFs) are produced anywhere electricity is used, including at home and in the workplace. Some experts are concerned about potential health effects from these fields. But should we be worried? While most researchers dont believe most EMFs are dangerous, there are still some scientists who question the safety of EMF exposure. Many say there hasnt been enough research into understanding whether EMFs are safe. Lets take a closer look. Since the beginning of the universe, the sun has sent out waves that create EMFs, or radiation. At the same time the sun sends out EMFs, we can see its energy radiating out. This is visible light. At the turn of the 20th century, electric power lines and indoor lighting spread across the world. population were sending off EMFs, just like the sun does naturally. Over the years, scientists learned that many of the emerging electrical appliances and treatment equipment, like imaging devices for X-rays and CT scans, were also found to make EMFs. Today, 90 percent of the worlds population has access to electricity and uses electricity and uses electricity and EMFs are a health concern. Radiation exists across whats called the electromagnetic spectrum. This radiation ranges from very high-energy (called high-frequency) on one end of the spectrum, to very low-energy ultraviolet (UV) rays This is ionizing radiation, meaning this energy can affect cells on the atomic level by removing an electron from an atom, or ionizing it. Ionizing radiation can damage the bodys DNA and cells, which may contribute to genetic mutations and cancer. On the other end of the spectrum is extremely low-frequency (ELF) radiation. It can move atoms around in the body or make them vibrate, but most researchers agree that it isnt enough to damage DNA or cells. In between ELF radiation and high-energy radiation, like: radiofrequency (RF) radiation, like: radiofrequency (RF) radiation. The result is called an electromagnetic field (EMF). But the electric and magnetic fields in ELF radiation can act independently. So we use the terms magnetic field and electric field to refer to these two different fields in ELF radiation. In summary, here are the two types of EMFs that you might be exposed to:High-frequency EMFs. This is the ionizing type of radiation. In summary, here are the two types of EMFs that you might be exposed to:High-frequency EMFs. This is the ionizing type of radiation. In summary, here are the two types of EMFs that you might be exposed to:High-frequency EMFs. This is the ionizing type of radiation. In summary, here are the two types of EMFs that you might be exposed to:High-frequency EMFs. This is the ionizing type of radiation. In summary, here are the two types of EMFs that you might be exposed to:High-frequency EMFs. This is the ionizing type of radiation. In summary, here are the two types of EMFs that you might be exposed to:High-frequency EMFs. This is the ionizing type of radiation. In summary, here are the two types of EMFs that you might be exposed to:High-frequency EMFs. This is the ionizing type of radiation. 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Its mild and thought to be harmless to people Household appliances like microwave ovens, cellphones, hair dryers, and washing machines, as well as power lines and MRIs, produce this type of radiation. This category of EMFs (RF-EMFs). Non-ionizing EMFs come from both natural and human-made sources. The earths magnetic field is an example of a natural EMF. Human-made EMFs are classified into two types, both generated by a variety of sources, including power lines, electrical wiring, and personal appliances like electric shavers, hair dryers, and electric blankets. Radiofrequency radiation. This non-ionizing radiation field is emitted from wireless devices, like cell phones, smart meters, tablets, and MRI machines. EMF exposure intensity decreases as you increase your distance from the object thats sending out waves. Some common sources of EMFs that emit varying levels of radiation include the following:microwave ovenscomputerssmart meterswireless (Wi-Fi) routerscellphonesBluetooth devicespower linesMRI machinesultraviolet light (UV) radiation. UV radiation comes naturally from the sun, and from man-made sources like tanning beds, phototherapy, and welding torchesX-rays and gamma rays. This type of radiation comes from both natural and human-made sources include medical X-rays and CT scans and cancer treatment. Theres disagreement in scientific literature over whether EMFs pose a danger to human health and, if so, how much. The International Agency for Research on Cancer (IARC) has classified non-ionizing EMFs in the radiofrequency range as Group 2B, a possible human carcinogen. These fields are produced by electronic products like cellphones, smart devices, and tablets. IARC operates under the World Health Organization (WHO). It convenes working groups of scientists from around the world regularly to evaluate the cancer risks presented to humans by environmental and lifestyle factors. The current IARC evaluation from 2011 pointed to a possible link between RF radiation and cancer in people, particularly glioma, a malignant type of brain cancer. This conclusion means that there could be some risk. The report emphasized that the link between cellphone use and cancer risk needs to be carefully monitored by the scientific community. It said more research was needed into long-term, heavy use of mobile phones. Some researchers feel theres already enough evidence of harm from long-term, low-level exposure to non-ionizing radiation that the IARC should upgrade the classification to a Group 1, a known carcinogen. Researchers began substantial research into the potential link between cellphones and cancer in 2000 in what would become the largest study to compare cancer cases in cellphone users and nonusers. The researchers followed cancer rates and cellphone use in more than 5,000 people in 13 countries. There was an association between the highest rate of exposure and glioma. However, this research also mentioned various potential biases and confounding variables that make the potential association difficult to interpret. The gliomas were more often found on the same side of the head that people used to speak on the phone. Even so, the researchers said that the connection wasnt strong enough to conclude that cellphone use caused cancer. In a smaller, more recent study, researchers analyzed data over almost 2 decades and found that people exposed to high levels of extremely low-level frequency magnetic fields (ELF-EMFs) over a long duration showed an increased risk of acute myeloid leukemia in adults. European scientists also uncovered a possible link between EMF and leukemia in adults. suggested that between 1.5 to 5 percent of childhood leukemia can be attributed to ELF-EMFs. But they noted that the result was inconclusive because monitoring. One review of more than two dozen studies on low-frequency EMFs suggests that these energy fields may cause various neurological and psychiatric problems in people. In one study, researchers found that an electromagnetic pulse (EMP), or a short burst of electromagnetic pulse disease. They added that more research is needed. Also, tentative research suggests that the bodys tissues and its nervous system may be affected by the heat generated by RF-EMFs. A study conducted on rats and mice suggested that the heat from cellphones affected by the heat generated by RF-EMFs. needed. Another research review suggested that radiofrequency EMFs might contribute to neurological cognitive disorders. But since the reported research was performed either on cells or animals, its results dont necessarily apply to people. Most research was performed either studies are needed. included:headachetremordizzinessmemory lossloss of concentrationsleep disturbanceEMF exposure levels are monitored and enforced at the global, national, and local levels in a varied patchwork of procedures by multiple organizations, depending on where you can see the widely varied exposure limits and enforcement measures in countries around the world. Internationally, the primary guidance on radiofrequency EMFs comes from the International Commission on Non-Ionizing Radiation Protection (ICNIRP). It bases its guidelines on its evaluation over many years of peer-reviewed scientific literature concerning health effects from RF EMF exposure. In 2020, WHO updated its international ICNIRP Guidelines for limiting exposure to larger RF electromagnetic fields ranging from 100 KHz (kilohertz) to 300 GH (gigahertz). The ICNERP guidelines currently specify that people at work shouldnt be exposed to current electric densities in the bodys head, neck and trunk of greater than 10 mA m-2 (the basic restriction). A lower limit of 2 mA m-2 is given for the general population to account for children and people who may be more sensitive. The expression 10 mA m-2 represents a measurement of electric current density. It translates as 10 milliamperes per meter squared. A milliampere is one 1/1000th of an ampere. Its the level above which electric and magnetic fields have been shown to have effects on bodily tissue and cognitive brain function. In the United States, there are no federal governmental agencies have responsibility for managing EMF exposure from certain products and technologies. The Environmental Protection Agency (EPA) coordinates EMF exposure recommendations in the United States. It generally relies on the ICNERP Guidelines, the EPA points out that the ICNERP EMF exposure limits protect people from well-known biological and health effects of exposure to high EMF levels. But the EPA takes a difference stance on low levels of EMF radiation. The EPA states in its EMF Guidelines that it neither recommends nor imposes limits on low-level EMFs because theres no scientific evidence that low levels of electromagnetic radiation damage human health. To support its statement regarding the relative safety of low-level EMF radiation, the EPA issued its 2020 official report, a literature review of 70 major studies conducted between 2008 and 2018. The report focused on cancer but also discussed many other health concerns. In the United States, a variety of governmental agencies have specific responsibilities for managing EMF exposure from various technologies, facilities, and products. Local governments sometimes impose their own controls: Electronic devices emitting non-ionizing or ionizing radiation are set by the U.S. Food and Drug Administration (FDA). Cell phones The Federal Communications Commission (FCC) sets exposure limits on electromagnetic radiation from both cell phones and cell phone towers. The FCC rules and Electronics Engineers (IEEE) and the National Council on Radiation Protection and Measurements (NCRP). plus input from other governmental agencies. Smart meters. The FCC sets exposure limits for radiation emitted from smart meters, those boxes on sides of houses and businesses that use a cellular transmitter to track power consumption. Power lines in either residential or occupational settings. Medical use. Many medical devices and procedures use ionizing radiation to diagnose and treat conditions and disease. Some examples include X-rays, CT scans, and radiation therapy. Various regulatory agencies share responsibility for the safety of these procedures and devices, including the Centers for Disease Prevention and Control (CDC), the FDA, the EPA, and the U.S. Nuclear Regulatory Commission (NRC). Nuclear power. Several regulatory agencies share response, including the EPA, the Federal Emergency Management Agency (FEMA), and the U.S. Customs and Border Protection (CBP) screens imported goods to be sure theyre free of harmful substances. Workplace. Exposure to EMF in workplaces is governed by legislation and enforced by the Health and Safety Authority (HSA). Electric fields are produced by voltage, and magnetic fields are produced by voltage. (volts per meter). Magnetic fields are measured in T (microteslas). Both electric fields vary in strengths at different times and locations. Electric field will be. An electric field exists even when theres no current flowing.Magnetic fields are produced by the flow of electric current and therefore vary depending on the strength and amount of the current being used. The more electric current a device uses, the stronger the magnetic field will be. It might be surprising to learn just how varied magnetic field levels are around products. The strength of a magnetic field may not depend on how large or powerful the device is. Also, the strength of the magnetic field may vary a lot even among similar products. For example, some hair dryers have a very strong field, while others produce hardly any EMF. It all depends on the product design. Also, exposure levels vary considerably depending on the distance you are from the device and how long youre exposed. Because of these variances, its difficult to say with accuracy what the EMF is for products. But both ICNERP and WHO internationally, and the EPA nationally, have stated that the EMF is for products. most common EMF fields you may encounter in daily living. The strongest electric fields that we encounter in daily life are beneath high-voltage transmission lines. Transformers reduce this high voltage before it goes into your home or business. Also, the walls of your home act as a shield to some degree. Directly beneath the power lines is where the field is strongest. Both fields (electric and magnetic) drop off significantly with distance. The further your home is from high-voltage power lines, the background magnetic field may be relatively light. Computer screens and television sets work similarly, producing both electric and magnetic fields at various frequencies. Screens with liquid crystal displays (LCDs) dont produce significant electric and magnetic fields. For this reason, modern TVs, which generally use LCD, LED, or plasma screens, emit only small amounts of radiation. But its enough that you should keep children from getting too close. Watching from a couch several feet away is thought to pose little danger. The FCC requires that all wireless communications devices sold in the United States meet minimum guidelines for safe human exposure to radiofrequency (RF) energy. For wireless devices that operate at 6 GHz or less and are designed for use near or against the body (cellphones, tablets, and other portable devices), FCC has set exposure limits in terms of Specific Absorption Rate (SAR). This is a measure of the rate at which the body absorbs RF energy. The FCC limit is 1.6 watts per kilogram (W/kg). All wireless devices sold in the United States are certified by the FCC that they dont exceed FCC exposure limits. The FCC incorporates a safety margin in these limits. If the FCC learns that a device doesnt perform according to its disclosure, the FCC ID Search database and enter your phones FCC ID number. Youll usually find the number somewhere on either the case or the device. You may have to remove the battery to find the number. Microwave energy the most in microwave energy the most energy the most energy the most in microwave energy the most ene microwave radiation and superneating, but mostly from misuse. Microwave ovens operate at very high power levels, but they have shields to reduce leakage of radiation outside the oven to almost nothing. The FDA limits the amount of microwaves that an oven can leak in its lifetime to 5 milliwatts (mw) per square centimeter, measured about 2 inches away. The FDA says this limit is far below a level known to harm people. Microwave ovens also must have safety features to prevent the generation of microwaves if the door is open. FDA tests ovens in its lab to make sure its standards are met. All ovens sold in the United States must have a label stating that they meet the safety standard. Every electrical appliance in your home emits EMFs. Still, according to the ICNIRP guidelines, most peoples exposure to EMF in daily life is very low. Much of your EMF exposures when you are near electrical appliances like refrigerators, microwaves, and washing machines. The EMF radiation drops off sharply as you move away from these appliances. You can check EMF levels in your home with an EMF meter. These handheld devices can be purchased online. But be aware that most cant measure EMFs of very high frequencies, and their accuracy is generally low, so their efficacy is limited. You can also call your local power company to schedule an on-site reading. Remember that ELF fields vary by location. If you hold your meter to the right of a clothes dryer, for example, you might get a zero reading. A foot to the left, the reading might be higher. So be sure to test in different locations around the electrical appliance, and within your house. Also, check readings at various points on your walls since much of your homes electrical current is transported via wires that run through the walls. If you find a reading is lower. Possible human health effects from exposure to EMFs hasnt yet been determined with precision and accuracy. Research in the coming years may better inform us. Some studies use animal or cell models, which are unreliable if applied to human health. The medical field hasnt substantiated EHS, although people do experience symptoms that are sometimes distressing and even disabling. No credible research currently links EHS symptoms to EMF exposure, and EHS isnt considered to be a medical diagnosis. The medical field advises that further research is needed. Still, some research gives tentative support to EMF symptomatology. Here are symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepression and depressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepressive symptoms that some studies have suggested:sleep disturbances, including insomniaheadachedepres and anxietynauseaskin burning and tinglingThe actions you can take to reduce your EMFs (RF-EMFs) and radiofrequency EMFs (RF-EMFs). This type of radiation youre concerned about. Read on to learn what steps you can take. Remember that this category of EMFs includes extremely low frequency EMFs (RF-EMFs). is produced by any electric device. These devices range from refrigerators and vacuum cleaners to televisions and computer monitors (when theyre turned on). According to WHO, extremely low frequency and radiofrequency EMFs are unlikely to cause any adverse health effects. You should feel safe using your cell phone and appliances. Power lines are also considered safe, as long as you keep a safe distance from them. The EMF strength around appliances are more than 100 times lower than the limit in the ICNERP quidelines for the general public. Dont sit or linger near appliances. One of the best ways to avoid EMF exposure in your home is to keep your distance from appliances. You need to get up close to turn on the television, open the fridge or microwave, and load the washing machine. Just keep these close encounters short, and dont sit next to appliances or allow your kids to. Put your phone down. Especially when you arent using the phone, place it away from you. At night when you sleep, put it in another room. Use the speaker function or earbuds with your phone. This will reduce RF exposure to your head. Earpieces do generate and emit fields, but not nearly as much as your phone. Using earpieces or speakerphone, you can greatly reduce exposure to your head. Dont carry your phone in a pocket. Try to carry your phone in a bag or briefcase when youre out. Unplug occasionally from electronic devices and electronic devices and electronic, or even several days. Your body will thank you! Remember, this is the type of radiation thats potentially dangerous to your health. High levels of high-frequency EMFs can damage DNA and cells. Low levels of this radiation come from medical devices like X-rays imaging machines , and UV rays from tanning beds or the sun. To reduce high-level exposure and associated risks, try these tips:Limit X-rays. Only receive X-rays that are medically necessary.Limit your time in the sun. You need some sun for your health, just not too much. Also, avoid sun during the middle of the day when the rays are strongest. Limit time in tanning beds. If you must have that quick summer tan, just limit your time under the lights. If you want to calculate your effective dose of ionizing radiation per year, you can try using the EPAs Dose Calculator. It carries a warning from the EPA that ionizing radiation is the type of EMF thats dangerous because it can potentially harm body tissues and DNA.EMFs occur naturally agree that low-frequency EMFs pose little danger to human health. But some researchers offer preliminary evidence that some danger may exist for long-term use, specifically to the nervous system and brain cognitive function. Exposure to large levels of high-frequency EMFs is known to damage human DNA and cells. But its very unlikely that youll be exposed to levels high enough to endanger your health in your daily life. Exposure comes mostly in small amounts. The best approach is to be aware that EMFs exist and be smart about your exposure. This is a developing field of research that will undoubtedly expand as our use of wireless devices and labor-saving machines increases. Keep an eve on the news for developing research. Healthline has strict sourcing guidelines and relies on peer-reviewed studies, academic research institutions, and medical journals and associations. We only use quality, credible sources to ensure content accuracy and integrity. You can learn more about how we ensure our content is accurate and current by reading our radiation. (2019). your radiation dose. (n.d.). M. (2020). Electromagnetic hypersensitivity: A critical review of explanatory hypotheses. the product emit radiation? (2018). and magnetic fields. (2020). fields and cancer [Fact sheet]. 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Effect of cell phone radiofrequency radiation on body temperature in rodents: Pilot studies of the National Toxicology Program's reverberation chamber exposure system. Skip to main content What are electromagnetic fields and where do they come from? Electric fields are created by differences in voltage: the higher the voltage, the stronger will be the resultant field. Magnetic field will exist even when there is no current flowing. If current does flow, the strength of the magnetic field will exist even when there is no current flowing. If current does flow, the strength of the magnetic field will exist even when there is no current flows: the greater the current flows: the greater the current does flow, the strength of the magnetic field will exist even when there is no current flows: the greater the greater the current flows: the greater the current flows: the greater the greater the current flows: the greater the g sources of electromagnetic fields Electromagnetic fields are present everywhere in our environment but are invisible to the human eye. Electric fields are produced by the local build-up of electric charges in the atmosphere associated with thunderstorms. The earth's magnetic field causes a compass needle to orient in a North-South direction and is used by birds and fish for navigation. Human-made sources of electromagnetic fields Besides natural sources the electromagnetic spectrum also includes fields generated by human-made sources. X-rays are employed to diagnose a broken limb after a sport accident. The electricity that comes out of every power socket has associated low frequency electromagnetic fields. And various kinds of higher frequency radiowaves are used to transmit information whether via TV antennas, radio stations or mobile phone base stations. What makes the various forms of electromagnetic fields so different? One of the main characteristics which defines an electromagnetic field (EMF) is its frequency or its corresponding wavelength. Fields of different frequencies interact with the body in different waves that travel at an enormous speed, the speed of light. The frequency simply describes the number of oscillations or cycles per second, while the term wavelength describes the distance between one wave and the next. Hence wavelength and frequency are inseparably intertwined: the higher the frequency the shorter the wavelength. A simple analogy should help to illustrate the concept: Tie a long rope to a door handle and keep hold of the free end. Moving it up and then down slowly will generate a single big wave; more rapid motion will generate a whole series of small waves. The length of the rope remains constant, therefore, the more waves you generate (higher frequency) the smaller will be the distance between them (shorter wavelength). What happens when you are exposed to electromagnetic fields? Exposure to electromagnetic fields is not a new phenomenon. However, during the 20th century, environmental exposure to artificial electromagnetic fields has been steadily increasing as growing electricity demand, ever-advancing technologies and changes in social behaviour have created more and more artificial sources. Everyone is exposed to a complex mix of weak electric and magnetic fields, both at home and at work, from the generation and transmission of electricity, domestic appliances and industrial equipment, to telecommunications that occur as part of the normal bodily functions, even in the absence of external electric fields. For example, nerves relay signals by transmitting electric impulses. Most biochemical reactions from digestion to brain activities go along with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity that your doctor can trace with the heart is electrically active - an activity theart is electrically active - an activi just as they influence any other material made up of charged particles. When electric fields act on conductive materials, they influence the distribution of electric charges at their surface. They cause current to flow through the body to the ground. Low-frequency magnetic fields induce circulating currents within the human body. The strength of these currents depends on the intensity of the outside magnetic field. If sufficiently large, these currents and muscles or affect other biological processes. Both electric and magnetic fields induce voltages and currents are very small compared to thresholds for producing shock and other electrical effects. Heating is the main biological effect of the electromagnetic fields to which people are normally exposed are very much lower than those needed to produce significant heating. The heating effect of radiowaves forms the underlying basis for current guidelines. Scientists are also investigating the possibility that effects from low level, long-term exposure to radiofrequency or power frequency fields have been confirmed, but scientists are actively continuing to research this area. Biological effects or health hazard? Biological effects or health hazard? Biological effects are measurable responses to a stimulus or to a change in the environment. These changes are not necessarily harmful to your health. For example, listening to music, reading a book, eating an apple or playing tennis will produce a range of biological effects. Nevertheless, none of these activities is expected to cause health effects. The body has sophisticated mechanisms to adjust to the many and varied influences we encounter in our environment. Ongoing change forms a normal part of our lives. But, of course, the body does not possess adequate compensation mechanisms for all biological effects. Changes that are irreversible and stress the system for long periods of time may constitute a health hazard. An adverse health effect causes detectable impairment of the health of the exposed individual or of his or her offspring; a biological effect, on the other hand, may or may not result in an adverse health effect. It is not disputed that electromagnetic fields above certain levels that might be harmful are restricted by national and international guidelines. The current debate is centred on whether long-term low level exposure can evoke biological responses and influence people's well being. Widespread concerns for healthA look at the news headlines of recent years allows some insight into the various areas of public concern. Over the course of the past decade, numerous electromagnetic field sources have become the focus of health concerns, including power lines, microwave ovens, computer and TV screens, security devices, radars and most recently mobile phones and their base stations. The International EMF ProjectIn response to growing public health concerns over possible health effects from exposure to an ever increasing number and diversity of electromagnetic field sources, in 1996 the World Health Organization (WHO) launched a large, multidisciplinary research effort. The International EMF Project brings together current knowledge and available resources of key international agencies and scientific institutions. Conclusions from scientific research needs to be done, scientific knowledge in this area is now more extensive than for most chemicals. Based on a recent in-depth review of the scientific literature, the WHO concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields. However, some gaps in knowledge about biological effects exist and need further research. Effects on general health Some

members of the public have attributed a diffuse collection of symptoms to low levels of exposure to electromagnetic fields at home. Reported symptoms include headaches, anxiety, suicide and depression, nausea, fatigue and loss of libido. To date, scientific evidence does not support a link between these symptoms and exposure to electromagnetic fields. At least some of these health problems may be caused by noise or other factors in the environment, or by anxiety related to the presence of new technologies. Effects on pregnancy outcomeMany different sources and electric blankets, radiofrequency welding machines, diathermy equipment and radar, have been evaluated by the WHO and other organizations. The overall weight, and congenital diseases. There have been occasional reports of associations between health problems and presumed exposure to electromagnetic fields, such as reports of prematurity and low birth weight in children of workers in the electronics industry, but these have not been regarded by the scientific community as being necessarily caused by the field exposures (as opposed to factors such as exposure to solvents). Cataracts General eye irritation and cataracts have sometimes been reported in workers exposed to high levels of radiofrequency and microwave radiation, but animal studies do not support the idea that such forms of eye damage can be produced at levels that are not thermally hazardous. There is no evidence that these effects occur at levels experienced by the general public. Electromagnetic fields and cancer. then any increase in risk will be extremely small. The results to date contain many inconsistencies, but no large increases in risk have been found for any cancer in children or adults. A number of epidemiological studies suggest small increases in risk have been found for any cancer in children or adults. indicate a cause-effect relation between exposure to the fields and disease (as opposed to artifacts in the study or effects unrelated to field exposure). In part, this conclusion has been reached because animal and laboratory studies fail to demonstrate any reproducible effects that are consistent with the hypothesis that fields cause or promote cancer. Large-scale studies are currently underway in several countries and may help resolve these issues. Electromagnetic fields. They ask whether aches and pains, headaches, depression, lethargy, sleeping disorders, and even convulsions and epileptic seizures could be associated with electromagnetic field exposure. There is little scientific evidence to support the idea of electromagnetic hypersensitivity. Recent Scandinavian studies found that individuals do not show consistent reactions under properly controlled conditions of electromagnetic field exposure. Nor is there any accepted biological mechanism to explain hypersensitivity. Research on this subject is difficult because many other subjective responses may be involved, apart from direct effects of fields themselves. More studies are continuing on the subject fields in relation to cancer. Studies in search for possible carcinogenic (cancer-producing) effects of power frequency fields is continuing, although at a reduced level compared to that of the late 1990's. The long-term health effects of mobile telephone use is another topic of much current research. No obvious adverse effect of exposure to low level radiofrequency fields has been discovered. However, given public concerns regarding the safety of cellular telephones, further research aims to determine whether any less obvious effects. 'Biological effect' does not equal 'health hazard'. Special research is needed to identify and measure health hazards. At low frequencies, external electric and magnetic fields induce small circulating currents within the body. In virtually all ordinary environments, the levels of induced currents inside the body are too small to produce obvious effects. The main effect of radiofrequency electromagnetic fields is heating of body tissues. There is no doubt that short-term exposure to very high levels of electromagnetic fields can be harmful to health. Current public concern focuses on possible long-term health effects caused by exposure to electromagnetic fields at levels below those required to trigger acute biological responses. WHO's International EMF Project was launched to provide scientifically sound and objective answers to public concerns about possible hazards of low level electromagnetic fields. Despite extensive research, to date there is no evidence to conclude that exposure to low level electromagnetic fields. is the investigation of possible links between cancer and electromagnetic fields, at power line and radiofrequencies. What is the current state of research? If electromagnetic fields constitute a health hazard, there will be consequences in all industrialized countries. The public demands concrete answers to the ever more pressing question, whether everyday electromagnetic fields cause adverse health effects. The media often seem to have definitive answers. However, one should judge these reports with caution and take into account that the primary interest of the media is not education. A journalist may select and report a story driven by a range of non-technical reasons: journalists compete with one another for time and space and different journals and newspapers compete for circulation numbers. Novel sensational headlines that are relevant to as many people as possible aid them in achieving these goals - bad news is not only the big news, it is often the only news we hear. electromagnetic fields are harmless receive little if any coverage. Science cannot provide a guarantee of absolute safety yet but the development of research areas is essential for the evaluation of a potential adverse health effect of electromagnetic fields. Different types of studies investigate distinct aspects of the problem. Laboratory studies on cells aim to elucidate the fundamental underlying mechanisms based on molecular or cellular changes that are brought about by the electromagnetic field - such a change would provide clues to how a physical force is converted into a biological action within the body. In these studies, single cells or tissues are removed from their normal living environment which may inactivate possible compensation. These studies provide evidence that is more directly relevant to establishing safe exposure levels in humans and often employ several different field levels to investigate dose-response relationships. Epidemiological studies are another direct source of information on long-term effects of exposure. These studies investigate the cause and distribution of diseases in real life situations, in communities and occupational groups. Researchers try to establish if there is a statistical association between exposure to electromagnetic fields and the incidence of a specific disease or adverse health effect. However, epidemiological studies are costly. More importantly, they involve measurements on very complex human populations and are difficult to control sufficiently well to detect small effects. For these reasons, scientists evaluate all relevant evidence when deciding about potential health hazards, including epidemiological studies. Interpretation of epidemiology, animal, and cellular studies. Interpretation of epidemiology, animal, and cellular studies. typically cannot establish a clear cause and effect relationship, mainly because they detect only statistical associations between exposure. Imagine a hypothetical study showing a link between electromagnetic field exposure in electrical workers of the company "X-Electricity" and an increased risk of cancer. Even if a statistical association is observed, it could also be due to incomplete data on other factors in the workplace. For example, electrical workers may have been exposed to chemical solvents with the potential to cause cancer. itself may have suffered from some problem with its design. Therefore, finding an association between some agent and a specific disease does not necessarily mean that the agent caused the disease. Establishing causality requires that an investigator consider many factors. The case for a cause-and-effect link is strengthened if there is a consistent and strong association between exposure and effect, a clear dose-response relationship, a credible biological explanation, support provided by relevant animal studies, and above all consistency between studies. These factors have generally been absent in studies involving electromagnetic fields and cancer. This is one of the strongest reasons why scientists have generally been reluctant to conclude that weak electromagnetic fields have health effects. Difficulties in ruling out the possibility of very small risks"The absence of detrimental effects. Difficulties in ruling out the possibility of very small risks"The absence of detrimental effects. Research Centre Seibersdorf)"There is no convincing evidence for an adverse health effect of electromagnetic fields and cancer has not been reached by expert committees that have been reached by experiments and the reach avoid giving an answer. Then why should research continue if scientists have already shown that there is no effect? The answer is simple: Human health studies are very good at identifying large effects, such as a connection between smoking and cancer. Unfortunately, they are less able to distinguish a small effect from no effect at all. If electromagnetic fields at typical environmental levels were strong carcinogens, then it would have been easy to have shown that by now. By contrast, if low level electromagnetic fields are a weak carcinogen, or even a strong carcinogen to a small group of people in the larger population, that would be far more difficult to demonstrate. In fact, even if a large study shows no association we can never be entirely sure that there is no relationship. The absence of an effect could mean that there really is none. But just as well it could mean that there really is none. But just as well it could mean that there really is none. But just as well it could mean that there really is none. But just as well it could mean that there really is none. But just as well it could mean that there really is none. But just as well it could mean that there is no relationship. difficult situation of all, which unfortunately has developed with epidemiology studies involving electromagnetic fields, is a collection of studies with weak positive results, which however are inconsistent among each other. In that situation, scientists themselves are likely to be divided about the significance of the data. However, for the reasons explained above, most scientists and clinicians agree that any health effects of low level electromagnetic fields, if they exist at all, are likely to be very small compared to other health risks that people face in everyday life. What's in the future? The main aim of WHO's International EMF Project is to initiate and co-ordinate research worldwide to produce a well-founded response to public concerns. This evaluation will integrate results from cellular, animal and human health studies to allow as comprehensive a health risk assessment of a variety of relevant and reliable studies will provide the most reliable answer possible about the adverse health effects, if any exist, of long term exposure to weak electromagnetic fields. One way to illustrate the necessity of evidence from different types of experiments is a crossword's solution with absoluteCERTAINTYnine questions must be answered. Assuming we can only answer three of these, we might be able to quess the solution. However, the three given letters may also be part of a very different word. Every additional answer will increase our own confidence. In fact, science will probably never be able to answer all questions, but the more solid evidence we collect the better will be our guess at the solution. Key points answer will increase our own confidence. there is a mechanism by which electromagnetic field exposure could cause harmful biological effects. Animal studies are essential for establishing effects in higher organisms whose physiology resembles that of humans to a degree. health outcomes in humans. Finding a statistical association between some agent and a specific disease does not mean that there really are none; however, it could also signify that an existing effect is undetectable with present methods. Results of diverse studies (cellular, animal, and epidemiology) must be considered together before drawing conclusions about possible health risks of a suspected environmental hazard. Consistent evidence from these very different types of studies increases the degree of certainty about a true effect What are typical exposure levels at home and in the environment? Electromagnetic fields at homeBackground electromagnetic field levels from electricity transmission and distribution facilities and residential wiring and appliances account for the background level of power frequency electric and magnetic fields in the home. In homes not located near power lines the fields are much stronger. Magnetic flux densities at ground level can range up to several T. Electric field levels underneath power lines can be as high as 10 kV/m. However, the fields (both electric and magnetic) drop off with distance from the lines. At 50 m to 100 m distance the fields are normally at levels that are found at similar locations outside the house. Electric appliances in the household The strongest power frequency electric fields that are ordinarily encountered in the environment exist beneath high voltage transmission lines. In contrast, the strongest magnetic fields at power frequency are normally found very close to motors and other electrical appliances, as well as in specialized equipment such as magnetic resonance scanners used for medical imaging.Typical electric field strengths measured near household appliances(at a distance of 30 cm)(From: Federal Office for Radiation Safety, Germany 1999)Electric field strength (V/m)Stereo receiver180Iron120Refrigerator120Mixer100Toaster80Hair dryer80Colour TV60Coffee machine60Vacuum cleaner50Electric oven8Light bulb5Guideline limit value5000Many people are surprised when they become aware of the variety of magnetic field levels found near various appliances. The field strength does not depend on how large, complex, powerful or noisy the device is. Furthermore, even between apparently similar devices, the strength of the magnetic field may vary a lot. For example, while some hair dryers are surrounded by a very strong field, others hardly produce any magnetic field at all. These differences in magnetic field at evices commonly found in homes and workplaces. The measurements were taken in Germany and all of the appliances operate on electricity at a frequency of 50 Hz. It should be noted that the actual exposure levels vary considerably depending on the model of appliances at various distances Electric appliance3 cm distance (T) 30 cm distance (T) 1 m distance (T) 4000.5 20.02 0.25 Microwave oven 73 2004 80.25 0.6Portable radio 16 561 < 0.01 Electric oven 1 500.15 0.50.01 0.04 Washing machine 0.8 500.15 30.01 0.15Iron8 300.12 0.30.01 0.03Dishwasher3.5 200.6 30.07 0.3Computer0.5 30 < 0.01Refrigerator0.5 1.70.01 0.25