



# Department of Medical Research

## Bulletin

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*The objective of this Bulletin is to disseminate international news about health and medicine, developments, activities in medical and health research in DMR. The Bulletin is published monthly and delivered to township hospitals.*

*The Editorial Committee, therefore, invites contributions concerning information about research activities and findings in the field of medicine and health.*

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### Highlights on Useful Research Findings Applicable to Health

#### **Bridging the Gaps for Delivering Health Messages: Identifying Barriers and Braces for Broadcasting Health Messages through FM Radios**

Frequency modulation (FM) radio which is accessible for the community even in rural areas is an effective channel for delivering health messages. A cross-sectional study was conducted in 2017 to describe process of developing health education programmes by FM radios and current linkage between health service programmes and FM radios; and to identify barriers and possible solutions for broadcasting health messages through FM radios. Total of 208 audio files related to health were collected for one month from nine FM radios. Eleven key informant interviews (KIIs) with programmers from FM radios and focal persons from health literacy promotion unit (HLPU) were conducted. Qualitative data from KIIs and audio files were analyzed with assistance of ATLAS ti version 6.1 software.

All FM programmers mentioned source of health messages as mainly from printed media such as newspaper and magazines. There are three main types of health education programmes — Public Service Announcement, Mini drama/radio play and health talks. FM radios received important health announcements through Myanmar Radio and Television (MRTV). Both programmers from FM radios and respondents from HLPU pointed out weak coordination among them and there was no regular linkage. The most common barrier for FM radios was getting health messages from service programmes regularly and finding speakers for health programmes.

Another limitation from FM radio was sparing air-time if the health talk is long (i.e. more than 15 minutes). Almost all FM radios contact health personnel whom they were acquainting previously to make a health programme such as interview or discussion or health talk. All respondents from FM radios suggested to have updated health messages from health service programmes in time. They highlighted there should be regular communications by emails between health service departments and FM radios. All FM radios are willing to deliver health messages and create health programmes. They also preferred having a book includes key health messages from the Ministry of Health and Sports. Findings from this study were utilized by health literacy and promotion unit for strengthening regular communication with FM radios and sending key health messages to FM Radios by emails.

**ကျန်းမာရေးအသိပညာ ဖြန့် ဝေနိုင်ရေးအတွက် ကွက်လပ်များကိုဖြည့်ဆည်းခြင်း (သို့ မဟုတ်)  
FM ရေဒီယိုများမှ ကျန်းမာရေးသတင်းအချက်အလက်များ ထုတ်လွှင့်နေမှုအတွက်  
အထောက်အပံ့ကောင်းများနှင့် အတားအဆီးများကို လေ့လာသော သုတေသန**

FM ရေဒီယိုများသည် ပြည်သူလူထု အထူးသဖြင့် ကျေးလက်နေ ပြည်သူများပင်လျှင် လက်လှမ်းမီ အသုံးပြုနိုင်သည့်အတွက် ကျန်းမာရေး သတင်းအချက်အလက်များ၊ ကျန်းမာရေးအသိ ပညာများဖြန့် ဝေရန်အတွက် ထိရောက်သော နည်းလမ်းတစ်ခု ပင်ဖြစ်သည်။ FM ရေဒီယိုများမှတစ်ဆင့် ကျန်းမာရေးသတင်း အချက်အလက်များ ထုတ်လွှင့်ရာတွင် ကြုံတွေ့ ရသောအတား အဆီးများ ဖြေရှင်းနိုင်မည့်နည်းလမ်းကောင်းများကို ရှာဖွေဖော် ထုတ်ရန်နှင့် FM ရေဒီယိုများတွင် ကျန်းမာရေး အသိပညာပေး အစီအစဉ်များ စီစဉ် ရေးဆွဲ ထုတ်လွှင့်နေသည့်လုပ်ငန်းစဉ်များ၊ ကျန်းမာရေးစီမံချက်များ/ ဌာနများနှင့် FM ရေဒီယိုများကြား လက်ရှိဆက်သွယ်ဆောင်ရွက်နေမှုပုံစံများကို သိရှိတင်ပြနိုင်ရန် အတွက် လတ်တလောအခြေအနေများကို လေ့လာမှုပြုသည့် သုတေသနတစ်ရပ်ကို ၂၀၁၇ ခုနှစ်အတွင်း ဆောင်ရွက်ခဲ့ ပါသည်။ FM ရေဒီယို ၉ ခုမှတစ်လအတွင်း ထုတ်လွှင့်သော ကျန်းမာရေး နှင့်ပတ်သက်သည့် အသံပိုင် စုစုပေါင်း ၂၀၈ ပိုင်ကို စုဆောင်း၍ ဆန်းစစ်မှုများ ပြုလုပ်ခဲ့ပါသည်။ FM ရေဒီယိုများ ၏ အစီအစဉ် စီစဉ်သူများနှင့် ကျန်းမာရေးအသိပညာမြှင့်တင် ရေးဌာနခွဲမှ တာဝန်ရှိသူများပါဝင်သည့် နှံ့ နှံ့ စပ်စပ်သိရှိသူစုပေါင်း ၁၁ ဦးကိုလည်း အသေးစိတ်မေးမြန်း ဆွေးနွေးခြင်းများလုပ် ဆောင်ခဲ့ပါသည်။

အဆိုပါ မေးမြန်းဆွေးနွေးချက်များမှ ရရှိလာသော အချက်အလက် များနှင့် အသံပိုင်များမှအချက်အလက်များကို ATLAS-Ti အမည်ရှိ ကွန်ပျူတာနည်းပညာအကူအညီဖြင့်ခွဲခြမ်း စိတ်ဖြာမှု များ၊ ဆန်းစစ်မှုများကို ပြုလုပ်ခဲ့ပါသည်။ သတင်းစာနှင့်မဂ္ဂဇင်း ကဲ့သို့သောပုံနှိပ်မီဒီယာ/ စာနယ်ဇင်းများကို ကျန်းမာရေးသတင်း အချက်အလက်များရရှိရာအဓိကအရင်းအမြစ်အဖြစ် FM ရေဒီယို များမှအစီအစဉ်စီစဉ်သူအားလုံးကဖော်ပြခဲ့ကြပါသည်။ ကျန်းမာ ရေးပညာပေးအစီအစဉ်များကို အဓိကအားဖြင့် သုံးမျိုးသုံးစားခွဲ ခြားနိုင်ပြီး အများပြည်သူဝန်ဆောင်မှုများနှင့် ပတ်သက်သော ကြေညာချက်များ (Public Service Announcement)၊ ရေဒီ ယိုဇာတ်လမ်းတို (Mini-Drama/ Radio Play) နှင့် ကျန်းမာ ရေးဟောပြောချက်များ (Health Talks) ဟူ၍ဖြစ်ကြပါသည်။ FM ရေဒီယိုများအနေဖြင့် ကျန်းမာရေးနှင့်ပတ်သက်သည့်အရေး ကြီးသော ကြေညာချက်များကို မြန်မာ့အသံနှင့်ရုပ်မြင်သံကြား (MRTV) မှတစ်ဆင့် ရရှိလေ့ရှိကြပါသည်။ ကျန်းမာရေးအသိ ပညာမြှင့်တင်ရေးဌာနခွဲမှ ဖြေကြားသူများသာမက FM ရေဒီယို

များမှအစီအစဉ် စီစဉ်သူများကလည်း ၎င်းတို့ နှစ်ဦးနှစ်ဖက်ကြား ပူးပေါင်းဆောင်ရွက်မှုများ အားနည်းနေသေးကြောင်း ထောက်ပြ ပြောဆိုခဲ့ကြပြီး ၎င်းတို့ ကြား ပုံမှန် ဆက်သွယ်ဆောင်ရွက်နေမှု များမရှိသေးပါ။ FM ရေဒီယိုများ အများဆုံးကြုံတွေ့ ရသော အခက်အခဲမှာ ကျန်းမာရေးဌာနများ/ စီမံချက်များမှ ကျန်းမာရေး သတင်းအချက်အလက်များကို ပုံမှန်ရရှိသိရှိနိုင်ရန်နှင့် ရေဒီယိုမှ ထုတ်လွှင့်သော ကျန်းမာရေးအစီအစဉ်များအတွက် ပြောကြားပေး မည့် ပညာရှင်များ ရှာဖွေရာတွင်ဖြစ်ပါသည်။ အခြားအခက်အခဲ တစ်ခုမှာလည်း အကယ်၍ ကျန်းမာရေးဟောပြောချက်သည် အချိန်ကြာမြင့်ပါက (၁၅ မိနစ်ထက်ကျော်လွန်ပါက) ထုတ်လွှင့် ချိန်ကို ပိုမိုတိုးမြှင့်ထားရှိပေးရန်အတွက် ကန့် သတ်ချက်များရှိနေ ခြင်းပင်ဖြစ်ပါသည်။ FM ရေဒီယိုအားလုံးနီးပါးသည် ကျန်းမာ ရေးဟောပြောချက် (သို့ မဟုတ်) ကျန်းမာရေးဆွေးနွေးခန်း (သို့ မ ဟုတ်) ကျန်းမာရေးမေးမြန်းခန်းတို့ ကဲ့သို့သော ကျန်းမာရေးအစီ အစဉ် တစ်ခုခုကိုလုပ်ဆောင်နိုင်ရန်အတွက် ကျန်းမာရေးနယ်ပယ် မှ ၎င်းတို့ နှင့်သိကျွမ်းဖူးသော ဆက်ဆံဖူးသောပုဂ္ဂိုလ်များကို ဆက်သွယ်ဆောင်ရွက်လေ့ရှိပါသည်။ FM ရေဒီယိုများမှဖြေကြား သူများအားလုံးက ကျန်းမာရေးဌာန/ စီမံချက်များမှ ခေတ်နှင့် လျော်ညီသော ကျန်းမာရေးသတင်းအချက်အလက်များကို အချိန် နှင့်တစ်ပြေးညီရရှိနိုင်ရန် အဆိုပြုခဲ့ကြပါသည်။ ကျန်းမာရေးနှင့် အားကစားဝန်ကြီးဌာနရှိ ကျန်းမာရေးဌာနများနှင့် FM ရေဒီယို များအကြား အီးမေးလ်အသုံးပြုလျက် ပုံမှန် ဆက်သွယ်ဆောင် ရွက်မှုများ လုပ်ဆောင်သင့်သည်ဟု ၎င်းတို့ က အလေးပေးပြော ကြားထားပါသည်။ FM ရေဒီယိုအားလုံးအနေဖြင့် ကျန်းမာရေး အစီအစဉ်များ ဖန်တီးထုတ်လုပ်ရန်နှင့် ကျန်းမာရေးအချက် အလက်များဖြန့် ဝေပေးရန် စိတ်အားထက်သန်လိုလားကြပါသည်။ ကျန်းမာရေးနှင့်အားကစားဝန်ကြီးဌာနမှ အဓိက ကျန်းမာရေး အချက်အလက်များကို စာအုပ်အဖြစ်ထုတ်ဝေပေးရန် FM ရေဒီယို များကဆန္ဒရှိကြပါသည်။ ယခု သုတေသနမှ တွေ့ ရှိချက်များကို အခြေခံ၍ ကျန်းမာရေးအသိပညာမြှင့်တင်ရေး ဌာနခွဲအနေဖြင့် FM ရေဒီယိုများသို့ အဓိက ကျန်းမာရေးသတင်းအချက်အလက် များကို အီးမေးလ်ဖြင့်ပေးပို့ ခြင်းနှင့် FM ရေဒီယိုများနှင့် ပုံမှန် ဆက်သွယ်ဆောင်ရွက်ခြင်းလုပ်ငန်းများကို အားဖြည့်ဆောင်ရွက် လျက်ရှိပါသည်။

*Reference: Saw Saw, Thanda Linn, Phyu Phyu Aye, et. al. The 46<sup>th</sup> Myanmar Health Research Congress Programme & Abstracts:148. (First Prize for Poster)*

**Abstract of Research Paper Published or Read Abroad by DMR Scientists**

**Application of SYBR Green Chemistry Based Real-time PCR to Quantify Hepatitis B Virus DNA in Chronic Liver Diseases in Myanmar**

Hepatitis B virus (HBV) infection is a major cause of chronic liver diseases worldwide. In addition to genotyping of the virus, quantitative analysis of HBV infection is extensively used for monitoring of disease progression and treatment. Affordable viral load monitoring is desirable in resource-limited setting.

The aim of this study is to develop an in-house real-time PCR based method, which is sensitive and efficient, offering an alternative method to conventional PCR on HBV detection at the Advanced Molecular Research Centre, Department of Medical Research, Myanmar. Core gene encoded in HBV 1.2mer plasmids was used

as HBV-DNA standard. To detect HBV DNA, real-time PCR based on SYBR® Green I chemistry was carried out following proper primer designing and PCR optimization. The core gene contained in the plasmids and clinical specimens were quantitatively measured using with real-time PCRABI7500 (Applied Bio-systems). The detection limit of the assay for the HBV DNA was 14 copies per microliter. Linear standard curve was obtained between  $10^{-2}$  and  $10^{-7}$  DNA ng/ $\mu$ l. None of negative samples showed false positive reactions in duplicate. The coefficient of variation for both intra and inter experimental

variability was carried out. The SYBR® green based detection method for HBV viral load is reliable, accurate, and reproducible.

In addition, the quantification of HBV DNA is useful to monitor the efficacy of anti-HBV therapy as well as to understand the natural history of HBV in the endemic country like Myanmar.

*Reference: Yi Yi Kyaw, Cho HK, Ohmar Lwin, et. al. Poster presented at the 2<sup>nd</sup> International Conference on Molecular Biology and Biotechnology, University of Malaysia, Kuala Lumpur, Malaysia, 1<sup>st</sup>-2<sup>nd</sup> November 2017.*

## News about Medicine & Health

### Chemicals in Meat Cooked at High Temperatures and Cancer Risk

*What are heterocyclic amines and polycyclic aromatic hydrocarbons, and how are they formed in cooked meats?*

Heterocyclic amines (HCAs) and polycyclic aromatic hydrocarbons (PAHs) are chemicals formed when muscle meat, including beef, pork, fish, or poultry, is cooked using high-temperature methods, such as pan frying or grilling directly over an open flame. In laboratory experiments, HCAs and PAHs have been found to be mutagenic—that is, they cause changes in DNA that may increase the risk of cancer.

HCAs are formed when amino acids (the building blocks of proteins), sugars, and creatine (a substance found in muscle) react at high temperatures. PAHs are formed when fat and juices from meat grilled directly over an open fire drip onto the fire, causing flames. These flames contain PAHs that then adhere to the surface of the meat. PAHs can also be formed during other food preparation processes, such as smoking of meats. HCAs are not found in significant amounts in foods other than meat cooked at high temperatures. PAHs can be found in other charred foods, as well as in cigarette smoke and car exhaust fumes.

*What factors influence the formation of HCA and PAH in cooked meats?*

The formation of HCAs and PAHs varies by meat type, cooking method, and “doneness” level (rare, medium, or well done). Whatever the type of meat, however, meats cooked at high temperatures, especially above 300°F (as in grilling or pan frying), or that are cooked for a long time tend to form more HCAs. For example, well done, grilled, or barbecued chicken and steak all have high concentrations of HCAs. Cooking methods that expose meat to smoke or charring contribute to PAH formation. HCAs and PAHs become capable of damaging DNA only after they are

metabolized by specific enzymes in the body, a process called “bioactivation.” Studies have found that the activity of these enzymes, which can differ among people, may be relevant to cancer risks associated with exposure to these compounds.

*What evidence is there that HCAs and PAHs in cooked meats may increase cancer risk?*

Studies have shown that exposure to HCAs and PAHs can cause cancer in animal models. In many experiments, rodents fed a diet supplemented with HCAs developed tumors of the breast, colon, liver, skin, lung, prostate, and other organs. Rodents fed PAHs also developed cancers, including leukemia and tumors of the gastrointestinal tract and lungs. However, the doses of HCAs and PAHs used in these studies were very high—equivalent to thousands of times the doses that a person would consume in a normal diet.

Population studies have not established a definitive link between HCA and PAH exposure from cooked meats and cancer in humans. One difficulty with conducting such studies is that it can be difficult to determine the exact level of HCA and/or PAH exposure a person gets from cooked meats. Although dietary questionnaires can provide good estimates, they may not capture all the detail about cooking techniques that is necessary to determine HCA and PAH exposure levels.

In addition, individual variation in the activity of enzymes that metabolize HCAs and PAHs may result in exposure differences, even among people who ingest (take in) the same amount of these compounds. Also, people may have been exposed to PAHs from other environmental sources, such as pollution and tobacco smoke. Nevertheless, numerous epidemiologic studies have used detailed questionnaires to examine

participants' meat consumption and meat cooking methods to estimate HCA and PAH exposures. Researchers found that high consumption of well-done, fried, or barbecued meats was associated with increased risks of colorectal, pancreatic, and prostate cancer.

*Do guidelines exist for the consumption of food containing HCAs and PAHs?*

Currently, no Federal guidelines address the consumption of foods containing HCAs and PAHs. The World Cancer Research Fund/American Institute for Cancer Research issued a report in 2007 with dietary guidelines that recommended limiting the consumption of red and processed (including smoked) meats; however, no recommendations were provided for HCA and PAH levels in meat.

*Are there ways to reduce HCA and PAH formation in cooked meats?*

Even though no specific guidelines for HCA/PAH con-

sumption exist, concerned individuals can reduce their exposure by using several cooking methods:

- Avoiding direct exposure of meat to an open flame or a hot metal surface and avoiding prolonged cooking times (especially at high temperatures) can help reduce HCA and PAH formation.
- Using a microwave oven to cook meat prior to exposure to high temperatures can also substantially reduce HCA formation by reducing the time that meat must be in contact with high heat to finish cooking.
- Continuously turning meat over on a high heat source can substantially reduce HCA formation compared with just leaving the meat on the heat source without flipping it often.
- Removing charred portions of meat and refraining from using gravy made from meat drippings can also reduce HCA and PAH exposure.

Source: <https://www.cancer.gov>.

Contributed by Biological Toxicology Research Division

### **Even New Birth Control Pills may Raise Women's Breast Cancer Risk**

Using hormonal birth control methods — including newer types of birth control pills, as well as intrauterine devices (IUDs) and implants — may slightly increase women's risk of breast cancer, according to a new study from Denmark. The study builds on earlier findings linking hormonal birth control and breast cancer, but the new study focused on newer forms of birth control.

The study, which included about 1.8 million women in Denmark, found that those who used hormonal birth control methods were 20 percent more likely to develop breast cancer over an 11-year period, compared with those who never used hormonal birth control. Still, a woman's overall chance of developing breast cancer linked to hormonal birth control use was quite small: The researchers estimate that there would be 1 extra case of breast cancer for every 7,690 women who took hormonal contraception (or 13 extra cases of breast cancer for every 100,000 women who used hormonal contraception).

When the researchers examined a number of different hormonal formulations used in birth control, they found that all of the formulations raised the risk of breast cancer by about the same amount. (Hormonal birth control methods typically use either a combination of the hormones estrogen and progesterin, or progesterin by itself.)

*Not a "new" link*

The findings of a link between hormonal contraception and breast cancer is not new; studies going back decades have suggested that the hormones in birth control could raise the risk of breast cancer. But these

earlier studies looked mainly at older types of birth control pills, which had a higher dose of estrogen than today's pills. Therefore, it wasn't clear if this risk applied to newer formulations of birth control pills or to other birth control methods, including intrauterine devices (IUDs) and implants that contain only the hormone progesterin.

The new study "confirms that the increased breast cancer risk ... that was initially reported with the use of older, often higher-dose formulations also applies to contemporary formulations" of birth control, David Hunter, a professor of epidemiology and medicine at Oxford University's Nuffield Department of Population Health in the United Kingdom, wrote in an editorial that accompanied the study. "These results do not suggest that any particular preparation is free of risk," Hunter added. But this risk should be weighed against the important benefits of hormonal contraception, which is an effective method of birth control, the researchers, from the University of Copenhagen, wrote in their study. What's more, other studies have found that taking hormonal birth control may actually reduce the risk of other cancers, including ovarian cancer, endometrial cancer and colorectal cancer, they said.

*Risk with longer use*

The new study involved women in Denmark ages 15 to 49 who had not previously been diagnosed with cancer. The researchers used nationwide registries to collect information about prescriptions that were filled for hormonal contraception, as well as diagnoses of breast cancer. The longer women used hormonal contraception, the greater their risk of breast cancer,

the researchers found. Using hormonal contraception for less than one year did not increase women's risk of breast cancer. However, using hormonal contraception for 10 years was linked with a 40 percent increase in the risk of breast cancer, compared with those who had never used hormonal contraception.

Once women stopped using these forms of birth control, the increased risk of breast cancer disappeared if the women had used hormonal contraception for less than five years. But if they had taken hormonal contraception for more than five years, the higher risk of breast

cancer persisted for at least five years after their discontinuation of hormonal birth control, the study found.

The findings held even after the researchers took into account some factors that can affect the risk of breast cancer, such as becoming pregnant or having a family history of the disease. But the study did not account for some other things that affect breast cancer risk, including physical activity levels and alcohol consumption.

Source: <https://www.livescience.com.mm>.

Contributed by Blood Research Division

## World's Top 10 Toxic Pollution Problems

Every day synthetic, toxic chemicals are released into the environment. It affects our water, land and air. Water is our most vital resource but also our most threatened. Without water, there is no life. Our land is where we live and thrive upon. The air is what we breathe; what travels through the air is what we inhale. As it ultimately affects the future of our planet and us, it is considered to be a global threat at huge cost to the environment. The toxic pollution problems discussed below impacts more to the people who live near to the sources of pollution. These pollutants may cause serious health effects such as birth defects, development disorders, respiratory problems, cancer and in some cases can lead to death. Apart from this, it can also have adverse effect on wildlife and environment.

Here is a list of the Top 10 Toxic Pollution Problems our world faces today, in no particular order:

### 1. Lead-acid battery recycling

These rechargeable batteries are composed of lead plates and sulphuric acid in a plastic case. The battery recycling business is a very large industry, and although it aims to reduce the number of disposable batteries as solid waste, batteries contain a high number of toxic metals and chemicals like lead oxide that lead to the pollution of our water and contamination of soil.

### 2. Mercury and lead pollution from mining

More than two million people globally are affected by mining and ore processing. These mining sites provide various minerals and metals to produce variety of products and minerals. The most hazardous chemicals that are found near these sites are lead, chromium, asbestos, arsenic, cadmium and mercury.

### 3. Coal mining (sulphur dioxide and mercury pollution)

Though it's often overlooked, the high levels of mercury in the air are a serious threat to human health. Originating from power plants fired by coal, many of which are located very close to large urban areas and cities in America. It can also travel excep-

tionally far (as in thousands of miles) through the air. Mercury is extremely damaging to human health as it severely damages the brain and nervous system when inhaled or made contact with. It is also estimated that a high percentage of pregnant woman in America are affected by high mercury levels that affect a foetus's brain development. All in all, mercury is one of the most deadly toxic pollutants in the air.

Not only is Sulphur Dioxide (SO<sub>2</sub>) a substantial pollutant in our air and a direct result of coal power plants, it is also one of the causes of some serious health problems. It can be a root cause of lung cancer, asthma, emphysema, and bronchitis. As a result, thousands of people are tragically hospitalized or die each year. It is seriously toxic to human health. SO<sub>2</sub> originates primarily from fossil fuel combustion at power plants and coal power plants.

### 4. Artisanal gold mining (mercury pollution)

The production process of retrieving gold from mined ores releases more mercury than any other global sector. The mining process is usually done in the open air, putting people living nearby at risk either through contaminated water or soil. The vaporized mercury is a potent neurotoxic element that causes development disorders and affects the central nervous system.

### 5. Lead smelting

Each year millions of people are affected by the toxic chemicals, primarily iron, limestone, pyrite and zinc that are released into the air by the dozens of lead smelting sites around the world. Lead smelting uses furnaces and other chemical agents to remove impurity from lead ores.

### 6. Pesticides pollution from agriculture and storage

Pesticides are substances necessary for agriculture to destroy targeted pests. An approximate 2 million metric tonnes of pesticides are used annually on fields. As a result, millions of tons of pesticides are dumped every year on our fields. Unfortunately, the health effects pesticides have on us are disastrous,

from simple skin irritation to hurting to nervous system to even causing cancer. Apart from this, stockpiles of old and outdated pesticides add to the trouble. Most of the farmers are illiterate and use expired products. An estimated six to nine million metric tonnes of such pesticides are improperly stored.

7. Arsenic in ground water

Arsenic in Ground Water is naturally occurring pollution problem that affects some 750,000 people, mostly in south Asia. Contaminated ground water is still used by many people which can lead to cancer, blood vessel damage, abnormal heart beat and some other ill effects.

8. Industrial waste water

Waste water is water that has been harmfully affected by outside influence and that flows from an open drain. Waste water may or may not be affected by any of the following, but certainly not limited to, batteries, smelting, toxins, organic particles, pathogens, methane and carbon dioxide. This water ends up in the environment where it is much more harmful to humans than irrigation water.

9. Chromium pollution (dye industry)

Believe it or not, the dye industry actually contains numerous health hazards. Dye is used to add color to material, but the additions they have to pollution are more than noticeable. While chromium, which is used in dye, is critical to the human diet and generally speaking causes no damage to the human body, Cr IV Chromium is dangerous and highly toxic, enough to cause death in humans.

10. Chromium pollution (tanneries)

Chromium is primarily used to turn animal hides into leather for consumers, in places called tanneries, which are primarily centered in South-East Asia. Such tanneries are still operating with little control and produce daily 7.7 million litres of waste water and 88 million tons of solid waste. Again, Cr IV is dangerous and can cause health problems as in respiratory and heart failure and cancer in the brain and kidneys.

Source: <https://www.conserve-energy-future.com/top-10-worst-toxic-pollution-problems.php>.

Contributed by Chemical Toxicology Research Division

- Recent Arrivals at Central Biomedical Library (<http://www.dmrlibrary.org>)**
1. ACP Annals of Coloproctology. 2017 December; 33(6).
  2. Antibiotic Resistance/ပဋိဇီဝဆေးယဉ်ပါးခြင်း။ Yangon: WHO/MOH; 2017.
  3. Circulation Journal. 2018 February; 82(2).
  4. Progress towards Myanmar's Sustainable Development Goals. Yangon: AMI/MISIS/YU; 2017.
  5. WHO South-East Asia Journal of Public Health. 2017 September; 6(2).

ဆေးသုတေသနဦးစီးဌာန၏ လုပ်ငန်းဆောင်ရွက်နေမှုများကို ပြည်သူများပိုမိုသိရှိလာစေရန်၊ ပြည်တွင်းရှိ ဌာနဆိုင်ရာအဖွဲ့ အစည်းများ ပြင်ပအဖွဲ့ အစည်းများနှင့် ဆက်သွယ်ဆောင်ရွက်ရာ၌ ပိုမိုလွယ်ကူစေရန်၊ ပြည်ပနိုင်ငံများရှိ တက္ကသိုလ်များ၊ အဖွဲ့ အစည်းများနှင့် ပူးပေါင်းဆောင်ရွက်ခြင်းကို လွယ်ကူစေရန်နှင့် နိုင်ငံတော်တွင် တိုးတက်ဖြစ်ပေါ်လာမည့် ဆက်သွယ်ရေး ကွန်ရက် အခြေခံအောက်အင်္ဂါ (Network Infrastructure) အား အသုံးပြု၍ e-government ဆိုင်ရာ လုပ်ငန်းများကို တိုးမြှင့်ဆောင်ရွက်သွားနိုင်ရန် ရည်ရွယ်လျက် လွှင့်ထူထားသော အောက်ဖော်ပြပါ Website များကို သုတေသီပညာရှင်များ၊ ကျန်းမာရေးဝန်ထမ်းများနှင့် စိတ်ပါဝင်စားသူများ လေ့လာနိုင်ပါသည်။

၁။ [www.dmrlm.gov.mm](http://www.dmrlm.gov.mm) (Official Website)  
 ၂။ [www.ercdmrlm.org](http://www.ercdmrlm.org) (Ethical Website)  
 ၃။ [www.dmrlibrary.org](http://www.dmrlibrary.org) (Central Biomedical Library Website)  
 ၄။ [www.dmr-um.gov.mm](http://www.dmr-um.gov.mm) (Pyin Oo Lwin Branch Website)  
 ၅။ [www.myanmarhsrj.com](http://www.myanmarhsrj.com) (Myanmar Health Sciences Research Journal Website)  
 ၆။ [www.mhrr-mohs.com](http://www.mhrr-mohs.com) (Myanmar Health Research Registry Website)

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