With the summer fast-approaching, many outdoor activities put on hiatus during the winter months will again become popular. However, humans are not the only creatures going outdoors on a warm, sunny day. Insects such as mosquitoes, gnats, biting flies, chiggers, fleas and ticks can ruin an otherwise pleasurable excursion. Aside from being annoying, these pests can spread disease. In the United States, mosquito bites have been linked to the spread of both West Nile virus and St. Louis encephalitis. Ticks can transmit Lyme disease and Rocky Mountain spotted fever. Insect bites can also lead to painful areas of irritation that may become infected. Therefore, to prevent the pain and discomfort associated with insect bites as well as transmission of other diseases, proper protection is of the utmost importance. Prevention involves both the use of chemical repellents as well as non-chemical methods. Remember, stinging insects such as bees, wasps, and hornets are not affected by standard insect repellents.

**Types of Repellents**

**DEET:** N,N-diethyl-m-toluamide (DEET), now known as N,N-diethyl-3-methylenbazamide, is the most common insect repellent used in the United States. The United States Department of Agriculture (USDA) developed this product in 1946 for use by the military. In 1957, it became available to the general public. It is estimated that 30-40% of the U.S. population uses DEET products annually. DEET works by blocking an insect's ability to recognize the scent of a person wearing the repellent.

DEET is available in concentrations ranging from 5-100%. These concentrations provide protection from bites for 1-12 hours, with higher concentrations yielding a longer duration of activity. Concentrations between 10-30% usually provide sufficient protection and little benefit results from applying concentrations greater than 50%. DEET is sold in a variety of different preparations including lotions, gels, aerosols, solutions, and wristbands. While there have been reports of suspected adverse effects linked to the use of DEET, most have been related to excessive application or accidental ingestion of the repellent. DEET is recommended as the repellent of choice by the American Academy of Pediatrics (AAP), the Food and Drug Administration (FDA), and the Environmental Protection Agency (EPA). Additional information on the use of DEET and other repellents in children is included in the accompanying table.

**Picaridin:** Picaridin is an alternative to DEET and has been widely used in Europe and Australia. It was introduced into the United States market in 2005. A study comparing 19.2% picaridin to 35% DEET found the two to be similar in efficacy and duration of action. People might prefer picaridin to DEET because it is odorless, less irritating to the skin, less greasy, and does not damage plastics or fabrics. Like DEET, picaridin blocks the insect's ability to recognize human odor. Picaridin is available in this country as both an aerosol spray and a towelette wipe and is manufactured in concentrations.
INSECT REPELLENTS: Itching For Relief

of 7% and 14%. The higher concentration provides effects lasting up to eight hours.

**PMD:** p-Menthan-3,8-diol (PMD) is a lemon and eucalyptus oil-based insect repellent. It has been a popular preparation in China for over 20 years. The mechanism by which PMD prevents insect bites is unknown. It provides protection for an average of 90 minutes and is usually applied twice daily. PMD is only available as a 10% lotion. Although this plant derivative is usually well-tolerated, accidental application to the eye can result in significant irritation.

**IR3535:** IR3535 is a synthetic repellent and has been used in Europe for over 20 years. It was marketed in the U.S. in 1999. The mechanism by which IR3535 protects against insect bites is not fully understood. In comparison to other repellents, IR3535 has a very short duration of protection that may only last for 30 minutes. IR3535 products are manufactured in strengths of 7.5-15% and are available in the form of an aerosol pump, a pump spray, and lotion.

**Citronella:** Citronella is derived from a grass found in tropical Asia. It has been used for over 50 years in the U.S. and has become a popular alternative to DEET. Citronella products tend to be the most costly of the insect repellents. It works by masking the human odors that attract insects. Citronella provides short-term (2-20 minutes) protection against mosquitoes and requires frequent application. It is not effective against ticks. Products range in concentration from 0.05-25% and are available as sprays, towelette wipes, oil and wristbands.

**HELPFUL TIPS FOR APPLYING INSECT REPELLENTS**

- Read and follow all directions and precautions on the product label
- Do not use over cuts, wounds or irritated skin
- Do not apply to eyes, mouth or hands; use sparingly around ears
- Have an adult apply repellent to children
- Do not use under clothing
- Do not spray repellents near food or open flames
- Use just enough repellent to cover exposed skin
- After returning indoors, wash skin with soap and water
- Wash all clothing exposed to the repellent prior to next wear

Insect repellents are available under a wide variety of brand names including Off, Cutter, Skin So Soft and Bug Block. The consumer should be aware that the different formulations available under a given brand name may not contain the same ingredient(s) or concentration. As stated earlier, DEET containing repellents are recommended by most medical organizations and federal agencies as the preferred products for preventing insect bites.

**OTHER MEANS OF PROTECTION FROM INSECT BITES**

While chemical repellents provide effective protection from insect bites, there are several alternatives to keep bugs away. These include deterring insects by using appropriate clothing, removing standing water, and others. Appropriate use of these methods plus proper application of insect repellents can contribute to a much more pleasant outdoor season.

**Suggested Protective Clothing**

- Long-sleeved shirts
- Socks
- Long pants (consider tucking pants into socks)
- Light-colored clothing
- Full-brimmed hats
- Mosquito nets

**Ways to Remove Standing Water**

- Unclog roof gutters
- Empty wading pools at least once a week
- Change water in bird baths at least weekly
- Regularly drain water that collects in fire pits

**Miscellaneous Methods of Prevention**

- Electronic insect control systems (i.e., bug zappers)
- Citronella-scented candles
- Yellow bug-lights in place of regular outdoor lighting

**INSECT REPELLENT USAGE IN CHILDREN**

<table>
<thead>
<tr>
<th>TYPE OF REPELLENT</th>
<th>RECOMMENDED FOR CHILDREN</th>
<th>ADDITIONAL INFORMATION</th>
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<tr>
<td>DEET</td>
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<tr>
<td>Picaridin</td>
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<td>PMD</td>
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<tr>
<td>Citronella</td>
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</tbody>
</table>

For more information on insect bites and repellents, visit the following Web sites:

- [http://www.aap.org/publiced/BR_Repellents.htm](http://www.aap.org/publiced/BR_Repellents.htm)