There are currently no substitutes for donated blood in the United States. Blood substitutes may be called “artificial blood” or “synthetic blood” because the products are made in a laboratory. Developing blood substitutes is difficult. Since the 1980s, researchers have tried to produce a safe blood substitute. Several novel blood substitutes are in development. These blood substitutes may be able to replenish blood loss and save lives in the future.

The problem with blood substitutes is that nothing acts exactly like blood. Because blood is so complex, no single blood substitute can do everything that donor blood can.

Currently, blood substitute products are not as safe as donated blood. The frontrunner blood substitute in development causes a 30% increase risk of death and a 171% increase risk of heart attack. Because of these concerns, the U.S. Food and Drug Administration (FDA) has declined approval of this potential blood substitute until it can be made more safe.

Traditional blood transfusions have their own safety issues. Donated blood can transmit infections, although this is rare. The rate of human immunodeficiency virus (HIV) infections from blood transfusions are estimated to be 1 infection per 185,000 transfusions. Transmission of hepatitis C (HCV) occurs in 1 transfusion per 300,000-600,000 transfusions.

Blood is labeled as A-type, B-type, AB-type, or O-type. If the donor’s blood-type does not match, the person receiving the transfusion may become sick or possibly die.

Donated blood is fresh under refrigeration for 42 days before expiring. This short time frame is the major reason the need for donated blood is so high. Donated blood needs to be replaced frequently, limiting availability.

The Benefits of Blood Substitutes
- Blood type is not an issue
- Blood substitutes have the potential to save lives. The technology to produce viable blood substitutes is available, but the final hurdle is safety. Until blood substitutes are safer, donated blood will still be needed for blood replenishment.

You can help. Donate blood today!

By Markpaul Santos, PharmD Candidate

REFERENCES:
Cinqair® (reslizumab) was approved in March 2016 as an add-on maintenance therapy for severe asthma in adult patients.  

Reslizumab should not be used for an acute asthma attack. Reslizumab decreases the response of eosinophils involved with the inflammation process in asthma. It does so by binding onto interleukin-5 (IL-5) and preventing IL-5 from activating eosinophils. Reslizumab is not indicated for the treatment of other eosinophilic conditions.¹

Reslizumab is given as an IV infusion over 20-50 minutes every 4 weeks.¹ The recommended dose is 3 mg/kg. The manufacturer has no recommendations for dose adjustments due to hepatic or renal impairments. In addition, potential drug interactions with reslizumab have not been studied.¹

Reslizumab causes oropharyngeal pain (2.6% of patients in clinical studies). Serious adverse effects reported with reslizumab include anaphylaxis (0.3%) and malignant neoplasm (0.3%).¹

Pregnancy data with reslizumab is lacking so the risks of birth defects and miscarriages are unknown. Reslizumab can cross the placenta and has a potential to affect the fetus, so this should be considered when prescribed in women of child-bearing potential.¹

Reslizumab improved FEV₁ compared to placebo in patients with high eosinophil counts and poorly controlled asthma.² This randomized, double-blind study enrolled 869 patients who received either reslizumab (n=394) or placebo (n=97) for 16 weeks. Overall, reslizumab nonsignificantly increased the FEV₁ by 68 mL when compared to placebo (p=0.17). In patients with eosinophil counts ≥ 400 cells/microL (69 on reslizumab; 13 on placebo), FEV₁ was 270 mL greater in the reslizumab group (p=0.04). The only quality of life measurement which improved with reslizumab was the asthma control questionnaire (ACQ-7). Reslizumab was well tolerated in this study. Limitations included the small number of patients with eosinophil counts ≥ 400 cells/microL, so the impact of reslizumab treatment in this population may not be generalizable to other patients.

Because of the short duration of the study, the long-term adverse effects of reslizumab are unknown. Potential bias due to funding by the manufacturer may have affected the results and interpretation.²

Patients with poorly controlled asthma and eosinophil counts ≥ 400 cells/microL may benefit from treatment with reslizumab. However, more studies are needed to determine if reslizumab is safe and effective in other populations.

**By Pochua Vang, PharmD Candidate**

**REFERENCES:**


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**Travel Tips References**


What is Seasonal Affective Disorder?

Seasonal affective disorder (SAD) is a type of serious depression that fluctuates with the changing of seasons. Most people suffer from symptoms during the winter and improve in the spring, but some people have symptoms that get worse during the summer. A less severe form of SAD, called subsyndromal seasonal affective disorder (S-SAD), is commonly known as the “winter blues.”

What causes SAD?

There are several ideas about what causes SAD, but the exact cause remains unknown. Studies show that it is probably a combination of the following factors:

A. Low Serotonin—Serotonin is a brain chemical that plays a key role in balancing mood. Low serotonin levels are a common problem in people suffering from depression. During the summer, sunlight exposure prevents too much serotonin from being broken down. In the winter, too much serotonin is broken down, leading to lower serotonin levels compared to summer.

B. Too Much Melatonin—Melatonin is a brain chemical which is produced in response to low light levels and causes sleepiness. As winter days get shorter, more melatonin is produced in the brain. Excess melatonin causes greater mental and physical tiredness in people with SAD.

C. Wake-Sleep Cycle Issues—Your body’s internal 24-hour clock (AKA circadian rhythm) normally helps you respond to changing light levels. A normal circadian rhythm helps you fall asleep at night and wake up in the morning. Circadian rhythms change with the seasons. People who have low serotonin and high melatonin levels (like some people with SAD) can have problems adjusting their circadian rhythm to the changing season. This can lead to daytime tiredness and trouble falling asleep at night.

D. Low Vitamin D—Your body produces vitamin D when your skin is exposed to sunlight. In the winter, when the days are shorter and people wear more layers of clothing, most people produce less vitamin D. Vitamin D may help control serotonin levels. Low vitamin D levels are connected to depression in some people.

What are the symptoms of SAD?

SAD symptoms focus on depressed mood and low energy levels, especially in the winter. Other symptoms of SAD that get worse in the winter include:

- irritability (moodiness)
- frequent crying
- trouble focusing
- sleeping more than usual
- less physical activity
- avoiding people
- carbohydrate (sugar) cravings
- weight gain from overeating

In SAD during the summer, symptoms center on irritability and include:

- weight loss from poor appetite
- insomnia
- restlessness
- anxiety
- agitation (anger)
- violent behavior

SAD symptoms are severe enough to affect a person’s daily routine. S-SAD (or “winter blues”) symptoms are usually noticeable, but do not affect the person’s everyday life as severely as SAD symptoms.

Treatment Options for SAD

If you are concerned that you or a loved one may be suffering from SAD or S-SAD, you should talk to your health care provider first. Your provider may recommend counselling and/or prescribe antidepressant medications depending on how much SAD or S-SAD affects your daily life. There are also treatments you can safely try at home, although they should never replace talking to a health care professional.

- Light Therapy—Light therapy helps to replace the sunlight lost as winter days become shorter. You can buy lights meant to mimic the sun, called “Happy Lights”, at most stores as winter approaches. These lights include simple instructions on starting low-intensity light therapy in your own home. Light therapy shows the strongest effect on SAD symptoms when used early in the morning every day. Side effects of light therapy are mostly related to eyestrain from bright light, but irritability is another common emotional side effect.

- Vitamin D—People can get vitamin D from their diet or from the sun. If you live north of the 33rd parallel, your body cannot produce enough vitamin D from sunlight between November and February. Vitamin D supplements are your best option for getting enough in your diet. Taking vitamin D as winter approaches may help improve SAD or S-SAD symptoms.

By Sean Collins, PharmD Candidate

REFERENCE:

The Zika virus (ZIKV) is primarily spread through the bite of an infected *Aedes* mosquito.¹⁴ ZIKV was originally discovered in the Zika forest of Uganda in 1947. Prior to 2007, 14 cases of ZIKV were reported in humans.¹ In May 2015, many cases of the ZIKV emerged in Brazil and quickly spread throughout the country. An estimated 440,000—1,300,000 cases were suspected by the end of 2015.² As ZIKV begins to adapt to densely populated urban environments, the health threat becomes greater. This is due to human transmission and amplification of the virus through the mosquito vector.³

**Diagnosis and Clinical Evaluation**

The clinical presentation of ZIKV disease is very similar to other viral infections like dengue, chikungunya, leptospirosis, malaria, rickettsia, group A *Streptococcus*, rubella, measles, parvovirus, enterovirus, adenovirus, and alphavirus.⁵ As a result of these similarities, the diagnosis of ZIKV disease is difficult.⁴,⁵ Initial diagnosis is based on the clinical signs and symptoms, dates and places of travel, and the patient’s recent activities.³

The signs and symptoms of ZIKV disease occur 3—12 days after the patient is bitten by an infected mosquito.³ The signs and symptoms are usually mild to moderate and include fever, maculopapular rash, arthralgia, conjunctivitis, myalgia, and headache.²,³ Symptoms often resolve 2-7 days after onset.³

**Diagnostic Testing**

A reversed transcriptase-polymerase chain reaction (RT-PCR) can be performed on the serum 7 days after becoming infected with ZIKV or a week after the onset of symptoms.²,³,⁶ This test is highly specific and sensitive for detecting the ZIKV. A positive RT-PCR indicates a ZIKV infection. If serum is collected ≥5 days after the onset of symptoms, a negative RT-PCR does not rule out infection.

ZIKV-specific immunoglobulin M (IgM) antibodies can be detected 4 days to 12 weeks after the onset of symptoms.² IgM testing is not specific, and due to cross-reactivity with related viruses, it can be difficult to differentiate ZIKV from the other viruses. A positive IgM result should be followed up with a plaque reduction neutralization test (PRNT). PRNT will help discriminate ZIKV from other viruses by measuring the virus-specific neutralizing antibodies.²,⁶

These available diagnostic tests are currently only available at centralized laboratories, like the CDC.⁶

**Clinical Management**

Currently, there is no specific antiviral treatment for the ZIKV.³,⁷ Supportive, symptom-directed care is the recommended treatment for ZIKV, such as fluids for dehydration. Until dengue fever can be ruled out, acetaminophen should be used instead of NSAIDs and aspirin due to the potential increased risk of bleeding.⁵,⁷

The ZIKV has been linked to inducing Guillain-Barre Syndrome (GBS) and other neurological autoimmune disorders.⁴,¹¹ The need for intensive care may be warranted in patients at risk for these specific disorders.⁴

Patients should prevent mosquito bites during the first week of infection. During this time, the ZIKV is still present in the blood and it can be passed to a mosquito through a mosquito bite.³,⁷

**Transmission**

The main route of ZIKV transmission is a mosquito bite. ZIKV is carried specifically by the *Aedes* species of mosquito. Mosquitoes become infected with the ZIKV when they feed on an infected human.¹⁴

⇒ Mother to Child

A pregnant woman can pass the ZIKV to her fetus due to the virus’ ability to cross the placenta.²,⁴,⁸ Studies are being conducted to determine the relationship between the virus and adverse pregnancy and infant outcomes. A mother may also pass the virus to her infant during delivery if she recently became infected with the ZIKV. ZIKV transmission through breastfeeding has not been reported at this time. However, the virus has been detected in breast milk and related viruses are known to be transmitted through breast milk, so caution is warranted in lactating women infected with ZIKV.²,⁴,⁸

⇒ Sexual Transmission

ZIKV is transmitted sexually through a man’s semen.⁹ The transmission can occur either before, during, and after the man has experienced symptoms because the virus is present in semen longer than in blood. Men infected with the ZIKV should use a condom or abstain from sex for at least six months after the onset of illness. Men who have traveled to an area with active ZIKV should use condoms or abstain from sex for at least six months after leaving the area with ZIKV.⁹

⇒ Blood Transfusion

Although transmission of ZIKV through blood transfusions has not been confirmed,⁵ several cases in Brazil are being investigated for this possibility. There is still a concern of transmission through blood transfusions due to the presence of the virus in blood.⁴,⁸

⇒ Other

ZIKV DNA has been detected in both the saliva and urine of patients 2-3 weeks after symptoms occurred. At this time, however, neither saliva nor urine are believed to transmit the virus.⁴

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**Zika Virus in**: Continued on Page 5
Zika Virus (cont.)

pregnancy

ZIKV can be transmitted from mother to child during pregnancy. The frequency of adverse outcomes due to congenital ZIKV is still unknown due to limited information. Microcephaly is one of the possible conditions associated with fetal ZIKV infection.

Before 2015, between 150—200 cases of microcephaly were reported in Brazil. Since the emergence of the ZIKV, the number of suspected microcephaly cases in newborns is greater than 5000. The actual number of microcephaly cases may be lower due to over-reporting and the lack of a standard definition of microcephaly.

Other congenital anomalies that may be associated with ZIKV include brain atrophy and asymmetry, hydraencephaly, ventriculomegaly, cerebral calcifications, abnormally formed brain structures, bilateral cataracts, intraocular calcifications, and hydrops fetalis.

ZIKV infected developing brain cells in vitro in 2 independent studies. Three days after exposure, ZIKV infected 85% of cultured brain cells in one of the studies. The infected brain cells grew more slowly and had abnormal cell division compared to normal brain cells. Other cultured cells were also exposed to ZIKV, but less than 10% were infected after 3 days. Analysis of fetuses exposed to ZIKV also found that the virus was present only in the brain, which supports the study’s results.

Conclusion

ZIKV is thought to be the cause of microcephaly cases in Brazil, as well as other neurological disorders such as Guillain-Barre syndrome. Preventative measures against mosquito bites are recommended in areas where ZIKV is endemic.

By Erica Hoversland, PharmD Candidate

REFERENCES:

Lemtrada® (alemtuzumab) is an effective immunomodulatory therapy for patients with relapsing-remitting multiple sclerosis (RRMS). Alemtuzumab can reduce relapse rates, improve disability scores, and extend the interval between relapses. As a result, alemtuzumab has the potential to be a new first-line option for patients newly diagnosed with RRMS, as well as patients with RRMS who have relapsed despite previous treatment with conventional first-line therapies.

Alemtuzumab is a monoclonal antibody that targets the CD52 glycoprotein on the surface of T and B lymphocytes. Alemtuzumab reduces the number of these lymphocytes, which results in long-term changes in adaptive immunity.

Alemtuzumab is given intravenously in two courses. The first course is an infusion of 12 mg/day for five consecutive days (total dose 60 mg). Premedication with methylprednisolone is required for the first three days immediately prior to infusion to decrease the incidence of infusion site reactions. Herpes zoster prophylaxis with acyclovir is also recommended for two months after the completion of the first course of treatment. The second course of alemtuzumab is given twelve months after the first course. The dose is the same as the first course (12 mg/day), but alemtuzumab is only given for three consecutive days (total dose 36 mg). Premedication with methylprednisolone and prophylaxis against herpes zoster infections are also required with the second treatment course.

The most common adverse effects of alemtuzumab are infusion-related and include rash (53%), itching (14%), and flushing (10%). Gastrointestinal side effects were also noted in clinical studies; nausea (21%), and diarrhea (12%) occurred most frequently. Alemtuzumab can also cause neurological adverse effects such as headache (53%) and insomnia (16%).

Alemtuzumab was more effective than interferon beta-1a (IFβ-1a) at slowing disease activity in patients with early RRMS in one phase 2 trial. Three hundred twenty-two patients with RRMS were randomized to receive either IFβ-1a 44 mcg three times a week or 2 treatment courses of alemtuzumab 12 mg/day or 24 mg/day. The sustained accumulation of disability (SAD) was reduced by 70.9% (95% CI 46.1-84.3%; p=0.001) with alemtuzumab when compared to IFβ-1a. The rate of relapse decreased by 73.6% with alemtuzumab doses (95% CI 57.9-83.5%; p=0.001). Because of the limited population, the results of this study may not be generalizable to other patients with RRMS.

Relapse rates were lower with alemtuzumab when compared to IFβ-1a in treatment-naive patients with RRMS. CARE-MS I, a phase 3 trial, supported previous studies which found that alemtuzumab was more effective than IFβ-1a. The alemtuzumab group had more relapse-free patients at 2 years than the IFβ-1a group (77.6% vs. 58.7%; p<0.0001). While the incidences of infection and infusion site reactions were higher in the alemtuzumab group than the IFβ-1a group, the rate of discontinuation due to adverse events was higher in the IFβ-1a group (6% versus 1%). The lack of blinding in the study may have biased the results.

Alemtuzumab also offers an effective immunotherapy option for patients with RRMS who have relapsed despite first-line treatment options. The CARE-MS II trial compared alemtuzumab with IFβ-1a in RRMS patients who had relapsed while taking IFβ-1a or glatiramer. Alemtuzumab reduced the risk of sustained accumulation of disability by 48% when compared to IFβ-1a (p=0.0084). Alemtuzumab also produced a net benefit in the expanded disability status scale (EDSS) of 0.41 when compared to IFβ-1a (p<0.0001). However, these results may not apply to patients with advanced disease (study patients had RRMS for an average of 4.5 years) or to those who received multiple treatments (most study patients had only used one previous MS drug).

Alemtuzumab is more effective than interferon beta-1a at reducing disability in patients with RRMS. In addition, the annual treatment cycle offers an alternative to more frequent treatments. Long-term efficacy and safety of alemtuzumab are unknown and still need to be studied.

By Matthew Colby, PharmD Candidate

REFERENCES:


Before traveling abroad, you need to be prepared on how to prevent and treat illness and injuries in an international country.

**Vaccinations**

Some international countries require specific vaccinations to enter the country. Visitors need to carry an International Certificate of Vaccination or some other proof that they have had the vaccinations and medical tests required to enter the country. Each country has different requirements so it is important to know which vaccines are needed or recommended for each country you plan to visit. Good resources to find out more about travel vaccines include your healthcare provider and the Center for Disease Control and Prevention’s Web site on Traveler’s Health (http://wwwnc.cdc.gov/travel/).

**Before You Travel**

Four to six weeks before your trip, you should visit either a travel medicine specialist or a provider with travel medicine experience. This visit is important for you to find out any health recommendations for your trip. You should also ask questions about travel health during the visit. Important information to give your provider at this visit:

- The countries you are visiting
- The length of your trip
- The type of activities you will be doing
- Details about your past/current medical history

Useful resources to help you find a provider include your public health department, private travel clinics, and the yellow fever vaccination clinic registry.

**International Health Insurance**

Many U.S. health insurance providers do not cover international medical services. It is important to check with your insurance company about international health coverage before your trip. Your insurance companies may cover some international medical costs, but most companies will not pay for your trip back to the US in the event of an emergency. If your insurance does not have any international coverage, you can purchase a short-term policy that will cover international health care expenses, including emergency services. **NOTE: Medicare, Medicaid, and Social Security do not provide coverage outside of the United States.**

**Prescription Medications**

If you are planning to take any prescription medications on your trip, here are some important tips.

- Remember to pack extra medication for your trip in case of travel delays.
- Carry all medicines in their original containers and keep them in your carry-on bag in case your checked luggage is lost or delayed.
- Carry a letter from your healthcare provider describing your medical conditions and listing your medications (both brand and generic names). This will help if there are any restrictions on bringing prescription medications into a foreign country.

- Make sure your prescription medications are not illegal in any country you plan to visit. The country’s embassy can help you with this.

**First Aid Traveling Kit**

Depending on the area where you are traveling, you should carry a travel health kit for various situations. Some helpful items to include in your kit:

- Your prescription medications
- Medicines to help prevent malaria (if needed)
- Antibiotics from your doctor to treat traveler’s diarrhea
- Over-the-counter medications:
  - Medicine for diarrhea and upset stomach
  - Allergy medication
  - Cough and Cold medication
  - Motion sickness medication
  - Pain/fever medication
  - Mild laxative
  - Cough drops
  - Hand sanitizer
  - Antifungal and antibacterial creams
  - 1% hydrocortisone cream

**Helpful Resources**

1. CDC’s TravWell app (compatible with both Android® and Apple® phones)
2. CDC For Travelers Resource Website (http://wwwnc.cdc.gov/travel/page/resources-for-travelers)

By Erica Hoversland, PharmD Candidate

References on Page 2
The Veterans Health Administration has established the Patient Aligned Care Team (PACT) system to provide the best health care possible to US Veterans. A PACT is based on the idea of patient-centered healthcare. That is the health care team working together with the patient at the center.

This type of team approach can make it easier for everyone involved in a patient’s care to know what the patient needs.

A Patient Aligned Care Team:
- Increased access to care
- Coordinated care
- Work with patients
- Teamwork

☑ Increase access to care

Patients have access to Telephone Care 24 hours a day, 7 days a week, as well as website access to information and VA services at http://www.myhealth.va.gov/. Using the website, patients can view, print, or download their personal health records.

☑ Coordinated care between health team members

The PACT makes the process of moving from one type of care to another much easier since the PACT involves primary care providers and specialists. With the PACT, health team members work to help prevent illness, not just treat illnesses.

☑ Work with patients

Team members include the patient in the conversation about their own health. Patients are encouraged to ask questions and view their health records. PACT gives the patient ways to improve their health, such as early screenings, lifestyle coaching, and teaching tools.

☑ Teamwork

Team members talk to one another about the patient’s health needs to provide the best care possible. This brings different aspects of health together for the patient, especially since the PACT includes doctors, nurses, pharmacists, dietitians, physical therapists, social workers, and mental health professionals.

The PACT system helps patients understand their options and the goals of their healthcare team.

REFERENCE: