This is a brief guide for principals and teachers, which highlights some of the basic facts about anemia as well as strategies for preventing or reducing anemia among school-aged children.

... a BALANCED DIET of meats, vegetables and fruits is KEY to preventing anemia
What is anemia?

Anemia is a disease caused by below-normal levels of hemoglobin. Hemoglobin is the protein in red blood cells that carries oxygen to the muscles, brain and other organs. If red blood cells carry insufficient oxygen, the body – particularly the mind – cannot function well.

What causes anemia?

The most common cause of anemia is iron deficiency. Without enough iron in the diet, the body cannot produce enough hemoglobin.

The causes of anemia include:
✶ Eating meals that are mostly starches and grains
✶ Not eating balanced meals including meat, fruit and vegetables, which contains vitamin A, B12, C and folic acid that are needed to make red blood cells

Other causes of anemia are:
✶ Infections that reduce the amount of iron or red blood cells in the body
✶ Iron deficiency caused by growth spurts in infants and teenagers, or heavy bleeding with normal menstruation in women
✶ Intestinal parasites (such as hookworms, roundworms or tapeworms) that block

Remember that consuming . . .

. . Only more grains (noodles, rice, mantou) is NOT enough to prevent anemia
. . a BALANCE of meats, vegetables and fruits is KEY to success
Iron-deficiency is a widespread problem and the most common nutritional deficiency in the world according to the World Health Organization.

According to a recent survey:

**39% of school-aged children in rural parts of Shaanxi Province are anemic!**

This problem is so common that nearly every school has some anemic children to be concerned about.

In fact, other studies have shown that anemia is a key concern in China. According to a 1998 national survey, on average 41.2% of women of reproductive age were anemic in rural areas. Based on a 2000 survey, 26.7% of rural children under 5 were anemic.

**What are the consequences for education?**

Iron-deficiency and anemia have been associated with numerous consequences for education. Children who are iron-deficient are likely to have:

1) Reduced mental development and cognitive capacity
2) Lower scores on intelligence tests
3) Poor attention span and reduced learning capacity
4) Reduced educational outcomes such as grades, attendance, and attainment
5) Lower wages in any future jobs they hold as an adult compared to non-anemic children

According to a recent CCAP/NW University/Xi’an Jiaotong University School of Medicine baseline study of fourth grade students in rural Shaanxi Province, anemia is linked to lower standardized math test scores, as well as math and language grades.


**What are the symptoms of iron-deficiency anemia?**

One reason anemia is such a widespread problem is that many people do not even realize they are anemic! It is impossible to tell if someone is anemic just by looking at them. This is why anemia is sometimes called an “invisible disease.”

However, people who are anemic often experience:

- weakness and tiredness
- inability to maintain body temperature
- numbness or coldness in their hands and feet
- withdrawn or apathetic tendencies
- decreased immunity
- pale skin

- inflammation of the tongue
- brittle nails
- depression
- hair loss
- headaches
- shortness of breath with activity
- fast heartbeat
- dizziness and irritability
- chest pain
- below-average height and weight (among children)

Anemia symptoms are very general and often difficult to detect. Many symptoms can be observed in people who are not anemic. Therefore, common observable symptoms are not a good indicator for whether a child is anemic.

**How do you test children for anemia?**

Since outward symptoms are not a good indicator of anemia, a simple blood test is required to test whether someone is anemic. One type of blood test only requires a finger prick to obtain a blood sample. The Hemocue is a small, portable machine that quickly reads the hemoglobin level of the sample. After only 1 minute, the Hemocue can tell you if a child has anemia.

**STEP 1** Prick finger to obtain a blood sample. This is not painful!

**STEP 2** Wait for 60 seconds

**STEP 3** The Hemocue machine tells you if the hemoglobin levels is too low, indicating anemia

Another option is for the doctor to draw a child’s blood. The blood is then examined in a laboratory where the amount of hemoglobin is measured, the number of RBCs is counted and the size and shape of the cells is examined.
Types of Iron
There are two types of iron in food, heme and non-heme.

**Heme Iron Sources**
- Chicken
- Beef
- Duck
- Lamb
- Pork

1. **Heme Iron** is found in animal meats such as beef, pork, poultry and fish.

2. **Non-heme Iron** comes from foods like fermented soy products (chou doufu, miso, tempeh, soy sauce), vegetables, and beans.

**Non-Heme Iron Sources**
Foods that are good sources of non-heme iron include: pumpkin or squash seeds, dried chili peppers, goji berries, potatoes (with skin), tofu, soybeans, cornmeal, red beans, cowpeas, persimmons, peanuts and black beans.

Iron Absorption
Heme iron from beef, pork, poultry is 2 to 3 times more easily absorbed than non-heme iron from soy products, vegetables and beans. Vitamin C, common in fruits and vegetables, increases the absorption of non-heme iron. Therefore, the best way to improve iron intake in a child’s diet is to include meat, chicken or fish to provide heme iron and a varied diet that provides non-heme iron and Vitamin C.
How do I eat enough iron every day?

Each photo shows 1 food that contains enough iron for 1 day.

Kids can eat the following foods in the amounts shown to meet their daily iron intake every day.

What is in a meal with enough iron?

But WAIT

Vitamin C helps the body absorb non-heme iron sources. A balanced diet contains sources of iron and vitamin C as well as other nutrients, which also help the body absorb iron.

How do I eat enough iron AND vitamin C every day?
How much chicken and beans and green pepper do I need to eat a day?

1/6 jin chicken + 2/3 jin beans + 2/5 jin green pepper

= ✔ ✔

enough iron AND vitamin C for 1 day!!

How much pork and tofu and cabbage do I need to eat a day?

1/4 jin pork + 2/5 jin tofu + 4/5 jin cabbage

= ✔ ✔

enough iron AND vitamin C for 1 day!!

How much iron do children need?

Children need iron every day to stay healthy.
Depending on age and gender, children should eat different amounts of iron each day:

<table>
<thead>
<tr>
<th>Age</th>
<th>Recommended Daily Allowance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td></td>
</tr>
<tr>
<td>1 – 4 years</td>
<td>7 mg</td>
</tr>
<tr>
<td>4 – 8 years</td>
<td>10 mg</td>
</tr>
<tr>
<td>9 – 12 years</td>
<td>8 mg</td>
</tr>
<tr>
<td>Young Men</td>
<td></td>
</tr>
<tr>
<td>14 – 18 years</td>
<td>11 mg</td>
</tr>
<tr>
<td>Young Women</td>
<td></td>
</tr>
<tr>
<td>14 – 18 years</td>
<td>15 mg</td>
</tr>
</tbody>
</table>

Note about Non-Heme Iron*

Remember that vegetables or tofu (non-heme iron sources) are not as well absorbed as meat sources of iron. Kids actually need to eat twice the amount of non-heme foods to get the daily recommended amounts from these foods. The amounts of iron shown above in tofu* and potatoes* contain about 20 mg of iron, not 10 mg. This is especially important to remember if kids do not get much meat in their diet.

Recommended Daily Allowance of Iron = 10 mg
While the most important micronutrients are iron and vitamin C, the body also needs vitamin A, B12 and folate (B9) to keep iron levels normal.

The key to preventing iron deficiency is to eat a balanced diet. Eating well-rounded meals which include both heme and non-heme iron sources will boost a child’s iron stores and help alleviate anemia.

But iron by itself is not enough, vitamin C is also needed for the body to absorb non-heme iron. Vitamin C will boost the iron kids get from foods such as legumes, whole grains and vegetables!

Consuming vitamin C with meals can boost the rate of iron absorption from food by as much as 300%!

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Deficiency in either folic acid (Vitamin B9) or Vitamin B12 can cause megaloblastic anemia, which is common in Shaanxi and Shanxi Province. Good sources of folic acid include vegetables, grains, beans and other plant-based food sources. Animal-based foods are rich in Vitamin B12.
As a principal or teacher, there are several ways to prevent your students from being

**Balanced Diet**

Provide wholesome meals to students at school. Make sure to include some meat, fish or chicken with every meal, as well as vegetables and fruits. Eating a variety of foods supplies a body with enough iron and other nutrients, such as vitamins, that help the body absorb iron.

**Multivitamins**

Give students multivitamins with iron every day. This helps prevent anemia and especially helps children who are already anemic. Follow the recommended dosages for children on the bottle, and be sure to provide clean drinking water for students to use when taking vitamins.

**What are the impacts of multivitamins?**

Based on a recent study in Shaanxi Province, students who took multivitamins with iron every day had higher hemoglobin levels than those students who did not take vitamins. This was especially true among the most anemic students.

Also, students that took multivitamins had higher standardized math test scores.

**What do teachers need to do?**

In the multivitamin study, teachers were asked to give students multivitamins every morning after a meal. After students entered the classroom and were seated, the teacher had one student help pour clean drinking water in cups for all the other students.

Most teachers found that this quickly became a routine task that was not difficult or time-consuming.
Cook school meals with foods that are fortified with iron. Some special types of soy sauce and flour have extra iron added. Special vitamin sprinkles, which contain minerals including iron, can also be cooked directly into meals.

According to research, consuming fortified soy sauce every day (~15 ml) has reduced or eliminated iron-deficiency in Chinese children. Studies found iron-fortified soy sauce was relatively not expensive and people who consumed it easily accepted the taste.

Not all stores carry fortified foods, so extra effort might be necessary for this option.

**Educate Parents**

Tell parents about anemia and why it is important. Share the strategies that you have learned to reduce anemia. Explain the importance of a balanced diet.

*Persistent efforts from teachers and principals to talk to parents is very important, and there are many successful examples of this!*

Most parents are very concerned about the well-being of their children. However, it is not an easy task to convey key nutrition and health information to parents! Giving parents pamphlets or letters about anemia and how to prevent anemia is not always effective. Some parents may not receive the information, some may not understand it, and some may not think they have the economic means to change their dietary habits.

Instead, try holding meetings at school with parents to communicate information directly! Frequently follow-up to check in about progress and to trouble-shoot.

**Educate Cooks**

Train school cooks on providing balanced meals and about which foods are rich in iron. Introduce fortified food options. Discuss realistic options for incorporating changes to school meals that will help prevent anemia and that are feasible in the long-term.
In order to improve iron-deficiency and general health, encourage kids to avoid eating junk foods. Many favorite snacks have either no or very little iron as well as other important nutrients. The more kids eat of these foods, the less healthy foods with iron they will want to eat.

Be aware that milk and eggs are not good sources of iron

Therefore, more milk and eggs do NOT prevent anemia and may even block some iron absorption. However, milk and eggs contain other nutrients, which benefit the body.