Teacher Preparation Notes for
Dragon Genetics Lab -- Principles of Mendelian Genetics

Materials

-- colored paper (2 each of orange, green, red, and yellow, and 1 each of blue and pink or purple)
-- print out the page of genes for each type of autosome and sex chromosome (given at the end of these instructions)
-- rubber cement or Elmer's glue
-- popsicle sticks (5 for each student in the class)

Instructions for Preparing Chromosomes

Each popsicle stick should be prepared to represent a pair of homologous chromosomes. You will want to have a complete set of five popsicle sticks for each student in your class. Xerox or print two copies of each page of autosome genes on the appropriate color paper and one copy of each page of sex chromosome genes on the appropriate color paper. This will provide enough popsicle sticks for 36 students (18 dragon mothers and 18 dragon fathers). Each page of autosome genes (given at the end of these instructions) intentionally includes some gene deletions and inversions.

For each page of genetic traits, cut out the strips, each with a vertical column of letters representing the genes in one chromosome. (There are 12 strips in each section of the page, for a total of 36 strips per page.) Apply rubber cement or Elmer's glue to both sides of a popsicle stick, and glue strips on both sides of the popsicle stick, continuing this until all the strips have been used to make popsicle stick chromosomes. For the autosomes and for the sex chromosomes for females, you can use any two strips from the same page. For the sex chromosomes for males, be sure to include an X-chromosome on one side and a Y chromosome on the other side of each popsicle stick.

Comments for Discussion with Students

For codominant traits (Ee and Ss), there are the same number of both alleles, so that the teacher can show a class ratio of 1:2:1. Other traits such as fangs/no fangs (N = no fangs, n = fangs) are set up to show that a recessive trait can be the predominant trait in the population. This can be discussed in terms of the need for fangs for survival, but the possible advantage of no fangs if meat is not available and plants begin to play a larger part in the diet.

The sex-linked traits also can stimulate the students to come up with some interesting theories. Males tend to fight more and therefore need protection of the chest plate (W = no chest plate, w = chest plate), and the same may be said of tail spikes (X/x). Short arms may be more powerful, while females may benefit from longer arms to hold/care for babies (Z/z).

The sex-influenced traits also lead to some theories. Female tend to have wings (M/m) which allows them to get away from those pesky males or to flee danger with their babies. Elbow spikes (T/t) are found in males and may relate to fighting.

The most confusing trait for students is the comb (R/r). Only males have a comb, although females have the genes for the comb. This usually leads to a discussion that you can inherit secondary sexual traits from either parent.

GREEN AUTOSOMES

A	A	a	a	a	a	a	A	A	A	A	A
B	b	B	B	B	b	b	b	b		b	B
C	c	c	C	C	C	C	c	c	C	c	C
D	d	d	D	d	d		D	D	d	d	D
E	e	E	E	e	e	e	e	E	e	e	E

A	A	A	A	A	A	a	a	a	a	a	a
B	B	B	b	b	b	b	b	b	B	B	B
C	C	c	c	c	C	C	C	c	c	c	c
D	d	D	d	D	d	D		d	D	d	d
E	e	e	E	E	e		E	e		e	E

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a	a	a	a	a	a		A	A	A	A	A
b	b	b	b	B	D	B	b	b	c	b	b
c	c	c	C	C	c	C	c	C	b	C	C
d	d	D	D	d	B	d	D	d	d	D	d
e	E	E	E		E	e	e	e	e	e	e

RED AUTOSOMES

F	F	F	F	F	H	f	f	f	f	h	F
G	G	g	g	g	G	G	G	G	g	G	g
H		h	H	F	h	h	H	H	F		h
I	I	i	i	I	i	i		I	I	I	i
J	j	j	j	j	j	j	j	j	J	J	J

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f	f	f	f	f	g	f		f	F	F	F
G	g	g	g	G	G	G	G	g	g	g	g
H	h	h	h	h	h	j	H	H	h	h	H
I	I	I	I	I	I	H	i	i	i	i	i
J	j	J	J	J	j	i	j	J	J	J	j

F	f	f		F	F	F		f	f	F	F
G	g	g	g	g	G	G	G	g	g	g	G
H	h	H	H	H	H	h	h	h	h	H	H
I	I	I	i	i	i	i		I	I	I	I
J	J	J	j	j	j	j	J	j	J	J	j

Orange Autosomes

K	K	K	K	K	k	k	k	k	k	k	k
L	l	l	L	L	L	L	l	l	l	L	L
M	m	m	m	M	p	m	m	M	M	M	M
N	n	N	n	n	O	n	n	n	n	n	n
O	o	o	O	o	n	O	O	O		o	O

K	k	k	k	k	k	K	K	K	K	K	K
L	l	L	l	L	l	l	l	L	L	l	l
M	m	m		m	M	m	m	M		M	M
N	n	n	n	o	N	n	n	n	n	n	n
O	O	o	o	n	O	O	o	o	O	O	O

K	k	K	k	k	K	K	k	K	k	K	k
L	l	l	L	L	l	L	l	L	l	L	l
M	m	m	M	M	m	m	M	m	M	M	m
N	n	n	n	n	n	N	n	n	n	N	N
O	o	o		O	O	O	O	o	O	o	O

Yellow Autosomes

P	p	p	P	P	P	p	p	p	P	P	p
Q	q	q	q	q	q	r	Q	q	q	q	Q
R	r	R	R	r	r	Q	r	R	r	r	R
S	s	S	s	S	s	S	s	S	s	S	s
T	T	t	T	t	t	T	t	T	t	t	

P	p	p	P	p	P	p	P	P	p	P	p
Q	q	q	q	q	Q	Q	Q	Q	Q	q	q
R	R	r	r	r	R	R	R	r	r	r	R
S	s	t	s	s	S	S	s	S	s	s	S
T	t	s	T	t	t	T	T	T	T	t	t

P	p	p	p	p		P	P	P	P	P	P
Q	Q	Q	Q	Q	s	q	q	q	q	q	q
R	r	r	r		r	R	R	r	t	r	R
S	S	s	s	S	q	s	S	S	S	s	s
T	t	t	t	T	t	T	T	T	r	t	t

SEX CHROMOSOMES—X/X chromosomes [pink or purple]

U	U	U	U	U	U	u	u	u	u	u	u
V	v	v	v	V	V	V	v	v	v	v	V
W	w	w	w	W	w	w	w	w	w	w	W
X	x	x	x	X	X	X	x	x	x	x	X
Z	z	z	Z	z	z	z	Z	Z	Z	z	z
-	-	-	-	+	+	+	+	+	-	-	-

U	U	u	u	u	u	U	U	U	u	u	U
V	v	v	v	v	v	V	V	V	V	V	V
W	W	w	w	w	w	w	w	w	w	w	w
X	x	x	X	X	X	X	x	x	x	x	x
Z	z	z	z	z	Z	Z	Z	Z	z	z	z
+	-	+	-	+	-	+	-	-	-	+	+

U	u	u	u	u	u	U	U	U	U	U	U
V	v	v	v	V	V	V	v	v	v	v	v
W	w	w	w	w	w	w	w	w	W	W	w
X	X	X	x	x	x	x	x	X	X	X	x
Z	z	z	z	z	z	z	Z	Z	Z	Z	z
+	+	+	-	-	-	-	+	+	-	+	-

SEX CHROMOSOMES --X/Y chromosomes [blue]

U	u	u	u	u	u	u	u	u	u	u	u
V	v	v	V	V	V	V	V	V	V	V	v
W	W	W	W	W	W	Y	Y	Y	Y	Y	Y
X	x	x	X	X	X						
Z	z	z	Z	Z	Z						
+	-	+	-	+	-						

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u	u	u	u	u	u	u	u	u	u	u	u
v	v	v	v	v	v	v	v	v	V	V	V
w	W	W	W	w	w	Y	Y	Y	Y	Y	Y
X	X	x	x	x	x						
Z	z	z	y	Z	Z						
-	-	-	-	+	+						

U	U	U	U	U	u	u	u	u	u	u	u
V	v	v	v	v	v	v	V	V	V	V	V
W	W	w	w	w	w	Y	Y	Y	Y	Y	Y
X	x	X	X	X	x						
Z	z	Z	Z	z	z						
+	+	+	+	-	-						