The organizational similarities between the myosin-rich structures that we have found and those reported for actin is not surprising, since by analogy to skeletal muscle actin and myosin interact to produce a motive force. The widespread intracellular distribution of these proteins observed in the present study is probably necessary if they are to provide a force-generating system for intracellular and morphogenetic movements. The observed binding of myosin antibodies from human uterine muscle and chick gizzard muscle with avian and mammalian tissues suggests a conservative structure for the myosin molecule. The structural basis for the interaction of myosin and actin in neuronal and glial cells and the role of these proteins in axoplasmic flow and neurite elongation are yet to be determined. The ultrastructural localization of myosin and actin in neuronal tissues and their association with other cytoskeletal elements, such as microtubules and microfilaments, are topics for further study.

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Genetic Mapping of Xenotropic Leukemia Virus-Inducing Loci in Two Mouse Strains

Abstract. *In genetic studies of C57BL/10 and BALB/c mice, inducibility of xenotropic murine leukemia virus from tissue cultures by treatment with 5-iododeoxyuridine shows single gene segregation ratios. In both strains, the virus-inducing loci are on chromosome 1, linked to the* Dip-1 *isozyme locus, but the two may not be at allelic sites.*

Xenotropic murine leukemia viruses (MuLV's) are strains that are unable to initiate exogenous infection of mouse cells but can infect cell cultures of a number of heterologous species (*1*). They appear to constitute a single class with respect to cross-reactivity in interference and virus neutralization tests, but there is much diversity within the group (*2, 3*).

While the ecotropic (mouse-tropic) MuLV's are present as chromosomally integrated viral genomes in some inbred mouse strains and not in others (*4*), xenotropic virus genomes are probably present in all mice. This has been shown in several ways. First, xenotropic virus strains have been isolated from almost all inbred mouse strains tested, although with markedly different facility. In some mouse strains, particularly NZB, xenotropic virus is continually produced both in vivo and in embryo tissue cultures (*1, 2, 5, 6*); in other mice, such as BALB/c and C57BL, the virus can be detected at low levels in vivo and can be induced in tissue culture by treatment with 5-iododeoxyuridine (IdU) (*1, 2, 7*); in still other strains of mice, such as NIH Swiss, the virus is rarely detected in vivo and is not inducible in vitro. Second, nucleic acid homology tests with labeled DNA probes prepared from two different xenotropic MuLV strains have shown that the complete nucleotide sequences of both viruses are present in the cellular DNA of all mice tested (*8*), including the noninducible NIH Swiss. Third, MuLV glycoprotein (gp70) molecules with a tryptic digest pattern similar to that of the NZB xenotropic MuLV are found in the serum of virtually all mouse strains tested (*3*).

The marked differences in virus expression among mouse strains permit classical Mendelian segregation analysis. Genetic studies have been based on crosses between strains negative for virus expression (generally NIH Swiss) and strains with spontaneous or inducible xenotropic virus expression. When embryo cultures of backcross segregants from BALB/c were tested for IdU-inducible virus, single gene segregation ratios were observed (*7*). Similarly, the data presented below on virus induction from tail tissue cultures indicated single gene control in B10.BR, C57BL/10, and BALB/c strains. In contrast, the segregation ratios reported in crosses with NZB mice varied with the system under study. A single gene was found to regulate spontaneous release of virus by embryo cultures (*5*), while infectious center tests of adult spleen cells revealed two (or possibly three) loci that can independently give the positive phenotype (*6, 9*).

Table 1. Segregation of xenotropic MuLV induction with *Dip-1* isozyme. Mouse strains B10.BR/SgLi, C57BL/10J, and BALB/cN, which are *Dip-1*^{a} and positive for xenotropic virus induction, were mated to A/J or NFS/N mice (an inbred line derived from NIH Swiss mice); both of these are *Dip-1*^{b} and xenotropic virus induction-negative. The F_1 hybrids were crossed to A/J or NFS/N mice (or both). Tissue cultures were prepared from tail biopsy tissue (*13*) and induced with IdU (20 μg/ml for 48 hours) when the cultures were in vigorous, subconfluent condition. Cells of the mink lung cell line CCL64 (*14*) were then added. Two weeks later, fluids from the mixed cultures were harvested, frozen, and thawed; they were then tested for the presence of xenotropic virus by the focus induction test in the mink S^+L^- cell line of Peebles (*15*). *Dip-1* typing was done on kidney extract or erythrocyte hemolyzate by standard procedures (*10*).

Cross from	Number of mice				Recombinants/ total	$r \pm$ S.E.*	
	Nonrecombinant phenotypes		Recombinant phenotypes				
	Dip-1^{ab}/ X-tr$^+$	*Dip-1*^{b}/ X-tr$^-$	*Dip-1*^{ab}/ X-tr$^-$	*Dip-1*^{b}/ X-tr$^+$			
B10.BR	60	72	22	14	36/168	21 ± 3	23 ± 3
C57BL/10	19	17	7	8	15/51	29 ± 6	
BALB/c	29	28	6	1	7/64	11 ± 4	

*Recombination frequency (%) ± standard error.

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We have now identified the linkage for the genes that govern IdU-inducibility of xenotropic virus in two mouse strains inducible for this virus—C57BL/10J, studied chiefly as its *H-2*^{k} congenic derivative B10.BR/SgLi, and BALB/cN. In crosses of these mice with noninducible strains, virus inducibility is regularly expressed in F_1 hybrids, and the segregation ratios in the backcross generation are compatible with single gene control (Table 1). In all three cases, virus inducibility showed linkage to the *Dip-1* locus on chromosome 1 (linkage group XIII), a gene that codes for electrophoretically distinguishable forms of the enzyme dipeptidase-1 (*10*). No correlation was observed between the virus phenotype and several other gene markers tested, including *Gpd-1* (chromosome 4), *Gpi-1* (chromosome 7), *Es-1* and *Gr-1* (chromosome 8), *Mod-1* (chromosome 9), and *H-2* (chromosome 17).

The linkage estimates obtained with the C57BL/10 and B10.BR hybrids were not significantly different ($P > .25$), and we presume that the two strains carry the same xenotropic virus-inducing locus. In contrast, the difference in recombination frequency between the BALB/c and C57BL/10 crosses (11 percent and 23 percent, respectively; $P = .05$) suggests that the virus-inducing loci in these strains may not be at allelic sites, even though both are clearly on chromosome 1. This would not be unprecedented, since ecotropic virus-inducing loci are not at allelic sites in different laboratory mouse strains (*11*). Until this question of allelism of the BALB/c and C57BL/10 xenotropic virus-inducing loci is clarified, we recommend that for the present only one, that of C57BL/10, be named; we refer to it as *Bxv-1*.

Further studies are in progress to define precise map positions and to determine if inducible xenotropic viruses in other inbred strains show linkage to chromosome 1 markers.

Knowledge of the chromosomal location of these xenotropic virus-inducing loci should facilitate analysis of these complex viruses, particularly with regard to their regulation, their expression as viral antigen in differentiated cell types in the absence of virus production, their role in the generation of recombinant viruses (*12*), and their importance in tumorigenesis.

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Specific-Opiate-Induced Depression of Transmitter Release from Dorsal Root Ganglion Cells in Culture

Abstract. *The opiate etorphine depresses monosynaptic excitatory postsynaptic potentials (EPSP's) elicited in spinal cord cells by activation of dorsal root ganglion cells in murine neuronal cell culture. The depression is reversed by naloxone. Statistical analysis of the synaptic responses reveals that the opiate reduces EPSP quantal content at this synapse without altering quantal size. Therefore, the opiate action is presynaptic and affects transmitter release rather than postsynaptic responsiveness.*

Electrophysiological studies with intracellular and extracellular recording techniques coupled with microiontophoresis have revealed a multiplicity of opiate effects on neuronal excitability and on responses elicited by putative excitatory and inhibitory neurotransmitters (*1*). Several lines of evidence have suggested that a presynaptic locus might be involved in mediating opiate effects in the nervous system and, in particular, that primary afferent fibers in the spinal cord might be one site of opiate action (*2*). Cell cultures containing dorsal root ganglion (DRG) and spinal cord (SC) cells offer an opportunity to assess directly pre- and postsynaptic mechanisms of drug action by means of electrophysiologic techniques; in our studies, we used mouse dissociated DRG-SC cell cultures to assess opiate effects on synaptic transmission. We report (i) that the opiate etorphine reversibly depresses synaptic transmission between DRG and SC cells, (ii) that this depression is presynaptic, and (iii) that the depression in synaptic transmission is reversible with the specific opiate antagonist, naloxone.

We used mouse SC cell culture and electrophysiological methods as described (*3*); the cultures were treated with nerve growth factor (*4*) for at least 1 week prior to the electrophysiological experiments. Experiments were performed in normal control medium (90 percent Eagle's minimal essential medium and 10 percent horse serum) to which Ca^{2+} and Mg^{2+} were added (the final concentration being 6.7 and 10 m*M*, respectively). A DRG cell and an SC cell within the same microscopic field were penetrated with micropipette electrodes filled with 4*M* potassium acetate, and ex-

Table 1. The effect of etorphine on quantal parameters for the DRG to SC EPSP. The data taken during either control conditions or under etorphine + naloxone conditions are shown under the heading control. Data taken during the application of etorphine are shown under the heading E.

Quantal size (q)			Quantal content (m)			EPSP amplitude ($\bar{v}$)		
Control	E	Ratio	Control	E	Ratio	Control	E	Ratio
313	286	0.91	44	14.1	.32	14.4	4.7	.33
96	105	1.09	66.5	28.3	.43	7.3	3.0	.45
183	193	1.05	24.8	11.1	.45	4.5	2.1	.47
222	253	1.13	52	24.7	.48	11.5	6.3	.55
190	144	0.75	46	36	.78	8.8	5.3	.60
201*	196*	.99	47†	23 †	.49	9.3‡	4.3‡	.47

*$P > .20$. †$P < .02$. ‡$P < .05$.

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