Amino acid sequence of Mox-2 and comparison to its *Xenopus* and rat homologs

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Mox-1 and *Mox-2* are two murine homeobox genes defining a novel homeobox gene subclass whose expression is restricted to mesodermally and mesenchymally derived tissues (1). We previously reported only the homeodomain sequence of *Mox-2* (1). Here we present the full protein-coding sequence of *Mox-2*, and a comparison with a subsequently reported gene, *Gax* (2), and a *Xenopus* homolog isolated in this laboratory.

C45BL *Mox-2* cDNAs were isolated as described (1). The longest cDNA is ~2200 bp, encoding a homeoprotein 303 amino acids. It is probably close to full length based upon data from the rat homolog (see below, and ref. 2). The sequence is confirmed on genomic clones isolated from C3H and 129 strains. The *Mox-2* and *Mox-1* homeodomains are 97% identical, but other parts of the proteins are diverged from each other and other vertebrate homeoproteins.

The comparison presented here indicates strongly that *Gax* (ref. 2) is the rat homolog of the previously reported *Mox-2* gene. The two proteins share 99% amino acid identity (Fig. 1). Using different genetic markers, Gorski *et al.* mapped *Gax* to chromosome 12, in the same region that *Mox-2* was already assigned (1). Additionally, the embryonic expression pattern of *Gax* mentioned is reminiscent to that of *Mox-2*. After extensive genomic and cDNA screening, we have detected no more *Mox-2* or *Mox-1* related genes. Thus, to minimize confusion and to maintain a logical subfamily connection, we propose that *Gax* be referred to as the rat homolog of the previously reported *Mox-2* (a name approved by the International Mouse Nomenclature Committee).

Partial cDNAs of the *Xenopus* homolog were cloned from a late neurula cDNA library, and the 5' protein-coding sequence completed from 2 genomic clones. *Xenopus* and mouse *Mox-2* proteins are 86% identical overall, with 100% in the homeodomain (Fig. 1). Together with the expression data we have obtained thus far in *Xenopus* (data not shown), it is extremely likely that it represents the true homolog of *Mox-2*.

Mox-2	MEHPLFGCLRSPHATAQGLHPFSQSSSLALHGRSDHMSYPGLSTSSSCII
Gax	-----
X. Mox-2	---T-----S-----A-----D--S-----L
Mox-2	AGYPNEEGMFASQHRGHNNHHHHHHHHHHHQQQQHQAQSNWHLQMSFPP
Gax	-----
X. Mox-2	T-----S--G-----●-----T-----I-----
Mox-2	SAARHSLCLQPDSGGPPPELGSSPPVLCSSSSSLGSSSTPTGAACAPGDYGR
Gax	-----
X. Mox-2	AST-----Q--*--D-SG--SI---T---TNNS---VT-----
Mox-2	QALSPADVEKRSKSKKSDSSDSEQGNYSKSEVNSKPKERTAFTEKQIRE
Gax	-----
X. Mox-2	-S---EA---T*-----S---D-----
Mox-2	LEAEFAHHNYLTRLRRYEIAVNLDLTERQVKVWFQNRMRKWKVKGGQQG
Gax	-----
X. Mox-2	-----
Mox-2	AAAREKELVNVKGTLLPSELSGIGAATLQQTGDLSLANEDSRDSDHSEHAHL
Gax	-----
X. Mox-2	-----TRSNS-----T-D--H--SQ-----

Figure 1. Deduced amino acid sequence of Mox-2, Gax, and *Xenopus* Mox-2 (X. Mox-2). The homeodomain is overlined. Asterisks found within the *Xenopus* sequence indicate single amino acids deleted in X. Mox-2 compared to mouse Mox-2. Additionally, X. Mox-2 has a nine histidine amino acid repeat rather than the twelve present in Mox-2; indicated by ●. The first forty amino acids of *Xenopus* Mox-2 were derived from genomic clones.

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