homeodomain is sufficient for the binding to *cad* mRNA; other regions of the protein, or other homeodomain proteins such as cad, orthodenticle and the homeodomain of antennapedia, did not bind. That the bcd homeodomain interacts with *cad* mRNA *in vitro* is consistent with the *in vivo* observation, suggesting that the homeodomain of bcd is necessary for the formation of the cad gradient (Fig. 1*f*,*g*). The failure of other homeodomain proteins to bind *cad* mRNA does not rule out the possibility that they possess RNA-binding properties as preceded by zinc-finger-type transcription factors[10].

To assess the functional significance of the *in vitro* interaction between bcd and *cad* mRNA, we performed co-transfection experiments with *Drosophila* Schneider cells[11]. We used chloramphenicol acetyl transferase (CAT) reporter gene constructs[11] containing different 3′ UTR sequences (Fig. 3). The reporter gene constructs were set under the control of the *bcd*-responsive, *cis*-acting element of the zygotic *hunchback* promoter[12]. After co-transfection with *bcd*, we determined the stimulated transcription of CAT mRNA by reverse transcription–polymerase chain reaction (RT–PCR)[13], and the translation of the CAT mRNAs with the different 3′ UTRs by assaying CAT activity[11].

CAT mRNAs containing the *Drosophila cad* 3′ UTR sequences or the regions including the BBR produced about sevenfold less CAT activity than CAT mRNA containing the *cad* 3′ UTR sequences of *Clogmia* or the 3′ half of the 3′ UTR of *Drosophila cad* (Fig. 3*a*–*c*). CAT mRNA containing the BBR within the simian virus 40 (SV40) 3′ UTR[11] were also translated less efficiently than those containing only the SV40 3′ UTR. These results suggest that bcd may not only act as a transcriptional activator in the assay system, but also reduce the translation efficiency of the BBR-containing mRNAs.

To show that *bcd* does indeed suppress the translation of BBR-containing mRNA, we examined reporter gene constructs containing the SV40 3′ UTR with or without the BBR that were transcriptionally activated by the yeast GAL4 transcriptional activator[14]. In the absence of bcd, the GAL4-stimulated CAT mRNAs were translated with similar efficiency (Fig. 4). In the presence of *bcd*, however, the translation of the BBR-containing CAT mRNA was significantly reduced, but the translation of CAT mRNA without the BBR was not significantly affected. This shows that bcd suppresses the translation of BBR-containing mRNA.

Our results are consistent with the argument that the anterior determinant bcd acts not only as a transcriptional activator but also functions in a manner analogous to the key components of the posterior maternal pattern-organizer system[15–20], which acts by translational repression through the activities of *nanos* and *pumilio*[15–20]. After binding the *pumilio* protein and a 55K protein to the *nanos*-response element within the 3′ UTR of *hunchback* mRNA[17,20], the *nanos* protein is thought to interact with this 'landing pad' to provide region-specific translational repression of the evenly distributed maternal *hunchback* mRNA[15–19]. This allows for the activation of the posterior gap genes *knirps* and *giant* in response to cad[5]. Thus, while in the posterior region of the embryo translational and transcriptional control are conducted through separate components, the anterior determinant bcd can exert both regulatory functions. Our findings also imply that the asymmetric distribution of the key components of the anterior and posterior maternal pattern-forming systems, which was thought to be set up independently[1,2], is linked through the dual function of bcd. □

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ADDENDUM

Identification of the breast cancer susceptibility gene *BRCA2*

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THE sequence for the *BRCA2* gene is now available at the web page of the Institute of Cancer Research, address http://www.icr.ac.uk/molcarc/brca2.htm, as well as from Genbank. □

ERRATUM

Mechanosensory signalling in *C. elegans* mediated by the GLR-1 glutamate receptor

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FIGURES 3 and 4 of this Letter were inadvertently transposed during the production process; the legend to Fig. 3 therefore describes the figure published as Fig. 4 and vice versa. □