



Contents lists available at ScienceDirect

Acta Histochemica

journal homepage: www.elsevier.de/acthis



Different pediatric brain tumors are associated with different gene expression profiling

Michelino Di Rosa^{a,*}, Cristina Sanfilippo^b, Massimo Libra^a, Giuseppe Musumeci^c,
Lucia Malaguarnera^a

^a Department of Biomedical and Biotechnology Sciences, University of Catania, Catania, Italy

^b Section of Neuroscience, University of Catania, Department GF Ingrassia, University of Catania, Catania, Italy

^c Department of Biomedical and Biotechnology Sciences, Human Anatomy and Histology Section, School of Medicine, University of Catania, Catania, Italy

ARTICLE INFO

Article history:
Available online xxx

Keywords:
Chitinases
Lysosomal glycosidase
Lysosomal protease
Tumor brain

ABSTRACT

Malignant brain tumors are the most common pediatric solid tumors and are the leading cause of death from childhood cancers. These tumors include several histologic subtypes. Due to the particular properties of brain tumors, such as growth and division, examination of brain tumors and the analysis of results are not simple. Up to date there is a dearth of useful biomarkers that have been validated and clinically implemented for pediatric brain tumors. In order to identify the new genetic alterations we recognized, using microarray dataset, chitinases as new potential biomarkers of CNS tumors. The modulation of chitinases was confirmed also in the different histologic subtypes. Our study revealed that distinct patterns of chitinases expression characterize the diverse histological subtypes. In addition evaluating other lysosomal enzymes such as glycosidases and proteases we found that NEU4, CTBS and GBA2 belonging to glycosidases family and CTSC, CTSK and CTSF belonging to proteases family were differently modulated. Future investigations are needed to be performed before some of these enzymes could finally be used as biomarkers of specific types of CNS neoplasms.

© 2015 Elsevier GmbH. All rights reserved.

Introduction

Childhood brain tumors are the second leading cause of death from childhood cancers. A broad increase in new cases of CNS tumors has been observed throughout the world (Woehrer et al., 2015). Brain tumors comprise of heterogeneous group of neoplasms, including approximately 120 entities as well as different types of primary brain tumors and a variety of secondary neoplasms (Louis et al., 2007). Generally, the diagnosis of CNS neoplasms is confirmed with histopathology examination and must start with careful neurologic examination followed by suitable brain imaging. Imaging techniques consent to define tumor location, its biologic activity and to estimate the

effects of patients' treatment, to differentiate tumor recurrence and determine tumor progression (Chandana et al., 2008). Blood and tissue biomarkers of central nervous system (CNS) tumors, neuroimaging techniques, especially MRI, are the standard methods in evaluation of disease status of patients with CNS tumors. At the moment, neuroimaging methods are characterized by the lack of specificity for differentiation of brain tumors, thus the tumor typing and grading are still definite by histopathological assessment of tissue sample that require surgical intervention. In addition, the frequency of pseudoprogression as well as pseudoresponse after treatment is a well-known limitation of these techniques. So far, few genes have been considered suitable as clinical biomarkers that may support neuroradiological differential diagnosis of central nervous system (CNS) tumors. The best solution in the process of CNS tumors diagnosis could be easily available biomarkers that should be useful in the monitoring of the disease course, differentiation diagnosis, and improve treatment options (Ilhan-Mutlu et al., 2013). Current treatments for these pediatric brain tumors include surgical resection, radiation, and chemotherapy. However, in young children, these treatments are associated with secondary damage to the developing brain, and result in long-term neuropsychological and neuroendocrine dysfunction. Given this clinical imperative and the limited success in

Abbreviations: PA, pilocytic astrocytoma; EPM, ependimoma; GBM, glioblastoma; MED, medulloblastoma; NB, normal brain; CHIT1, chitinase 1; CHIT2, chitinase 2; CHIT3, chitinase 3; CHIT4, chitinase 4; CHIT5, chitinase 5; CHIT6, chitinase 6; CHIT7, chitinase 7; CHIT8, chitinase 8; CHIT9, chitinase 9; CHIT10, chitinase 10; CHIT11, chitinase 11; CHIT12, chitinase 12; CHIT13, chitinase 13; CHIT14, chitinase 14; CHIT15, chitinase 15; CHIT16, chitinase 16; CHIT17, chitinase 17; CHIT18, chitinase 18; CHIT19, chitinase 19; CHIT20, chitinase 20; CHIT21, chitinase 21; CHIT22, chitinase 22; CHIT23, chitinase 23; CHIT24, chitinase 24; CHIT25, chitinase 25; CHIT26, chitinase 26; CHIT27, chitinase 27; CHIT28, chitinase 28; CHIT29, chitinase 29; CHIT30, chitinase 30; CHIT31, chitinase 31; CHIT32, chitinase 32; CHIT33, chitinase 33; CHIT34, chitinase 34; CHIT35, chitinase 35; CHIT36, chitinase 36; CHIT37, chitinase 37; CHIT38, chitinase 38; CHIT39, chitinase 39; CHIT40, chitinase 40; CHIT41, chitinase 41; CHIT42, chitinase 42; CHIT43, chitinase 43; CHIT44, chitinase 44; CHIT45, chitinase 45; CHIT46, chitinase 46; CHIT47, chitinase 47; CHIT48, chitinase 48; CHIT49, chitinase 49; CHIT50, chitinase 50; CHIT51, chitinase 51; CHIT52, chitinase 52; CHIT53, chitinase 53; CHIT54, chitinase 54; CHIT55, chitinase 55; CHIT56, chitinase 56; CHIT57, chitinase 57; CHIT58, chitinase 58; CHIT59, chitinase 59; CHIT60, chitinase 60; CHIT61, chitinase 61; CHIT62, chitinase 62; CHIT63, chitinase 63; CHIT64, chitinase 64; CHIT65, chitinase 65; CHIT66, chitinase 66; CHIT67, chitinase 67; CHIT68, chitinase 68; CHIT69, chitinase 69; CHIT70, chitinase 70; CHIT71, chitinase 71; CHIT72, chitinase 72; CHIT73, chitinase 73; CHIT74, chitinase 74; CHIT75, chitinase 75; CHIT76, chitinase 76; CHIT77, chitinase 77; CHIT78, chitinase 78; CHIT79, chitinase 79; CHIT80, chitinase 80; CHIT81, chitinase 81; CHIT82, chitinase 82; CHIT83, chitinase 83; CHIT84, chitinase 84; CHIT85, chitinase 85; CHIT86, chitinase 86; CHIT87, chitinase 87; CHIT88, chitinase 88; CHIT89, chitinase 89; CHIT90, chitinase 90; CHIT91, chitinase 91; CHIT92, chitinase 92; CHIT93, chitinase 93; CHIT94, chitinase 94; CHIT95, chitinase 95; CHIT96, chitinase 96; CHIT97, chitinase 97; CHIT98, chitinase 98; CHIT99, chitinase 99; CHIT100, chitinase 100; CHIT101, chitinase 101; CHIT102, chitinase 102; CHIT103, chitinase 103; CHIT104, chitinase 104; CHIT105, chitinase 105; CHIT106, chitinase 106; CHIT107, chitinase 107; CHIT108, chitinase 108; CHIT109, chitinase 109; CHIT110, chitinase 110; CHIT111, chitinase 111; CHIT112, chitinase 112; CHIT113, chitinase 113; CHIT114, chitinase 114; CHIT115, chitinase 115; CHIT116, chitinase 116; CHIT117, chitinase 117; CHIT118, chitinase 118; CHIT119, chitinase 119; CHIT120, chitinase 120; CHIT121, chitinase 121; CHIT122, chitinase 122; CHIT123, chitinase 123; CHIT124, chitinase 124; CHIT125, chitinase 125; CHIT126, chitinase 126; CHIT127, chitinase 127; CHIT128, chitinase 128; CHIT129, chitinase 129; CHIT130, chitinase 130; CHIT131, chitinase 131; CHIT132, chitinase 132; CHIT133, chitinase 133; CHIT134, chitinase 134; CHIT135, chitinase 135; CHIT136, chitinase 136; CHIT137, chitinase 137; CHIT138, chitinase 138; CHIT139, chitinase 139; CHIT140, chitinase 140; CHIT141, chitinase 141; CHIT142, chitinase 142; CHIT143, chitinase 143; CHIT144, chitinase 144; CHIT145, chitinase 145; CHIT146, chitinase 146; CHIT147, chitinase 147; CHIT148, chitinase 148; CHIT149, chitinase 149; CHIT150, chitinase 150; CHIT151, chitinase 151; CHIT152, chitinase 152; CHIT153, chitinase 153; CHIT154, chitinase 154; CHIT155, chitinase 155; CHIT156, chitinase 156; CHIT157, chitinase 157; CHIT158, chitinase 158; CHIT159, chitinase 159; CHIT160, chitinase 160; CHIT161, chitinase 161; CHIT162, chitinase 162; CHIT163, chitinase 163; CHIT164, chitinase 164; CHIT165, chitinase 165; CHIT166, chitinase 166; CHIT167, chitinase 167; CHIT168, chitinase 168; CHIT169, chitinase 169; CHIT170, chitinase 170; CHIT171, chitinase 171; CHIT172, chitinase 172; CHIT173, chitinase 173; CHIT174, chitinase 174; CHIT175, chitinase 175; CHIT176, chitinase 176; CHIT177, chitinase 177; CHIT178, chitinase 178; CHIT179, chitinase 179; CHIT180, chitinase 180; CHIT181, chitinase 181; CHIT182, chitinase 182; CHIT183, chitinase 183; CHIT184, chitinase 184; CHIT185, chitinase 185; CHIT186, chitinase 186; CHIT187, chitinase 187; CHIT188, chitinase 188; CHIT189, chitinase 189; CHIT190, chitinase 190; CHIT191, chitinase 191; CHIT192, chitinase 192; CHIT193, chitinase 193; CHIT194, chitinase 194; CHIT195, chitinase 195; CHIT196, chitinase 196; CHIT197, chitinase 197; CHIT198, chitinase 198; CHIT199, chitinase 199; CHIT200, chitinase 200; CHIT201, chitinase 201; CHIT202, chitinase 202; CHIT203, chitinase 203; CHIT204, chitinase 204; CHIT205, chitinase 205; CHIT206, chitinase 206; CHIT207, chitinase 207; CHIT208, chitinase 208; CHIT209, chitinase 209; CHIT210, chitinase 210; CHIT211, chitinase 211; CHIT212, chitinase 212; CHIT213, chitinase 213; CHIT214, chitinase 214; CHIT215, chitinase 215; CHIT216, chitinase 216; CHIT217, chitinase 217; CHIT218, chitinase 218; CHIT219, chitinase 219; CHIT220, chitinase 220; CHIT221, chitinase 221; CHIT222, chitinase 222; CHIT223, chitinase 223; CHIT224, chitinase 224; CHIT225, chitinase 225; CHIT226, chitinase 226; CHIT227, chitinase 227; CHIT228, chitinase 228; CHIT229, chitinase 229; CHIT230, chitinase 230; CHIT231, chitinase 231; CHIT232, chitinase 232; CHIT233, chitinase 233; CHIT234, chitinase 234; CHIT235, chitinase 235; CHIT236, chitinase 236; CHIT237, chitinase 237; CHIT238, chitinase 238; CHIT239, chitinase 239; CHIT240, chitinase 240; CHIT241, chitinase 241; CHIT242, chitinase 242; CHIT243, chitinase 243; CHIT244, chitinase 244; CHIT245, chitinase 245; CHIT246, chitinase 246; CHIT247, chitinase 247; CHIT248, chitinase 248; CHIT249, chitinase 249; CHIT250, chitinase 250; CHIT251, chitinase 251; CHIT252, chitinase 252; CHIT253, chitinase 253; CHIT254, chitinase 254; CHIT255, chitinase 255; CHIT256, chitinase 256; CHIT257, chitinase 257; CHIT258, chitinase 258; CHIT259, chitinase 259; CHIT260, chitinase 260; CHIT261, chitinase 261; CHIT262, chitinase 262; CHIT263, chitinase 263; CHIT264, chitinase 264; CHIT265, chitinase 265; CHIT266, chitinase 266; CHIT267, chitinase 267; CHIT268, chitinase 268; CHIT269, chitinase 269; CHIT270, chitinase 270; CHIT271, chitinase 271; CHIT272, chitinase 272; CHIT273, chitinase 273; CHIT274, chitinase 274; CHIT275, chitinase 275; CHIT276, chitinase 276; CHIT277, chitinase 277; CHIT278, chitinase 278; CHIT279, chitinase 279; CHIT280, chitinase 280; CHIT281, chitinase 281; CHIT282, chitinase 282; CHIT283, chitinase 283; CHIT284, chitinase 284; CHIT285, chitinase 285; CHIT286, chitinase 286; CHIT287, chitinase 287; CHIT288, chitinase 288; CHIT289, chitinase 289; CHIT290, chitinase 290; CHIT291, chitinase 291; CHIT292, chitinase 292; CHIT293, chitinase 293; CHIT294, chitinase 294; CHIT295, chitinase 295; CHIT296, chitinase 296; CHIT297, chitinase 297; CHIT298, chitinase 298; CHIT299, chitinase 299; CHIT300, chitinase 300; CHIT301, chitinase 301; CHIT302, chitinase 302; CHIT303, chitinase 303; CHIT304, chitinase 304; CHIT305, chitinase 305; CHIT306, chitinase 306; CHIT307, chitinase 307; CHIT308, chitinase 308; CHIT309, chitinase 309; CHIT310, chitinase 310; CHIT311, chitinase 311; CHIT312, chitinase 312; CHIT313, chitinase 313; CHIT314, chitinase 314; CHIT315, chitinase 315; CHIT316, chitinase 316; CHIT317, chitinase 317; CHIT318, chitinase 318; CHIT319, chitinase 319; CHIT320, chitinase 320; CHIT321, chitinase 321; CHIT322, chitinase 322; CHIT323, chitinase 323; CHIT324, chitinase 324; CHIT325, chitinase 325; CHIT326, chitinase 326; CHIT327, chitinase 327; CHIT328, chitinase 328; CHIT329, chitinase 329; CHIT330, chitinase 330; CHIT331, chitinase 331; CHIT332, chitinase 332; CHIT333, chitinase 333; CHIT334, chitinase 334; CHIT335, chitinase 335; CHIT336, chitinase 336; CHIT337, chitinase 337; CHIT338, chitinase 338; CHIT339, chitinase 339; CHIT340, chitinase 340; CHIT341, chitinase 341; CHIT342, chitinase 342; CHIT343, chitinase 343; CHIT344, chitinase 344; CHIT345, chitinase 345; CHIT346, chitinase 346; CHIT347, chitinase 347; CHIT348, chitinase 348; CHIT349, chitinase 349; CHIT350, chitinase 350; CHIT351, chitinase 351; CHIT352, chitinase 352; CHIT353, chitinase 353; CHIT354, chitinase 354; CHIT355, chitinase 355; CHIT356, chitinase 356; CHIT357, chitinase 357; CHIT358, chitinase 358; CHIT359, chitinase 359; CHIT360, chitinase 360; CHIT361, chitinase 361; CHIT362, chitinase 362; CHIT363, chitinase 363; CHIT364, chitinase 364; CHIT365, chitinase 365; CHIT366, chitinase 366; CHIT367, chitinase 367; CHIT368, chitinase 368; CHIT369, chitinase 369; CHIT370, chitinase 370; CHIT371, chitinase 371; CHIT372, chitinase 372; CHIT373, chitinase 373; CHIT374, chitinase 374; CHIT375, chitinase 375; CHIT376, chitinase 376; CHIT377, chitinase 377; CHIT378, chitinase 378; CHIT379, chitinase 379; CHIT380, chitinase 380; CHIT381, chitinase 381; CHIT382, chitinase 382; CHIT383, chitinase 383; CHIT384, chitinase 384; CHIT385, chitinase 385; CHIT386, chitinase 386; CHIT387, chitinase 387; CHIT388, chitinase 388; CHIT389, chitinase 389; CHIT390, chitinase 390; CHIT391, chitinase 391; CHIT392, chitinase 392; CHIT393, chitinase 393; CHIT394, chitinase 394; CHIT395, chitinase 395; CHIT396, chitinase 396; CHIT397, chitinase 397; CHIT398, chitinase 398; CHIT399, chitinase 399; CHIT400, chitinase 400; CHIT401, chitinase 401; CHIT402, chitinase 402; CHIT403, chitinase 403; CHIT404, chitinase 404; CHIT405, chitinase 405; CHIT406, chitinase 406; CHIT407, chitinase 407; CHIT408, chitinase 408; CHIT409, chitinase 409; CHIT410, chitinase 410; CHIT411, chitinase 411; CHIT412, chitinase 412; CHIT413, chitinase 413; CHIT414, chitinase 414; CHIT415, chitinase 415; CHIT416, chitinase 416; CHIT417, chitinase 417; CHIT418, chitinase 418; CHIT419, chitinase 419; CHIT420, chitinase 420; CHIT421, chitinase 421; CHIT422, chitinase 422; CHIT423, chitinase 423; CHIT424, chitinase 424; CHIT425, chitinase 425; CHIT426, chitinase 426; CHIT427, chitinase 427; CHIT428, chitinase 428; CHIT429, chitinase 429; CHIT430, chitinase 430; CHIT431, chitinase 431; CHIT432, chitinase 432; CHIT433, chitinase 433; CHIT434, chitinase 434; CHIT435, chitinase 435; CHIT436, chitinase 436; CHIT437, chitinase 437; CHIT438, chitinase 438; CHIT439, chitinase 439; CHIT440, chitinase 440; CHIT441, chitinase 441; CHIT442, chitinase 442; CHIT443, chitinase 443; CHIT444, chitinase 444; CHIT445, chitinase 445; CHIT446, chitinase 446; CHIT447, chitinase 447; CHIT448, chitinase 448; CHIT449, chitinase 449; CHIT450, chitinase 450; CHIT451, chitinase 451; CHIT452, chitinase 452; CHIT453, chitinase 453; CHIT454, chitinase 454; CHIT455, chitinase 455; CHIT456, chitinase 456; CHIT457, chitinase 457; CHIT458, chitinase 458; CHIT459, chitinase 459; CHIT460, chitinase 460; CHIT461, chitinase 461; CHIT462, chitinase 462; CHIT463, chitinase 463; CHIT464, chitinase 464; CHIT465, chitinase 465; CHIT466, chitinase 466; CHIT467, chitinase 467; CHIT468, chitinase 468; CHIT469, chitinase 469; CHIT470, chitinase 470; CHIT471, chitinase 471; CHIT472, chitinase 472; CHIT473, chitinase 473; CHIT474, chitinase 474; CHIT475, chitinase 475; CHIT476, chitinase 476; CHIT477, chitinase 477; CHIT478, chitinase 478; CHIT479, chitinase 479; CHIT480, chitinase 480; CHIT481, chitinase 481; CHIT482, chitinase 482; CHIT483, chitinase 483; CHIT484, chitinase 484; CHIT485, chitinase 485; CHIT486, chitinase 486; CHIT487, chitinase 487; CHIT488, chitinase 488; CHIT489, chitinase 489; CHIT490, chitinase 490; CHIT491, chitinase 491; CHIT492, chitinase 492; CHIT493, chitinase 493; CHIT494, chitinase 494; CHIT495, chitinase 495; CHIT496, chitinase 496; CHIT497, chitinase 497; CHIT498, chitinase 498; CHIT499, chitinase 499; CHIT500, chitinase 500; CHIT501, chitinase 501; CHIT502, chitinase 502; CHIT503, chitinase 503; CHIT504, chitinase 504; CHIT505, chitinase 505; CHIT506, chitinase 506; CHIT507, chitinase 507; CHIT508, chitinase 508; CHIT509, chitinase 509; CHIT510, chitinase 510; CHIT511, chitinase 511; CHIT512, chitinase 512; CHIT513, chitinase 513; CHIT514, chitinase 514; CHIT515, chitinase 515; CHIT516, chitinase 516; CHIT517, chitinase 517; CHIT518, chitinase 518; CHIT519, chitinase 519; CHIT520, chitinase 520; CHIT521, chitinase 521; CHIT522, chitinase 522; CHIT523, chitinase 523; CHIT524, chitinase 524; CHIT525, chitinase 525; CHIT526, chitinase 526; CHIT527, chitinase 527; CHIT528, chitinase 528; CHIT529, chitinase 529; CHIT530, chitinase 530; CHIT531, chitinase 531; CHIT532, chitinase 532; CHIT533, chitinase 533; CHIT534, chitinase 534; CHIT535, chitinase 535; CHIT536, chitinase 536; CHIT537, chitinase 537; CHIT538, chitinase 538; CHIT539, chitinase 539; CHIT540, chitinase 540; CHIT541, chitinase 541; CHIT542, chitinase 542; CHIT543, chitinase 543; CHIT544, chitinase 544; CHIT545, chitinase 545; CHIT546, chitinase 546; CHIT547, chitinase 547; CHIT548, chitinase 548; CHIT549, chitinase 549; CHIT550, chitinase 550; CHIT551, chitinase 551; CHIT552, chitinase 552; CHIT553, chitinase 553; CHIT554, chitinase 554; CHIT555, chitinase 555; CHIT556, chitinase 556; CHIT557, chitinase 557; CHIT558, chitinase 558; CHIT559, chitinase 559; CHIT560, chitinase 560; CHIT561, chitinase 561; CHIT562, chitinase 562; CHIT563, chitinase 563; CHIT564, chitinase 564; CHIT565, chitinase 565; CHIT566, chitinase 566; CHIT567, chitinase 567; CHIT568, chitinase 568; CHIT569, chitinase 569; CHIT570, chitinase 570; CHIT571, chitinase 571; CHIT572, chitinase 572; CHIT573, chitinase 573; CHIT574, chitinase 574; CHIT575, chitinase 575; CHIT576, chitinase 576; CHIT577, chitinase 577; CHIT578, chitinase 578; CHIT579, chitinase 579; CHIT580, chitinase 580; CHIT581, chitinase 581; CHIT582, chitinase 582; CHIT583, chitinase 583; CHIT584, chitinase 584; CHIT585, chitinase 585; CHIT586, chitinase 586; CHIT587, chitinase 587; CHIT588, chitinase 588; CHIT589, chitinase 589; CHIT590, chitinase 590; CHIT591, chitinase 591; CHIT592, chitinase 592; CHIT593, chitinase 593; CHIT594, chitinase 594; CHIT595, chitinase 595; CHIT596, chitinase 596; CHIT597, chitinase 597; CHIT598, chitinase 598; CHIT599, chitinase 599; CHIT600, chitinase 600; CHIT601, chitinase 601; CHIT602, chitinase 602; CHIT603, chitinase 603; CHIT604, chitinase 604; CHIT605, chitinase 605; CHIT606, chitinase 606; CHIT607, chitinase 607; CHIT608, chitinase 608; CHIT609, chitinase 609; CHIT610, chitinase 610; CHIT611, chitinase 611; CHIT612, chitinase 612; CHIT613, chitinase 613; CHIT614, chitinase 614; CHIT615, chitinase 615; CHIT616, chitinase 616; CHIT617, chitinase 617; CHIT618, chitinase 618; CHIT619, chitinase 619; CHIT620, chitinase 620; CHIT621, chitinase 621; CHIT622, chitinase 622; CHIT623, chitinase 623; CHIT624, chitinase 624; CHIT625, chitinase 625; CHIT626, chitinase 626; CHIT627, chitinase 627; CHIT628, chitinase 628; CHIT629, chitinase 629; CHIT630, chitinase 630; CHIT631, chitinase 631; CHIT632, chitinase 632; CHIT633, chitinase 633; CHIT634, chitinase 634; CHIT635, chitinase 635; CHIT636, chitinase 636; CHIT637, chitinase 637; CHIT638, chitinase 638; CHIT639, chitinase 639; CHIT640, chitinase 640; CHIT641, chitinase 641; CHIT642, chitinase 642; CHIT643, chitinase 643; CHIT644, chitinase 644; CHIT645, chitinase 645; CHIT646, chitinase 646; CHIT647, chitinase 647; CHIT648, chitinase 648; CHIT649, chitinase 649; CHIT650, chitinase 650; CHIT651, chitinase 651; CHIT652, chitinase 652; CHIT653, chitinase 653; CHIT654, chitinase 654; CHIT655, chitinase 655; CHIT656, chitinase 656; CHIT657, chitinase 657; CHIT658, chitinase 658; CHIT659, chitinase 659; CHIT660, chitinase 660; CHIT661, chitinase 661; CHIT662, chitinase 662; CHIT663, chitinase 663; CHIT664, chitinase 664; CHIT665, chitinase 665; CHIT666, chitinase 666; CHIT667, chitinase 667; CHIT668, chitinase 668; CHIT669, chitinase 669; CHIT670, chitinase 670; CHIT671, chitinase 671; CHIT672, chitinase 672; CHIT673, chitinase 673; CHIT674, chitinase 674; CHIT675, chitinase 675; CHIT676, chitinase 676; CHIT677, chitinase 677; CHIT678, chitinase 678; CHIT679, chitinase 679; CHIT680, chitinase 680; CHIT681, chitinase 681; CHIT682, chitinase 682; CHIT683, chitinase 683; CHIT684, chitinase 684; CHIT685, chitinase 685; CHIT686, chitinase 686; CHIT687, chitinase 687; CHIT688, chitinase 688; CHIT689, chitinase 689; CHIT690, chitinase 690; CHIT691, chitinase 691; CHIT692, chitinase 692; CHIT693, chitinase 693; CHIT694, chitinase 694; CHIT695, chitinase 695; CHIT696, chitinase 696; CHIT697, chitinase 697; CHIT698, chitinase 698; CHIT699, chitinase 699; CHIT700, chitinase 700; CHIT701, chitinase 701; CHIT702, chitinase 702; CHIT703, chitinase 703; CHIT704, chitinase 704; CHIT705, chitinase 705; CHIT706, chitinase 706; CHIT707, chitinase 707; CHIT708, chitinase 708; CHIT709, chitinase 709; CHIT710, chitinase 710; CHIT711, chitinase 711; CHIT712, chitinase 712; CHIT713, chitinase 713; CHIT714, chitinase 714; CHIT715, chitinase 715; CHIT716, chitinase 716; CHIT717, chitinase 717; CHIT718, chitinase 718; CHIT719, chitinase 719; CHIT720, chitinase 720; CHIT721, chitinase 721; CHIT722, chitinase 722; CHIT723, chitinase 723; CHIT724, chitinase 724; CHIT725, chitinase 725; CHIT726, chitinase 726; CHIT727, chitinase 727; CHIT728, chitinase 728; CHIT729, chitinase 729; CHIT730, chitinase 730; CHIT731, chitinase 731; CHIT732, chitinase 732; CHIT733, chitinase 733; CHIT734, chitinase 734; CHIT735, chitinase 735; CHIT736, chitinase 736; CHIT737, chitinase 737; CHIT738, chitinase 738; CHIT739, chitinase 739; CHIT740, chitinase 740; CHIT741, chitinase 741; CHIT742, chitinase 742; CHIT743, chitinase 743; CHIT744, chitinase 744; CHIT745, chitinase 745; CHIT746, chitinase 746; CHIT747, chitinase 747; CHIT748, chitinase 748; CHIT749, chitinase 749; CHIT750, chitinase 750; CHIT751, chitinase 751; CHIT752, chitinase 752; CHIT753, chitinase 753; CHIT754, chitinase 754; CHIT755, chitinase 755; CHIT756, chitinase 756; CHIT757, chitinase 757; CHIT758, chitinase 758; CHIT759, chitinase 759; CHIT760, chitinase 760; CHIT761, chitinase 761; CHIT762, chitinase 762; CHIT763, chitinase 763; CHIT764, chitinase 764; CHIT765, chitinase 765; CHIT766, chitinase 766; CHIT767, chitinase 767; CHIT768, chitinase 768; CHIT769, chitinase 769; CHIT770, chitinase 770; CHIT771, chitinase 771; CHIT772, chitinase 772; CHIT773, chitinase 773; CHIT774, chitinase 774; CHIT775, ch

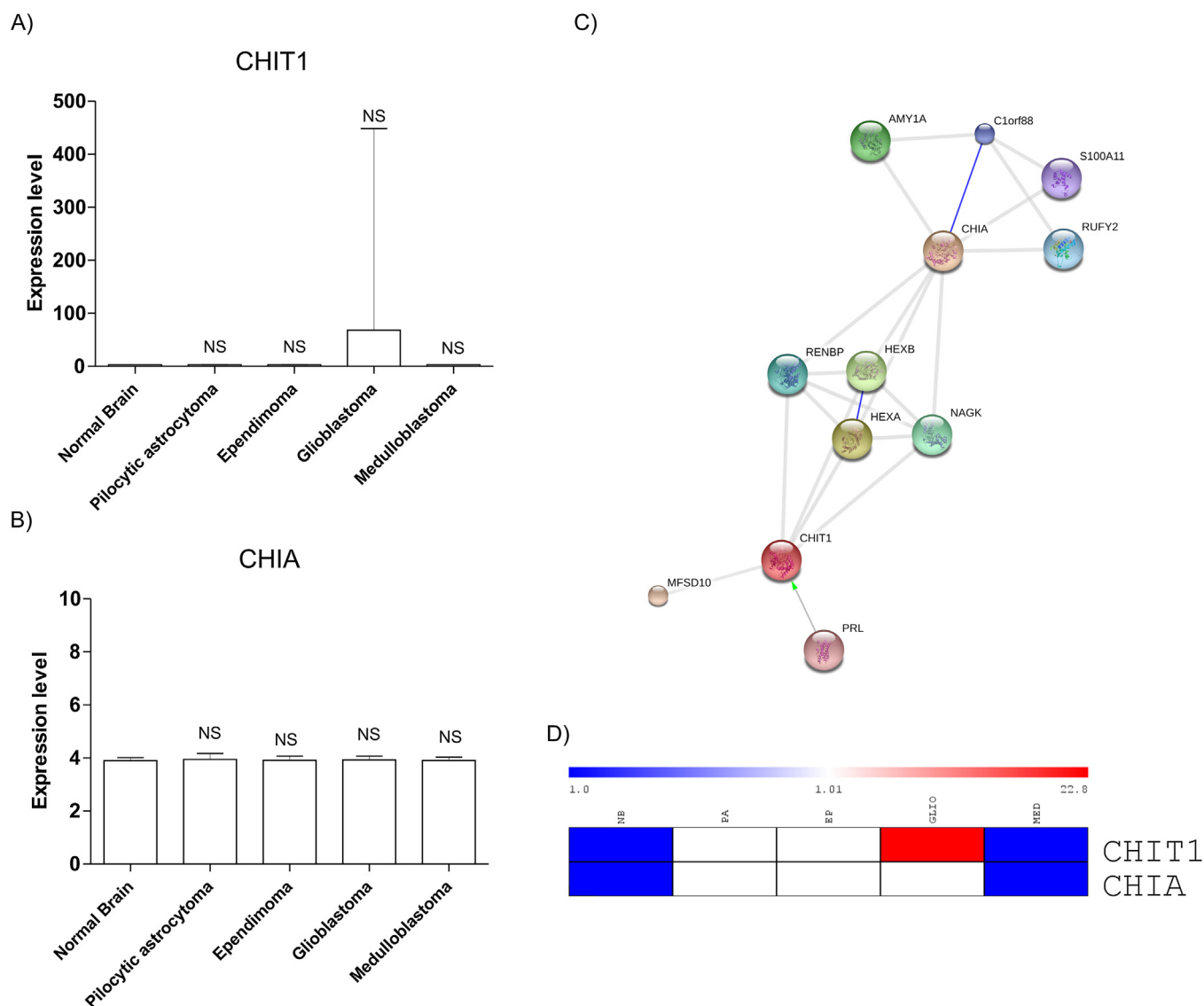


Fig. 1. Chitinases genes expression in pediatric brain tumors. (A, B) No significant change was observed in CHIT1 and CHIA expression. (C) STRING network of Chitinase. (D) Heatmap of chitinases expressed in pediatric brain tumors. Gene expression values are color coded from bright red (most upregulated) to dark blue (most downregulated). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

identifying therapeutic targets by conventional genomic analyses it is imperative to identify the key genetic and growth control pathways de-regulated in the in pilocytic astrocytoma (PA), ependimoma (EPN), medulloblastoma (MED) and glioblastoma multiforme (GBM) which are the most common pediatric brain tumor types sample that require surgical intervention. The spectrum of brain tumors arising in children differs significantly from what is observed in adults, with PA and medulloblastoma (MB) accounting for the largest portion of pediatric low grade and malignant brain tumors, respectively. These tumors rarely occur in adults, who have a higher incidence of meningioma and malignant gliomas, especially GBM (Ostrom et al., 2013). Additionally, the structural alterations and sequence-based changes that characterize pediatric and (Rickman et al., 2001) adult brain tumors are often different and reflect differences in the underlying mechanisms of tumor formation (Fangusaro, 2012; Kilday et al., 2009; Ramkissoon et al., 2013). New genomic technologies such as DNA microarrays may elucidate the molecular mechanisms underlying major human brain pathology including tumors (Anagnostopoulos and Tsangaris, 2014; Glade Bender et al., 2015; Madabhushi et al.,

2014; Paratore et al., 2006; Suva and Louis, 2013). Some studies have used microarrays to compare the expression pattern of high-grade tumor with low-grade tumor or non-tumoral brain tissue (Gutmann et al., 2002; Khatua et al., 2003; Mischel et al., 2004; Rickman et al., 2001; Sallinen et al., 2000). They identified cell cycle and growth regulators, invasion and growth factors and cytokines that probably play a role in brain tumors progression. In this study, employing a network-based analytical approach we chose to compare PA EPN, MED and GBM and PA in order to find a new list of genes involved in tumor brain invasion. We were able to identify a number of novel potential candidate genes for the evaluation of the malignancy and prognosis of pediatric brain tumor.

Materials and methods

Selection of a microarray expression dataset

The microarray dataset for the transcriptional profile of pediatric brain tumors was obtained from the NCBI Gene Expression

Download English Version:

<https://daneshyari.com/en/article/8287662>

Download Persian Version:

<https://daneshyari.com/article/8287662>

[Daneshyari.com](https://daneshyari.com)